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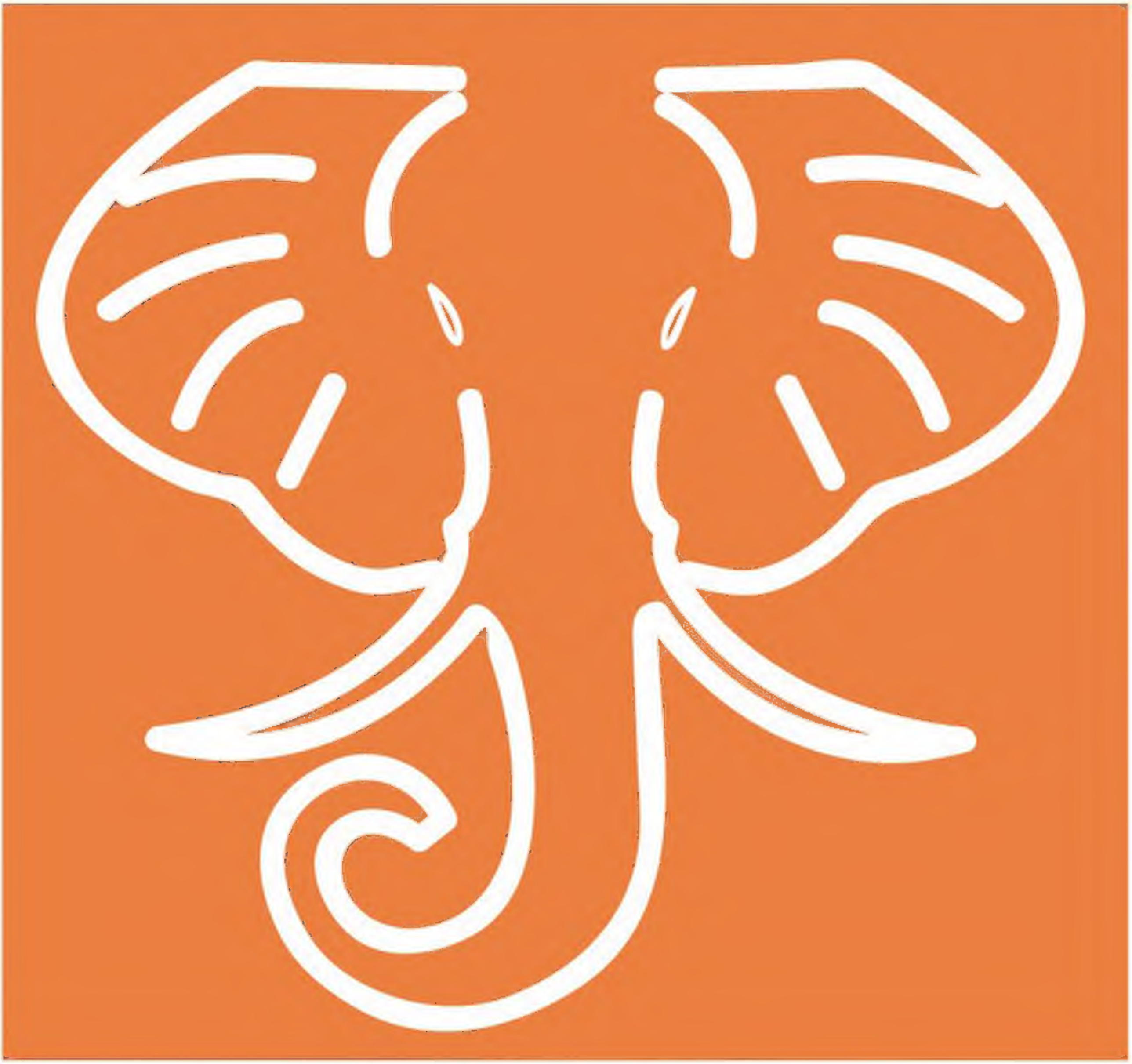

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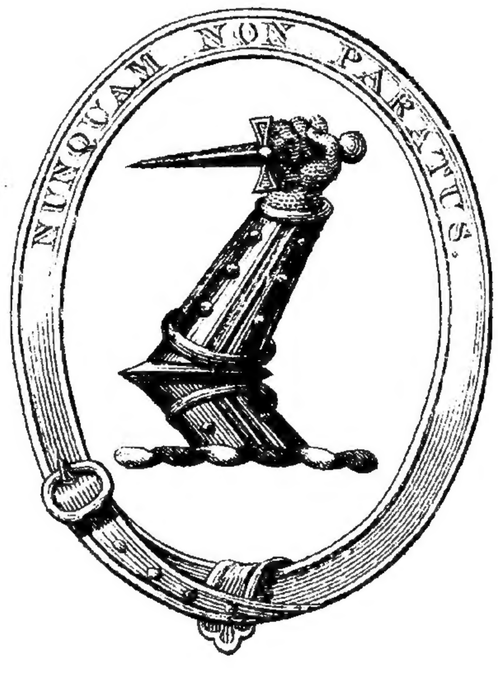

Thomas Haddan.

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THE

CYCLOPÆDIA;

OR,

Universal Dictionary

OF

ARTS, SCIENCES, AND LITERATURE.

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THE

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CYCLOPÆDIA:

OR, A NEW

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OF

ARTS and SCIENCES.

FOOD.

FOOD *of* PLANTS, in *Agriculture* and *Vegetation*, the various kinds of fine attenuated and elaborated materials which are abſorbed from the ſurrounding atmoſphere, or taken up from the ſoil, in order to their nouriſhment and ſupport. It ſeems not improbable but that many of the more fluid and elaſtic matters of nature may contribute in this way. The more ancient writers were extremely anxious to aſcertain the nature of the *pabulum*, or food of plants, but their inquiries on the ſubject were far from ſatisfactory. They aſcribed the growth and increaſe of plants to ſeveral different matters, as water, air, earth, fire, &c.; and even to the neutral ſalt, known by the name of nitre. But they were not able to ſhew which of them was properly the food of plants. Van Helmont was ſtrongly in favour of water; Bradley contended for its being air, while Lawrence and others ſupported the opinion of its depending on fire. And a great number of more modern authors have ſtood forward in ſupport of earth, and nitre as the food of plants. The matter, however, continued in this unſettled ſtate, until the improvements of the French chemiſts threw additional light upon it, by ſhewing that various gaſeous, liquid, carbonaceous, and other ſubſtances, either in their ſimple or combined ſtates, were eſſential to the nouriſhment and ſupport of vegetable life.

Further inquiries into the nature and principles of vegetation, and the manner in which it is performed, are however highly deſerving of the attention of thoſe who are engaged in the cultivation of the ſoil, as upon the knowledge of theſe in a great meaſure depends, not only the improvement of huſbandry, but the advantageous production of different ſorts of plants, as crops. The agriculturaliſt ſhould indeed be in poſſeſſion of the full and complete knowledge of the means by which all the various ſorts of uſeful field plants are beſt capable of being raiſed, ſupported, and brought to perfection. A juſt and exact notion of theſe muſt contribute greatly in directing and aſſiſting him in the care and management of his lands and crops, as well as in ſhewing the moſt advantageous ſtates and conditions of the ground for affording the nouriſhment and ſupport of the plants, in the moſt eaſy, abundant, and expeditious manner.

The reſearches of doctor Ingenhouſz throw conſiderable light not only on the nature of the food of plants, but likewiſe on the renovation and improvement of ſoils. It is contended by this ingenious philoſopher, in an able eſſay, inſerted in the thirty-ſeventh volume of the Annals of Agriculture, that the ſureſt way of finding out the real nouriſhment of organized bodies, ſeems to be to inquire what is the ſubſtance without which they inevitably periſh, and which alone is ſufficient to continue their life. All animals require two ingredients for the continuation of their exiſtence; *viz.* atmoſpheric air, and moiſt food, derived either from animal or vegetable ſubſtances; which food being received into the ſtomach or ſome reſervoir deſtined for that purpoſe, and being gradually digeſted and changed into different ſubſtances in the different organs, is applied to the whole economy of the animal body. Vegetables being deprived of progreſſive motion, by which means the greateſt number of animals go in ſearch of food, muſt find in the narrow compaſs or ſpace they occupy every thing neceſſary for their ſubſiſtence. As they are in contact with two ſubſtances only, the earth and the atmoſpheric air, their nouriſhment muſt, he thinks, exiſt in either of them, or in both. The earth is neceſſary to the plants, as the only means to fix them ſtedfaſtly to the ſpot, by ſpreading through it their roots; but as earth contains generally moiſture, ſalts, air, &c. nature has taken advantage from this circumſtance, ſo that the filaments of the roots pump from the ſoil all that is

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is offered to their ſuckers, and can be abſorbed by them; but as ſome plants may live and thrive without being in contact with any earth, we ought to take it for granted, that the ſoil, or what exiſts in the ſoil, is not the only food of plants. Water is neceſſary to all organized beings, as without it no circulation of juices could be carried on, but from this neceſſity it can only be deduced that water is a vehicle of the food, and by no means that it is the true nouriſhment of animals or vegetables; the leſs ſo, as it is an incontrovertible fact that ſeveral plants can live without being in contact with water. Thus the agave, cactus, aloe, cacalia, &c. live on the moſt dry rocks in the hotteſt climates, where it does not rain ſometimes in the ſpace of ſeveral months, and where the burning ſun pierces all other plants, and even deprives the trees of all their leaves, and what is extraordinary, almoſt all the parts of ſuch plants are full of juices. The nocturnal dew, it is ſuppoſed, cannot give ſufficient nouriſhment to ſuch plants, as all other plants would alſo maintain themſelves with it. But to be certain that thoſe plants do not ſubſiſt by dew, we ought to conſider only that ſome plants of that ſpecies may be kept alive in the hot houſes, either in pots, without being watered, or by hanging them up from the cieling. Now, as by what he has ſaid here, it ſeems, the writer thinks, to be probable, that neither water nor ſoil is or contains all the true nouriſhment of vegetables, it muſt be concluded, that plants muſt find it in the atmoſpheric air, for this, it is aſſerted, is the only ingredient, without which all vegetables periſh. A plant ſhut up in vacuo ſoon dies, and it dies in all ſorts of aerial fluids, which are incapable of ſupporting animal life; ſuch as carbonic acid gas, or fixed air, hydrogen gas, or inflammable air, phlogiſticated air, or azote, &c. It is true, he admits, that doctor Prieſtley and Mr. Scheele have propagated a doctrine diametrically oppoſite to what he has here advanced, by ſaying that plants thrive wonderfully in putrid air, and periſh in pure or dephlogiſticated air. This doctrine, though generally adopted, and very ingeniouſly applied by ſir John Pringle and others to illuſtrate the mutual reſemblance eſtabliſhed by the author of nature between the vegetable kingdom, and the animal creation, is, it is conceived, refuted by his experiments, by which he thinks, he has proved, that plants ſhut up in vital air live ſo much the longer, as this air is ſuperior in purity to atmoſpheric air. In his "Expériences ſur les Végétaux," tome ii. he has explained the manner of making theſe experiments with ſucceſs; and has ſhewn the reaſon why, of two plants, the one ſhut up with common air, the other with the ſame quantity of vital air, (both kept in the dark,) the plant placed in common air can only be kept alive during a certain very limited time, whereas the plant ſhut up in vital air may be kept alive much longer, even as long as there is vital air enough remaining to cover the whole plant.

From theſe and many other conſiderations, he has deduced that from the two organized kingdoms, the animal and the vegetable, the animal derives its nouriſhment from the vegetable; but that the vegetable creation is independent of the animal world, provides for itſelf, and derives its ſubſiſtence chiefly from the atmoſphere.

It is ſtated, that when he engaged in the experiments on vegetables, which he publiſhed in 1779 in Engliſh, and in 1780 more fully in French, Dr. Prieſtley had already obſerved, that vegetables poſſeſſed a power of correcting bad air; which however was denied by Mr. Scheele in Sweden, who found that plants, inſtead of correcting bad air, corrupted good air. This contradiction ſtruck Dr. Prieſtley ſo much, that he employed the ſummer of 1778 in repeating his former experiments; and after the moſt accurate reſearches he concluded, that though there ſeems to be ſuch a power in plants, yet that very often they have quite a contrary effect, as Mr. Scheele found; but that he did not know what the reaſon of this uncertain effect of plants on air was. In 1778 he found, by accident, that by expoſing well-water a long while to the ſun, it produced a filmy greeniſh ſediment, which produced pure air in the ſunſhine: by examining this matter with a microſcope, he found it deſtitute of organization, and pronounced it to be neither an animal nor a vegetable ſubſtance, but a ſubſtance *ſui generis*, to which he gave the name of green matter. M. Berthollet found alſo, that by expoſing dephlogiſticated marine acid to the ſun, vital air was produced; and Mr. Scheele in Sweden found that the ſame air was alſo produced from nitrous acid, expoſed to the light of the ſun. Dr. Ingenhouſz aſſerts, that he was fortunate enough to diſcover the true reaſon why plants did ſometimes correct bad air, and ſometimes made it worſe, which reaſon was never ſo much as even ſuſpected by either of the above-mentioned philoſophers. He diſcovered, in the ſummer of 1779, that all vegetables are inceſſantly occupied in decompoſing the air in contact with them, changing a great portion of it into carbonic acid gas or fixed air, which being ſpecifically heavier than atmoſpheric air, tends naturally to fall downwards, and being miſcible with moiſture, ſalts, and different ſorts of earthy ſubſtances, is apt to combine with them. He alſo found that the roots, flowers, and fruits, are inceſſantly employed in this kind of decompoſition, even in the middle of the ſunſhine; but that the leaves and green ſtalks alone ceaſe to perform this operation during the time the ſun, or an unſhaded clear day light, ſhines clear upon them, during which time they throw out a conſiderable quantity of the fineſt vital air, and moreover make the air in contact with them purer, or more approaching to the nature of vital air. He has indeed ſtated facts which prove that vital air, produced by vigorous plants in the ſunſhine, is of the greateſt purity in itſelf; and that the air thrown out by them in the ſhade, or in the dark, is in itſelf, that is to ſay, being free from other air, the moſt active poiſon in deſtroying animal life yet known.

He does not doubt but that this continual decompoſition of atmoſpheric air muſt have a general utility for the ſubſiſtence of the vegetables themſelves, and that they principally derive their true food from this operation, by changing this decompoſed air into various juices, ſalts, mucilage, oils, &c. much the ſame as in graminivorous animals, the ſimple graſs changes in the various organs, into the numerous and very heterogeneous fluids and ſolids. It would, however, he thinks, be a very difficult, if not impoſſible taſk, to give a clear and ſatisfactory theory, by which theſe various changes, compoſitions, decompoſitions, new combinations, &c. performed upon one ſingle ſpecies of food, ſuch as graſs, may be explained. The ſame incomprehenſible transformations are going on in vegetables. If once it was ſatisfactorily proved, that plants can ſubſiſt in what they find in atmoſpheric air without any other ſubſtance, we ought, he thinks, to content ourſelves with the fact alone; for it would be in vain to attempt to penetrate the myſtery of all the changes this air undergoes in the organs of theſe living beings; no more need we wiſh anxiouſly to inveſtigate by what means, in a man who lives only on rice and water, all the various tranſmutations of this ſimple food are performed. This myſtery is, it is ſuppoſed, above the reach of our very limited underſtandings. The new light which chemiſtry has received in our age, affords us the means of underſtanding many phenomena which we were either ignorant of,

of, or which nobody underſtood any thing of before. The new diſcoveries in the nature of water, air, ſalts, &c. open the door to an infinite number and variety of new diſcoveries. The identity of the ſame principle of all acids, called oxygen, which the French chemiſts have eſtabliſhed, throws new light on the difference which exiſts in the various acids already known, and on the changes which theſe acids undergo. Thus, the ſame acidifying principle attaching itſelf to a different baſis, becomes either nitrous, vitriolic, marine, or any other acid. With carbon it becomes fixed air, or carbonic acid gas, with ſulphur it becomes vitriolic or ſulphuric acid; with phoſphorus it becomes phoſphoric acid; with azote it becomes nitrous acid, &c. The laſt was a diſcovery made by Mr. Cavendiſh. It may thus, the writer thinks, be reaſonably ſuppoſed, that ſome acids taken into our body may loſe in the various operations of our organs their former radical and combine with a new one, and by this combination entirely change their nature. Without ſuch like changes taking place in our organs, how could we account for the generation of the great quantity of phoſphoric acid exiſting almoſt every where in our bodies, (which acid has already got the name by ſome eminent chemiſts of *animal acid*,) principally in our bones? Whereas we find no where the marine acid, though of all acids we take in the greateſt quantity of it. We find in ſeveral liquids its baſis, the foſſil alkali; as in bile, urine, &c.: but we find nothing of its acid, nor even the marine ſalt undecompoſed, except in the ſerum of the blood, and the *chylus*, in which this ſalt has not yet undergone the elaboration of the vital organs. It ſeems, therefore, as if all the acids, the marine, the vegetable, the carbonic, &c. were in our organs transformed, for the greateſt part, into the animal or phoſphoric acid. It appears, at leaſt, probable, that without ſuppoſing this change of acids to take place in our bodies, we could not account for the great abundance of phoſphoric acid exiſting in our bodies; for though it really exiſts in ſome of our foods, yet the quantity of it is but trifling.

It is farther contended that if plants imbibe fixed air, or carbonic acid gas, it is not more difficult to believe that this ſubſtance may be transformed, elaborated, or modified into various other ſubſtances and ſalts in the organs of the plants, than it is difficult to believe that the above-mentioned changes take place in the human body. Who can believe, without demonſtrative proof, that the aerial fluid, the carbonic acid gas, conſtitutes about $\frac{40}{100}$ of limeſtone; and that this ſtone having loſt its hardneſs, by being deprived of this aerial fluid, regains its former conſiſtency by recovering this fluid? As the carbonic acid is compoſed of the acidifying principle, the oxygen, and the carbon or coal, plants may derive from theſe two principles ſome of the moſt eſſential ſubſtances we find in them; their acids, their oils, their mucilage, &c.; theſe ingredients, together with the azote abſorbed alſo with the atmoſpheric air, being elaborated in their organs, ſomewhat analogous to the wonderful, though to the human underſtanding incomprehenſible, elaborations and combinations which we obſerve in the bodies of animals. M. Haſſenfratz's three papers on the nouriſhment of plants, delivered in 1792 to the Royal Academy of Paris, have met with very general approbation; and the principal part of the doctrine contained in them, *viz.* that *coal*, or carbon, *conſtitutes the principal nutritive ſubſtance of plants*, has been adopted by the celebrated Mr. Kirwan, in his "Diſſertation on Manures," ſome time ſince preſented to the attention of the agriculturaliſt.

In the firſt it is contended that water and air are not alone ſufficient to nouriſh plants, but that the developement or growth of theſe matters is owing to the carbon, which, being originally lodged in the ſeed, is expended in this buſineſs. In the ſecond, the writer attempts to prove that the carbonic acid, or fixed air, is not a nutritive ingredient of plants, and that the act of vegetation does not decompoſe the carbonic acid; but, on the contrary, this carbonic acid is, as Dr. Ingenhouſz has diſcovered, formed by plants in the dark, and drawn from the plants and the oxygen of the water decompoſed by vegetables. Mr. Kirwan, however, differs in this reſpect from M. Haſſenfratz, and thinks that the carbonic acid is decompoſed by the act of vegetation. In the third paper, it is aſſerted that the carbon, the true nouriſhment of plants, is derived by the roots from the ſoil, where it is found ready in a ſtate of ſufficient ſolution or ſuſpenſion to be abſorbed by the ſuckers, and carried through the whole plant. It is thought that the vigour of the plants depends chiefly upon the quantity of carbon with which the ſoil is impregnated; and the name of carbon is given to the brown ſediment of the infuſion of dung which remains after the water is evaporated or conveyed away by the action of heat, &c.

But the doctrine contained in theſe memoirs, as well as the important experiments to which they relate, require, in Dr. Ingenhouſz's opinion, farther inveſtigation, before it can be proved or clearly underſtood. The following hints and conſiderations may, it is ſuppoſed, perhaps ſhew the way towards the true myſtery of the manner which nature employs to feed the plants. All ſeeds contain a certain quantity of food, by which the plant may be kept alive in the beginning of its growth; ſome have a conſiderable portion of mucilaginous matter, ſuch as the ſeed of quince; ſome have, beſides this mucilage, a very thick cover or pulp, by which the ſeed is ſurrounded, ſuch as the ſeed of grapes, apples, pears, melons, cucumbers, &c. which ſubſtances ſerve alſo as food for animals. All thoſe ſubſtances by which many grains are thickly covered, yield a great quantity of fixed air, or carbonic acid gas, when the ſeed lodged in them begins to vegetate; but this ſubſtance, being exhauſted at the cloſe of their fermentation and putrefaction, the embryo plants muſt be capable of providing for themſelves. A newborn child may alſo live a few days without food, being nouriſhed by ſome nutritious matter which it brings with it when born, and which it had imbibed by the mouth when in the womb, and part of which nouriſhment was prepared in the pectoral gland of the child; as it is well known that all children, male as well as female, come into the world with a portion of true milk elaborated in their breaſts. Thus alſo, the yolk of the egg is drawn into the ſtomach of the chick when ready to break its priſon, by means of which yolk it is nouriſhed till it has acquired ſtrength enough to go in ſearch of food. The mothers of animals, endowed with breaſts, feed, during a certain time, their offspring by their milk. Many animals, ſuch as birds of different kinds, wander about in ſearch of food to be carried to their young. Very few animals find, on the ſpot where they exiſt, every thing they want. But all plants are deſtined by nature to remain on the ſame ſpot, and therefore muſt poſſeſs ſuch faculties as prepare into food ſome of the ſubſtances in contact with them, as ſoon as they have conſumed the ſmall ſtore of food they are provided with before they vegetate. As the very firſt decompoſition of the pulp ſurrounding the ſeeds is accompanied with the production of carbonic acid gas, and the firſt operation of the embryo, or beginning plant, is to decompoſe the air in contact with it, by changing the oxygenous part of it into carbonic acid gas, of which it probably abſorbs, in the

dark and ſhade, the oxygen, and, in the ſunſhine, the carbon, throwing out at the ſame time the oxygen alone, and keeping the carbon to itſelf as nouriſhment; as all theſe different operations have one general effect, *viz.* the decompoſing the air in contact with plants, it ſeems more than probable that vegetables derive their principal food from this decompoſition, and the production of fixed air, or carbonic acid gas. This ſuppoſition will, it is contended, acquire a degree of greater probability by conſidering, that all airs which cannot be eaſily changed or decompoſed into fixed air, as poſſeſſing no oxygen at all, are true poiſons to plants, ſuch as hydrogen or inflammable air, putrid air and azote, contrary to Dr. Prieſtley's and Mr. Scheele's doctrine; and that vital air itſelf, or an air approaching to its nature, maintains a plant remarkably well in its full vigour, and that carbonic acid gas concentrated, or without a great portion of reſpirable air, kills alſo plants, as this air and all other airs, poiſonous to vegetable life, are alſo deſtructive of animal life; which doctrine the writer offered firſt, in contradiction to that of the two celebrated philoſophers juſt mentioned. Dr. Ingenhouſz ſhould, however, have proved the firſt poſition by experiments, in oppoſition to thoſe of Mr. Young and other inquirers, as the firſt has, he aſſures us, fed plants with hydrogen or inflammable air, till they became, comparatively ſpeaking, giants among dwarfs. How then, he aſks, does it act as a poiſon? If nothing elſe be given, it may, as the moſt nutritious food may, ſuffocate animals. Dr. Ingenhouſz, however, ſtates, that when he diſcovered, in 1779, that all vegetables decompoſe the common air by night, and change a part of it into fixed air; and when he drew from this and ſome other facts the concluſion, that the plants abſorb this fixed air and turn it into their nouriſhment, the new doctrine of chemiſtry was not publiſhed; and, being ignorant of all the beauties of that ſyſtem, he was unable to reduce theſe facts to a proper theory: but ſince we have been inſtructed in the analyſis of water and air, it is become, he thinks, much eaſier to explain the phenomena of vegetation. As it is now admitted that fixed air, or carbonic acid gas, is compoſed of oxygen deprived of its caloric, or matter of heat, and of carbon, it is not difficult to underſtand how plants provide or prepare their own nouriſhment by producing carbonic acid, ſuppoſing it to be demonſtrated that carbon is the principal nouriſhment of plants, as hinted above.

It is further ſuggeſted, that from this doctrine it would naturally be inferred, that plants muſt grow the moſt rapidly at ſuch time as they prepare the greateſt quantity of this nouriſhment, which is when they are in the dark; and this is juſt what really happens, as all plants grow with much more rapidity in a dark place than in the light, as M. Du Hamel and M. Bonnet, of Geneva, found. Plants in general grow leſs, it is ſuppoſed, towards the middle of the day than at any other time; many do not advance at all when the ſun is near the meridian; ſome even become manifeſtly ſhorter towards that time of the day.

The writer has alſo diſcovered that the roots of plants, even when expoſed to the ſunſhine, produce carbonic acid gas, but that the leaves and green ſtalks produce this acid only in the dark; and that flowers and fruits, with a few exceptions among the laſt, produce at all times, even at the roots, carbonic acid. Thus there is no time loſt, ſome parts, or the whole plant, being conſtantly employed in this buſineſs of preparing carbonic acid. Though M. Haſſenfratz ſeems to believe that plants do not derive the carbon (in his opinion their true nouriſhment) from the carbonic acid, but find it ready made in the dung; the doctor, however, thinks it more probable that plants derive it chiefly from the carbonic acid, which is a ſubſtance very eaſily decompoſable into its two ingredients, *viz.* oxygen and carbon. All manures, but principally dung, produce a great quantity of carbonic acid either by themſelves, or by decompoſing the air in contact with them. But here, ſays he, ſeems to ſtart up a difficulty, how a plant or manure can draw from the atmoſpheric air carbonic acid, as common air contains, according to the new ſyſtem, only $\frac{1}{100}$ of it, and, according to M. Lavoiſier, none at all. Though, according to theſe principles, it could not be accounted for theoretically, it is thought we have at hand facts enough, from which it ſeems evident, that the common air can by itſelf furniſh all the ingredients for the compoſition of carbonic acid, as we ſhall ſee bye and bye.

It is ſuggeſted, that we are as yet very far from underſtanding the various productions, which in this world are expoſed to our ſenſes as offſprings from the infinite combinations, decompoſitions, chemical affinities or attractions, &c. every where in action, on the ſurface, and in the bowels of the earth, in the atmoſphere, the waters of the ſea, and all others in the organized bodies of animals, vegetables, &c. The new ſyſtem of chemiſtry, indeed, furniſhes a vaſt deal of new light, but is yet by no means ſufficient to penetrate into the deep myſteries of organized beings; for inſtance, the propagation of animals and vegetables has, the writer thinks, acquired from it but very little, if any light at all. But to return to the ſubject of the production of carbonic acid. Calcareous ſtones and alkaline ſalts, deprived of their carbonic acid by fire, regain it ſolely by the expoſure to the open air. If this production can happen by ſuch ſimple means, can we be aſtoniſhed that organized bodies draw it from the ſame ſource, the atmoſphere; which to him ſeems to be the general magazine or ſtore-houſe of all the ſubſtances which enter into the compoſition of all organized bodies of the animal and vegetable kingdom, and even many others of the mineral kingdom in addition.

It is further remarked that M. Du Hamel found that a branch of a vine, or any other tree, conducted within a hot-houſe, its root remaining out of its boundaries, will there ſhoot forth vigorous leaves, new buds, flowers, and produce fruit, when all the other branches remaining expoſed to the open air, ſhew no ſigns of life; being, with their roots benumbed by the cold, and probably deſtitute of any motion or circulation of their juices. If the growth of vegetables depended on the abſorption of carbon by their roots, the branch drawn into a hot-houſe could not, the doctor ſays, thrive at all, as long as the root and ſtem were benumbed by cold weather. But this branch, being in contact with no ſubſtance but air, heat and light, muſt derive from the ſurrounding air alone all it wants, to perform all the operations neceſſary to its growth and propagation. By watching all its phenomena, it will be found decompoſing the air in contact with it, but in a very different way by day and by night; and that it performs theſe tranſmutations of air chiefly within its organs, is the more probable, becauſe all plants abſorb the air in contact with them, with all its contents, and throw it out in a given time much altered from what it was at the moment it was drawn in. The period of time required by a plant to renew all the air it has abſorbed, he found to be leſs than half an hour by day and by night. This laſt aſſertion, which he has demonſtrated by facts, will, he ſuppoſes, perhaps be looked upon by critical minds as ſomewhat paradoxical, as it ſeems difficult to conceive that the ſame organized body can, at the ſame time, inhale and evaporate from the ſame ſurface the ſame fluid; but this double phenomenon being continually performed in all parts of living animals, the difficulty of underſtanding it vaniſhes

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of courſe. Though the moſt part of animal plants which afford good nouriſhment for men, ſuch as wheat, rye, maize, &c. will grow in poor ſoils, yet they do not become thriving in a luxuriant way, but in what is called a rich or well manured ſoil. Thoſe plants have a quick growth, when aſſiſted by heat and the ſun's light, come very ſoon to their term, or to the act of propagating their ſpecies, or of producing ſeed; which being come to perfection, the vital power of the plant is exhauſted, and it dies. Theſe plants being of a tender ſtructure, and generally not ſpreading their roots deep in the ground, require the niceſt attention in preparing the ſoil, ſo that the roots may find the leaſt reſiſtance in ſpreading, and alſo as much nouriſhment ready prepared for being abſorbed by the roots as the plants want to become vigorous, and no more; as it is well known that too much manure, as well as too little, will prevent the plants from thriving. By want of manure, the plant may, he thinks, be conſidered as ſtarved, and by too much, as choaked with food. This may perhaps be conſidered, it is conceived, as ſomewhat analogous to a chicken which will lay no eggs, or very few, by feeding it too little, or too much; and it may be with plants, perhaps as it is with animals, that too much food may be hurtful to both.

But, if carbon or coal be really the genuine food of plants, it ſeems to him doubtful whether the brown mud remaining after an infuſion of dung is evaporated, be real coal, before it has undergone an ignition. It ought rather, it is thought, to be called an extract, and may again be diffuſed through water, or diſſolved, as it was before the evaporation; but when it is burned into real coal, it is become almoſt totally inſoluble in water, as all charcoal is generally well known to be. Charcoal is not only inſoluble, but almoſt unalterable, incorruptible, poſſeſſing, only when newly ignited, an antiſeptic power, which it recovers again by a new ignition; and he cannot help ſtill doubting whether real coal, reduced even to impalpable powder, poſſeſſes any manifeſt quality by which it deſerves to be arranged among manures. The juſtly celebrated Mr. Arthur Young, having put this powder to the trial, found it had no beneficial effect at all on vegetation. Though there is no doubt but that vegetables draw in by their roots a good deal of food, yet he thinks the principal buſineſs of feeding is carried on by the leaves in the atmoſphere. Beſides the fact of M. Du Hamel deſcribed above, there are ſeveral other conſiderations which ſeem to give ſtrength to this aſſertion. Many European trees, when ſtripped at once of all their leaves, will die. (Trees in very hot climates ſuffer the loſs of their leaves by the ſcorching ſun for a time in dry weather, without periſhing.) Doctor Ingenhouſz was preſent at the following fact: the ſulphurous ſmoke from burning a few pounds of antimony mixed with nitre was accidentally driven by the wind upon a very thriving large pear-tree, full of pears half ripe; next day he found all the leaves and pears fallen off, and the tree irrecoverably dead. A plant placed under a bell, with its root in a phial full of water, will, he ſays, die when the bell is exhauſted by an air pump: it will equally periſh, if, inſtead of reſpirable air, it be immerſed in any air unfit for breathing animals. If the roots were the chief organs of feeding plants, their life might, he ſuppoſes, be ſupported in any of thoſe airs, principally ſuch as poſſeſs no acrimonious ingredient, ſuch as pure azote; but pure azote will kill a living plant, and prevent ſeeds from vegetation. Reſpirable air, moderately warm, is alone ſufficient to make a plant vegetate, without any light. He found even that ſeeds are hurt by a ſtrong light, grow ſlowly, and are often killed before the two lobes are become leaves, and their plumula and root are formed; and that, if they ſurvive the action of light, they remain commonly but weak or deformed plants. This ſhews, it is ſuppoſed, that in agriculture almoſt all ſeeds not covered will periſh, when the ſun ſhines upon them at the time of their beginning to ſwell or vegetate. His experiments have, he thinks, proved ſufficiently that ſuch ſeeds or embryo plants periſh by the light only, (which is inſupportable to all very young plants, as well as plants weakened and ſickened by tranſplantation,) and not by the heat of the ſun, or by want of moiſture. When a plant is reared up in the dark, either under the ground, or in a dark or ſhaded open place, to a certain degree of ſtrength, light becomes more and more beneficial to it: not however for its advancing in ſize, but for acquiring ſtrength, getting a lively green colour, and for its becoming fit for propagating its ſpecies, which propagation will not ſucceed without ſufficient ſun-ſhine, or at leaſt day-light, and a due degree of heat; that is to ſay, the heat of the air, and by no means the heat of the ſoil; which laſt, though very beneficial to ſome plants, is rather hurtful to ſeveral: and indeed the ground being kept moiſt by watering, is always kept cool by the continual evaporation, and yet plants in general thrive very well in moiſt ground, though always kept cool. Trees in a foreſt ſpread their principal roots to ſuch a depth as the heat of the atmoſphere can never reach; their roots are, winter and ſummer, in an uniform temperature of 50—52 degrees of Fahrenheit's thermometer. This ſhews, it is conceived, that the vegetation of trees, as is that of almoſt all plants, being ſtopped, or nearly ſo, during the winter, is revived by the heat of the atmoſphere alone, without any regard to the heat of the ſoil, which is ſcarcely ſubject to any alteration, but at the ſurface. The heat of the atmoſphere alone, it is thought, ſets the juices of trees into motion, which motion ſets, by propagation alſo, the juices of the roots into the ſame motion: thus the juices drawn from the roots upwards, empty the filaments and ſuckers, which by this motion upwards naturally become powerfully abſorbent, without any degree of heat being more neceſſary for this abſorption or attraction than is required for the ſuction of an ordinary pump. Boyle or Hales, (if he recollects well,) applying a glaſs tube to the trunk of a vine cut off in the ſpring, collected a very great quantity of juice pumped up by the roots; which motion of the fluids in vegetables depends greatly upon their irritability, according to M. Van Marum; which ſeems to be the more probable, as an electrical exploſion, directed through a plant, ſuch as euphorbia, ſtops immediately all motion in its juices by extinguiſhing the irritability. The roots thus abſorbing the moiſture preſented to their ſuckers, take in of courſe all ſalts, earth, metallic ſubſtances, &c. that can be diſſolved in water, or in the ſaline matter to be found in almoſt all waters. This ſolvent is found to be, for the moſt part, fixed air. Though we find ſome of theſe ſalts, with all their characteriſtic qualities, in ſome plants growing in a ſoil impregnated with them, as are many plants growing near the ſea-ſhore which are full of ſea ſalt; yet it is not leſs true, that moſt part of the ingredients imbibed by the roots, as well as by the leaves, trunks, and branches, undergo almoſt a total change in the organs of the plants, even ſo far as to produce in one plant a wholeſome food, and in another, its next neighbour, a true poiſon. But as he has proved before, that the atmoſphere alone can furniſh ſome plants all that is wanting for all their functions, we ought not to look too anxiouſly among rubbiſh or dung, for the true and natural food of vegetables, though in thoſe ſubſtances a greater quantity of this food is at hand, ready prepared, and partly imbibed in the form of carbonic acid, mucilage,

mucilage, oily and ſaline matter, by which the plant is enabled to provide food for throwing out and nouriſhing more branches, flowers, and fruits. He thinks it difficult to conceive how a large tree finds, during centuries, nouriſhment on the ſame ſpot, on the ſuppoſition of M. Haſſenfratz, that its principal food is coal: and that this coal is not derived from the decompoſition of the carbonic acid (of which coal conſtitutes nearly one-third, according to M. Lavoiſier $\frac{28}{100}$). That gentleman admits doctor Ingenhouſz's diſcovery as well founded, that plants produce carbonic acid in the dark; and that roots, being always deprived of day-light, are of courſe inceſſantly occupied with this buſineſs. There exiſts every where in the ſoil common air; and common air alone is, the doctor ſays, ſufficient to furniſh, as he has proved before, carbonic acid even without plants. Thus there is no difficulty in tracing the ſource of this coal, and of conceiving how the large trees find, during centuries, that immenſe quantity of food it requires for its maintenance, growth, and abundant production of fruit or ſeed, all which is certainly derived in part from the ſoil; but he ſtill believes chiefly from the atmoſphere, by means of the leaves abſorbing and decompoſing the air in contact with them.

It is ſtated, that the tranſmutation of common air into different ſolid bodies, ſuch as plants, is a very ancient doctrine. Pythagoras and Epicurus took it, the writer ſays, for an undoubted fact; and Lucretius, who has adorned his poem "De Rerum Natura" with this doctrine, aſſerts that air changes continually into different other ſubſtances, and that theſe are again decompoſed into air, which afterward returns again into the compoſition of the different bodies; and that if this inceſſant rotation did not exiſt, every thing in this world would have been changed into air, which, of courſe, would have been at laſt the only ſubſtance exiſting. Anaximenes alſo aſſerted that all bodies are made of air, or formed of aerial matters.

It is ſuggeſted that in a preceding page the doctor hinted at a new theory of a curious fact, *viz.* that plants accelerate their growth in the dark, and advance the leaſt in the middle of the day (which is an obſervation of M. Gardini). Though this theory may perhaps be erroneous, yet, as it is ſupported on a real fact, he aſſerts further that plants changing in the dark more reſpirable air into carbonic acid than they can digeſt, they throw out a large quantity of it, and thus render the air in contact with them leſs reſpirable; and that in the day they abſorb, with the atmoſpheric air ſo much matter of heat and light, or caloric furniſhed by the ſun, that they cannot digeſt it all, and therefore throw it out as ſuperfluous, combined with the oxygen which has thus acquired the nature of vital air; which vital air, though not yet obtained by plants in its greateſt purity, is however in itſelf full as pure as that which we obtain from the beſt manganeſe, or any other ingredient. In a letter to ſir John Sinclair, in 1794, he quoted as a proof of carbonic acid being the principal food of plants, the fact he diſcovered, that the wonderful apparatus which a plant produces when it is occupied with the propagation of its ſpecies, *viz.* the flower, is inceſſantly producing carbonic acid. By this obſervation we may, it is thought, be led to the knowledge of the true natural food of vegetables; and it may be ſaid as a further illuſtration, that if we were deſirous to know what is the natural food of ſome particular animals, one of the ſureſt methods to find it out, would be to obſerve what kind of nouriſhment the parents bear to their young. Thus we ſhould find that a pigeon is beſt fed by grains, and a ſwallow by inſects. By a ſimilar concluſion, it is inferred that the true, or principal aliment of plants is reſpirable air decompoſed. By examining the air thus decompoſed, he found it conſiſted of two ſubſtances, *viz.* of fixed air or carbonic acid gas, and phlogiſticated air, or azote; but as carbonic acid contains two diſtinct ſubſtances, *viz.* coal or carbon, and oxygen, it may be queſtioned which ingredient of the two is the real food we look for. M. Haſſenfratz thinks it is principally coal: though his opinion is that the plant does not derive the coal from the carbonic acid, but from the ſoil or dung. The doctor is, however, much inclined to think that both theſe ſubſtances ſerve as food: and he is moreover inclined to believe that the azote alſo enters the plant, and has alſo ſome ſhare in feeding it. One of his reaſons for thinking ſo is, that plants abſorb continually the whole of the atmoſpheric air, and that in ſeparating this fluid by decompoſition into its conſtituent parts, they throw out that part of it which they cannot fully digeſt at the time it is produced, *viz.* at night, the azote and the carbonic acid diſengaged one from another, or only mechanically, not chemically, as formerly they were mixed, and in the ſun-ſhine the oxygen almoſt alone, the carbon and the azote remaining within the plant at that time. Though he thinks it probable that the azote enters, in ſome way or other, into the compoſition of plants, yet he ſuppoſes it is not abſolutely neceſſary for a plant, as a plant thrives admirably well without it, *viz.* in pure oxygen. It is true, however, that plants alſo die in pure carbonic acid; but in this caſe the plant may be perhaps conſidered as if it were choaked with it. He, however, acknowledges very readily, that the juſt mentioned theory has not all the clearneſs he could wiſh to give it. But the facts quoted to ſupport it, though contradicted during twelve years, are now, it is aſſerted, admitted, even by thoſe who have been the chief oppoſers of the doctrine.

The writings of the late Dr. Darwin have furniſhed a variety of uſeful and intereſting facts and obſervations on the nature of the food of plants, and the general economy of vegetables. In the analogy which he has drawn between the manner in which animals and vegetables are nouriſhed and ſupported, there is much that renders the theory of the food of plants more clear and intelligible. It is ſtated, that the various ſubſtances which conſtitute animal bodies, or which are found in the cavities of them, are compoſed from ſimpler elements by the proceſs of digeſtion, and ſanguification, and ſecretion; for it is well known that even milk, which ſo much reſembles the chyle of animals, is not abſorbed by the lacteals, without its being previouſly coagulated, and again diſſolved in the ſtomach by the power of digeſtion. Hence it happens, that the chyle of all animals, and from every kind of food which they take into their ſtomachs, is very ſimilar; and, like milk, conſiſts of water, ſugar, mucilage, and oil; the laſt of which, not being ſoluble in water, but only miſcible with it, gives its opaque white colour. But that though the chyle from different kinds of aliment is ſo ſimilar, that all the various conſtituent parts of animal bodies are ultimately produced from the chyle by ſanguification and ſecretion; yet it happens that ſome kinds of aliment poſſeſs a greater quantity of thoſe particles, which make chyle, than other kinds of aliment; ſuch materials, for inſtance, as already contain much ſugar, mucilage, and oil, which exiſt in chyle; there may, it is ſuppoſed, be other materials, which are inviſible from their perfect ſolution in water, either alone, or when converted into acids by the addition of oxygen; as carbon, phoſphorus, calcareous earth, marine and ammoniacal ſalts; though it is more probable that the two laſt are formed and ſecreted by animal proceſſes, as well as ſe-

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lected by the abſorbent roots of vegetables, as they are more compounded bodies than the former kinds.

And it is aſſerted that ſimilar to this chyle of animals is the ſap-juice, which is abſorbed from the earth by the roots of plants, conſtitutes their nouriſhment, and conſiſts of water, ſugar, and mucilage, with other tranſparent ſolutions, as of carbon, phoſphorus, and calcareous earth. But though it has been proved by the experiments of ſome philoſophers, that vegetables can extract or compoſe all theſe ſubſtances from air and water alone, yet ſome materials contribute more to the production of this vegetable chyle or ſap-juice than others, ſuch as the recrements of dead vegetable and animal ſubſtances in general.

The doctor therefore obſerves, that if any one ſhould aſk what is the food of animals? he ſhould anſwer, that in the moſt early ſtate of animal life the embryo lives on a mucilaginous fluid with which it is ſurrounded, whether in the egg or womb: that in its infant ſtate the young animal is ſuſtained by milk, which its ſtomach converts into chyle or nouriſhment: and that in their adult ſtate, animals are ſuſtained by other vegetable or animal ſubſtances taken into their ſtomachs, which are there converted into chyle, partly by a chemical and partly by an animal proceſs; as by a mixture of gaſtric juice with water and heat, ſome of theſe recrements of organic nature are decompoſed, either into their ſimpler component parts, or ſometimes even into their elements; while other parts of them are only rendered ſoluble or miſcible with water, and are then drunk up by the abſorbents of the ſtomach and inteſtines. In this proceſs of digeſtion much ſugar is produced, which is probably immediately ſelected and drunk up by the numerous mouths of the lacteals or lymphatics, to which it is preſented by the vermicular or periſtaltic motions of the ſtomach and inteſtines. And as this ready ſelection and abſorption of the ſugar, as ſoon as it is formed, prevents it from paſſing into the vinous or acetous fermentation; it is probable, that from the want of ſuch a means of ſeparating ſaccharine matter, as ſoon as it is formed, chemiſtry has not yet been able to produce ſugar from its elements without the aſſiſtance of animal digeſtion, or vegetable germination, as in the proceſs of malting.

It is further remarked, that in this proceſs of digeſtion, it is believed a great part of the water, ſugar, mucilage, and oil, which exiſt in vegetable and animal recrements, are not decompoſed into their elements, but abſorbed by being ſoluble or miſcible with water; the carbon, the phoſphorus, and the hydrogen, are alſo, it is ſuppoſed, diſſolved in the other fluids by means of oxygen, and form a part of the chyle, without their being converted into gaſes; for, when this happens to any exceſs, in reſpect to carbon, it eſcapes from the ſtomach in eructations; and the ſame occurs to the inflammable air or hydrogen, if a part of the water becomes decompoſed in the inteſtines; which, if it be not abſorbed by its ſolution in other fluids, but acquires a gaſeous ſtate, is liable to eſcape below; though both theſe gaſes ſeem occaſionally to revert to a fluid ſtate, from their aerial one in the ſtomach or inteſtines, and to be then capable of being abſorbed by the lacteals or lymphatics of the ſyſtem.

It is aſked what then is the food of vegetables? The embryon plant in the ſeed or fruit is ſurrounded with ſaccharine, mucilaginous, and oily materials, like the animal fœtus in the egg or uterus, which it abſorbs and converts into nouriſhment; while the embryon buds of deciduous trees, which is another infantine ſtate of vegetables, are ſupplied with a ſaccharine and mucilaginous juice, prepared for them at the time of their production, and depoſited in the roots or ſap-wood of their parent-trees, as in the vine, maple, and birch; which ſaccharine matter is ſoluble and miſcible with the water of the ſurrounding earth in the ſubſequent ſpring, and is forcibly abſorbed by their root-veſſels, and expands their naſcent foliage or leaves.

It is therefore concluded, that in their infantine ſtate, there is a wonderful analogy between plants and animals; and it is particularly curious to obſerve in the proceſs of converting barley into malt, by the germination of the ſeed, that the meal of the barley is, in part, converted into ſugar by the digeſtion of the young plant, exactly as in the animal ſtomach. The wonderful effect of vegetable digeſtion in producing ſugar may be deduced from the great product of the ſugar-cane, and of the maple-tree in America; and the wonderful effect of animal digeſtion in producing ſugar, appears in patients who labour under diabetic affections.

It is now proper to come to the conſideration of the food of adult plants; and in this conſiſts the great and eſſential difference between the nutritive proceſſes of animals and vegetables. The former are poſſeſſed of a ſtomach, by which they can, in a few hours, decompoſe the tender parts of vegetable and animal ſubſtances by a chemical proceſs within themſelves, conducted in the heat of ninety-eight degrees, with a due quantity of water, and a perpetual agitation of the ingredients; which both mixes them and applies them to the mouths of the abſorbent veſſels which ſurround them. Whereas a vegetable being, having no ſtomach, is neceſſitated to wait for the ſpontaneous decompoſition of animal or vegetable recrements; which is indeed continually going on in thoſe ſoils and climates, and in thoſe ſeaſons of the year which are moſt friendly to vegetation; but is in other ſituations, and in other ſeaſons, a ſlow proceſs in a degree of heat as low as 40° of Fahrenheit, (in which the rein-deer moſs, *moſchus rangiferinus*, vegetates beneath the ſnow in Siberia,) and often without an adapted quantity of water to give a due fluidity, or any mechanical locomotion to preſent them to the abſorbent mouths of their roots: or in ſtill worſe ſituations, adult vegetables are neceſſitated ſtill more ſlowly to acquire or produce their nutritive juices from the ſimpler elements of air and water, with perhaps the ſolutions of carbonic acid and calcareous earth, and perhaps of ſome other matters, with which one or more of them abound, or are ſaturated. See AIR, WATER, CARBONIC *Acid Gas*, and CALCAREOUS *Earth*.

It is however remarked, that M. Haſſenfratz found that the vegetation of thoſe plants was imperfect which had not been ſuffered to grow in contact with the earth; as they never arrived at ſuch maturity as to produce fruit, and were found, on analyſis, to contain a leſs portion of carbon than other plants of the ſame kind. The experiments were tried on hyacinths, kidney-beans, and creſſes. Hence the doctor thinks the other great difference which exiſts between theſe two extenſive kingdoms of nature is, that the larger and warmer blooded animals certainly, and it is ſuppoſed all the tribes of inſects, and of colder-blooded creatures alſo, cannot exiſt long on air and water alone, except in their ſtate of hibernal torpor. The neareſt approach to this is, however, it is thought, ſeen in ſome fevers, where water alone has been taken for a week or two, and yet the patient has recovered: and there is a well atteſted account of a numerous caravan, which having loſt their route or their proviſions, are affirmed to have lived ſome weeks on gum-arabic and water, without any other ſubſtance.

But vegetables, on the contrary, as ſuggeſted above, can, it is conceived, exiſt, though in a feebler ſtate, on water and air alone, with the carbonic acid, and perhaps other inviſible ſolvents,

ſolvents, which theſe elements unavoidably contain. This is ſuppoſed to be owing to the low degree of heat which they produce internally, and to the ſlow circulation of their blood, or ſap-juice; from both which circumſtances leſs nutriment is expended, as is the caſe by animals which ſleep during the winter ſeaſon in their habitations, or other places.

It is therefore ſuggeſted, that, for the purpoſe of ſupplying adult vegetables with nouriſhment, it ſhould firſt be conſidered what kinds of matter are moſt prevalent or moſt neceſſary in their compoſition. Secondly, what of theſe ſubſtances they can abſorb without previous decompoſition. And laſtly, how to expedite the decompoſition of vegetable and animal ſubſtances on or in the ſoil, like the digeſtive proceſſes in the ſtomachs of animals; we may, in this way, it is ſuppoſed, become acquainted with the ſources and the management of manures as the food of plants. And it is not improbable but that their uſes and applications on lands may be regulated and conducted with greater certainty and ſucceſs. See MANURE, and VEGETATION.

FOOL, according to Mr. Locke, is one who makes falſe concluſions from right principles; by which he is diſtinguiſhed from a madman. See FOLLY.

Dr. Willis relates, that, upon diſſecting a fool, the principal differences found between him and a man of ſenſe, were, that the brain was ſmaller; and that the cervical plexus, formed of the intercoſtal nerve, whereby the correſpondence between the brain and heart is effected, was leſs, and ſent forth fewer branches to the heart, &c. Nervor. Deſcript. & Uſ. cap. 26.

FOOL'S PARSLEY, in *Botany*. See ÆTHUSA.

FOOL'S *Stones*. See ORCHIS.

FOOLADO, in *Geography*, a kingdom of Africa, on the banks of the Senegal river, between the 5th and 7th degrees of W. longitude, and the 12th and 14th of N. latitude. This is ſaid to be the original country of the Foulahs, but they poſſeſs many other kingdoms at a great diſtance from each other. See FOULAHS.

FOOLCHOKY, a town of Bengal; 15 miles N.E. of Maulda.

FOOLICONDA, a town of Africa, in Yani, on the N. ſide of the Gambia; 60 miles N.W. of Piſania. N. lat. 14° 3′. W. long. 14° 25′.

FOOLOMANICA, a town of Africa, in Foolado. N. lat. 13° 10′. W. long. 6° 2′.

FOOLOOTA, one of the ſmaller Friendly iſlands; 24 miles N. of Annamooka.

FOOLPARAS, a town of Hindooſtan, in Bahar. N. lat. 26° 19′. E. long. 86° 41′.

FOOLPOUR, a town of Hindooſtan; 16 miles N.W. of Benares.

FOOSHT, a ſmall iſland of the Red ſea, of an irregular form, about five miles from N. to S. and about nine in circumference. On the ſouth it is low and ſandy, and on the north is a black hill or cape that may be ſeen at the diſtance of four leagues. It has two watering-places; one on the E. of the iſland, the other on the W. When the water is firſt taken up, it is muddy, and appears as black as ink: but when it has ſettled two or three days, it becomes excellent. The wells are taken care of by a Marabout or ſaint, to whom this office belongs. This iſland is covered with a kind of bent graſs, which, for want of rain, and by the conſtant feeding of the few goats that are kept here, is prevented from growing to any height. The end of the iſland ſounds very hollow underneath, like Solfaterra near Naples; and as quantities of pumice-ſtones were found here, there is reaſon for preſuming that the black hill was once a volcano. It abounds in good fiſh; ſome of which, though not the beſt for food, exhibited very beautiful colours. The inhabitants are poor fiſhermen of a blackiſh colour, and go naked, except that they wear a rag about their waiſt. Their faces are neither ſtained nor painted. The fiſh they catch is carried to Loheia, and exchanged for dora and Indian corn, as they have no bread but what they procure in this way. They have here a flat fiſh with a long tail, the ſkin of which is a ſpecies of ſhagreen, with which are made the handles of knives and ſwords. Pearls too are found here; but they are neither large nor of a good water. The iſland abounds with beautiful ſhell-fiſh, and ſponges of the common kind are collected along the coaſt. The town conſiſts of about 30 huts, built with faggots of bent graſs or ſpartum, and theſe are ſupported within by a few ſticks, and thatched with the graſs of which they are built. At the diſtance of 4 miles, E.N.E. is Baccalun, an iſland, low, long, and as broad as Fooſht, inhabited by fiſhermen; without water in ſummer, which is brought from Fooſht; but in winter rain water is preſerved in ciſterns. Theſe were built in ancient times, when this was a place of importance for the fiſhing of pearls, and they are at this day in perfect repair. Fooſht is the moſt convenient watering-place for ſhips bound up the channel from Jibbel-Teir; and the weſtern watering place is moſt eligible. N. lat. 15° 59′ 43″. E. long. 42° 27′. Bruce's Travels, vol. i.

FOOT, a part of the body of moſt animals, whereon they ſtand, walk, &c.

Animals are diſtinguiſhed, with reſpect to the number of feet, into bipedes, *q. d. two-footed*; ſuch are men and birds; quadrupeds, *q. d. four-footed*; ſuch are moſt land animals: and multipedes, *q. d. many-footed*; as inſects. The reptile kind, as ſerpents, &c. have no feet.

Galen has ſeveral good obſervations on the wiſe adjuſtment of the number of feet in men and other animals, in his book De Uſu Part. lib. iii.

The fore-feet of the mole are admirably formed to dig, and ſcratch up the earth, and make way for its head, &c.; in water-fowls, the legs and feet are excellently adapted to their reſpective occaſions, and manners of living; in ſuch as are to wade in rivers, the legs are long and bare of feathers a good way above the knee; their toes alſo are broad; and in ſuch as bear the name of *mudſuckers*, two of the toes are ſomewhat alated, that they may not eaſily ſink in walking upon boggy places.

Others, which are to ſwim, are whole-footed; *i. e.* have their toes webbed together: as in the gooſe, duck, &c. and it is pretty enough to obſerve, how artfully theſe will gather up their toes and feet, when they withdraw their legs, or go to take their ſtroke in ſwimming; and again expand, or open, the whole foot, when they preſs upon, or drive themſelves forward in the water.

FOOT, in *Anatomy*. See EXTREMITIES.

FOOT, *Bathing of*. See PEDILUVIUM.

FOOT, *Bleeding in the*. See BLEEDING.

FOOT, *Diſtortion of*. *Club-foot* is the name given to ſuch deformity and diſtortion of the foot as prove prejudicial to the functions of the part.

Children are ſometimes born with their feet thus diſtorted, and ſometimes this diſagreeable ſpecies of deformity comes on after birth, being occaſioned by a bad habit, which ſome nurſes have of making children ſtand and attempt to walk at too early a period of life.

In certain ſubjects, we find the legs themſelves diſtorted; in ſome, the knees are deformed, while in others, the fault lies in the tarſus and ankle-joint, in which caſe, the feet are twiſted either inward or outward.

The

The Latins uſed to confer the epithet *vari* on patients afflicted with a preternatural inclination of the feet inward, and the expreſſion *valgi* was applied to ſuch perſons as had their feet turned too much outward.

When the foot is diſtorted inwards, which is moſt common, the ſole aſſumes more or leſs a perpendicular poſition, and is occaſionally turned quite backward, the patient being compelled to walk on the external edge of the foot.

The deformity ſometimes affects only one foot, ſometimes both. The following external appearances are obſervable in the mis-ſhapen part. The foot is bent from before backward, ſo that the inſtep ſeems very much arched, and the ſole of courſe conſiderably excavated in the tranſverſe direction. In ſome ſubjects the metatarſal bones incline towards each other, whereby a longitudinal hollow is alſo occaſioned in the ſole of the foot. The great toe is, at the ſame time, bent inward towards the os calcis, while this latter is alſo approximated to the former part. Hence it is obvious, that the internal edge of the ſole of the foot muſt be extremely concave, and the external one particularly convex.

As the patient can only walk upon the outer edge of the foot, the ſurface of the ſole is ſoft and ſmooth; but the projecting external part of the foot (that is to ſay, the ſkin covering the metatarſal bone of the little toe, and the os cuboides) is much thickened and indurated. On compariſon with a ſound foot, the tibia ſeems to incline obliquely from behind forward in its deſcent to the aſtragalus; the heel is leſs prominent behind; and the muſcles of the calf are ſhortened.

Little, or nothing, of the internal malleolus can be felt, while the external one forms an extraordinary projection. The ſkin of the inner ankle is alſo conſiderably on the ſtretch.

The leg and thigh, compared with the reſt of the limbs, are always in an emaciated ſtate. In new-born children this circumſtance is not obſervable. The knee is turned outward as well as the whole thigh, while the ham is rolled inward.

The bones and muſcles are ſtill more remarkably altered. On examination, Camper found the neck of the aſtragalus twiſted, the fore part of the foot being drawn inward by the action of the tibialis anticus and poſticus muſcles. The peronei muſcles conſequently loſe their ſtrength, and no longer retain the power of drawing the foot outward. The aſtragalus conſequently becomes more and more diſplaced, and puſhed in the external direction. The os calcis itſelf becomes approximated to the bones of the tarſus by the action of the abductor and flexor brevis pollicis pedis. The heel is conſiderably retracted, in conſequence of the tibialis anticus and other muſcles, from their altered condition, having loſt all effectual power of counteracting the muſcles of the calf.

Brückner, a German practitioner, has referred the original defect to the os naviculare; but without having made any examinations by diſſection. This bone is ſaid to be forced more inward, and to be ſo changed in poſition, that its lower ſurface inclines obliquely inward, and the knob on its inſide obliquely upward. The os cuboides is turned obliquely outward, and, when diſplaced very conſiderably, it ſlips ſomewhat away from the anterior end of the os calcis, and from the os cuneiforme externum.

The reſt of the bones muſt all of neceſſity ſuffer, more or leſs, from the foregoing deviations from nature, and the os calcis, in particular, becomes conſiderably leſs prominent backward.

The following account is given by Cloſſius of the examination of two club-feet.

In the left foot, which was only ſlightly affected, nothing in the leaſt unnatural was obſerved betwixt the tibia and aſtragalus. The malleolus internus was of a proper length, and the os naviculare was in every reſpect naturally connected with the aſtragalus, and firſt cuneiform bone. It was only remarked that the foot, in conſequence of the great convexity of the os naviculare, had too abrupt a ſlope at its outer edge, which was inclined towards the ſole; that the third cuneiform bone was ſomewhat ſeparated from the os naviculare, and the os cuboides a little removed inward at its connection with the os calcis. From theſe circumſtances, it was inferred, that the tibialis poſticus muſcle had acted ſo powerfully on the third cuneiform and the cuboid bone as to have brought towards the ſole the outer edge of the foot, nearer to the internal margin of the ſame.

The moſt conſiderable deformity was in the right foot.

The narrow part of the aſtragalus was twiſted inward and downward, and on the inſide it and the head of the bone were compreſſed together. The ſurface, articulated with the tibia, was puſhed ſo much obliquely inward, that a conſiderable portion of it in front was not at all oppoſed to the tibia, while the back part of the latter had a new articular ſurface formed on it. The ſide of the articular ſurface of the aſtragalus, and the malleolus externus connected with it, were both thrown more forward, out of their natural ſituation. The part of the aſtragalus to which the malleolus internus is joined, was with ſome of this latter proceſs abſorbed.

The tibia extended very obliquely from above downward, and from behind forward to the os calcis, or elſe the protuberance of the latter was drawn upward, ſo as to appear ſhortened.

The whole of the aſtragalus being diſtorted inward, it follows, that its head of courſe projected externally, and formed a prominence on the back of the foot.

The os naviculare was rightly connected with the three cuneiform bones, and was not in the leaſt mis-ſhapen.

The back of the foot was alſo remarkably convex, and the os calcis conſiderably bent forward towards the great toe. As the inſide of the head of the aſtragalus was abſorbed, and its neck diſplaced inward, the os naviculare was in cloſe contact with the remains of the malleolus internus. Neither the os naviculare, nor the os cuboides, was at all narrower than the correſponding bone in the oppoſite limb, ſo that the great toe did not incline preternaturally towards the heel, though this may be the caſe when the deformity is very conſiderable.

Cloſſius is of opinion that the diſtortion originated as follows: the tibialis poſticus muſcle had approximated the outer edge of the foot to the inner one, and conſequently had occaſioned a longitudinal excavation in the ſole. The fibres of the tendon of the ſame muſcle, which ran in a ſtraight direction to be implanted into the cuboid, third cuneiform, and navicular bones, had acquired the power of ſtrongly turning the foot inward, and forcibly extending it. Hence, the ſole was rendered very hollow tranſverſely, and the inſtep particularly convex; hence the end of the foot pointed downward conſiderably, while the os calcis was drawn up very high; and hence aroſe the diſtortion of the aſtragalus, and the palpable abſorption of certain portions of this bone.

When the head and neck of the aſtragalus are diminiſhed, the abductor pollicis pedis can act with great effect on the

projecting lever of the os calcis, ſo as to diſtort this bone inward and upward, and bring the great toe nearer to it.

The cauſe of the diſtortion is not always to be imputed, as ſome have imagined, to a partial luxation of the ankle-joint; but to a change in the form of the bones, more eſpecially of the aſtragalus.

In conſequence of the diſtortion of the foot, the muſcles which are ſituated in the ſole, and run from behind forward, become conſiderably ſhortened, ſo that the toes bend on every attempt to put the foot in a ſtraight poſition. That the peronei muſcles muſt be conſiderably on the ſtretch muſt be manifeſt to every body.

Camper thought the reaſon of the leg's being emaciated quite inexplicable, as there is no defect in the functions of the digeſtive organs, and no preſſure operating on the part.

Cloſſius ſuggeſts, as an explanation of the cauſe of the preceding change, the unnatural poſition, the tenſion, and the inactive ſtate of the muſcles; for club footed perſons neither move their ankle, nor their knee-joints, but bring their feet forward in a circular manner, with ſtiff knees and a limping gait. The feet are not approximated in walking, and the thigh and knee become conſiderably turned outward. Alſo, ſince ſuch perſons tread upon the outer edge of the foot, the peronei muſcles muſt be continually more and more weakened, and the deformity increaſed.

Camper has imputed the occaſional cauſe of the diſtortion to want of room in the uterus. However, other authors maintain, that this cauſe is by no means eſtabliſhed, ſince, during the five firſt months of geſtation, the child can move very freely in the womb, and as there is even at a later period no particular deficiency of ſpace. Other authors have conceived that a more likely cauſe is the foot's being propelled by ſome incident or another into a preternatural poſition in the womb, and remaining in ſuch condition.

It is curious however (if what ſome writers allege be true), that the club-foot ſhould occaſionally prevail in particular families, and ſeem to be an hereditary affection.

The deformity may alſo come on after birth, when children, either from inclination, or in conſequence of ulcers on the ſole, accuſtom themſelves to tread upon the outer edge of the foot.

The cure is the more eaſy of accompliſhment, the younger the child is, and hence it is a rule to begin the treatment at an early period. The affliction, however, has been removed in children thirteen years of age.

The firſt indication in the treatment is to make the contracted tendons, faſciæ, and muſcles ſupple again. Surgical writers, with this view, recommend the employment of warm bathing, which is to be repeated every day. They alſo adviſe the foot to be rubbed with oleaginous applications, or bathed in warm oil, and rubbed with the ſame. The frictions are to be made as far upward as the ham, and the limb is likewiſe to be bathed to this extent.

After keeping the foot immerſed for a certain time, an endeavour is to be made to ſtraighten it, and bring it more into a natural poſition. This trial is to be repeated ſeveral times in the courſe of the day, and particular care muſt be taken to depreſs the heel.

It is to be underſtood that the attempts are to be made with great care and perſeverance, and that the child muſt be entirely prohibited from putting the affected foot to the ground.

Before having recourſe to the employment of machines for the purpoſe of keeping the foot in the deſired poſition, it is always worth while to try what ſimple bandages will effect; for machines can only be uſed on ſuch children as are ſomewhat advanced in life, and the deformity is invariably the more eaſy of removal, the fewer years the patient has attained.

Some ſurgeons adviſe the uſe of a bandage, applied all over the part, and compoſed of a fine towel or piece of muſlin. The advantage of ſuch a contrivance is, that it does not cut the limb too much. The knot is to be made on the middle of the inſtep, ſo as that the bandage may ſtrongly draw the toes outward and upward, and thus lower the heel.

Some degree of benefit may be expected from the uſe of this kind of bandage in all thoſe caſes in which the diſtortion is not too conſiderable; and the os calcis not too much bent.

When the child begins to walk, it always turns its toes inwards, and does not bend its knee; conſequently the gait is attended with a motion of the body from one ſide to the other, the child treads on the point of its foot, and the heel is drawn up.

Due care at length makes all theſe defects diſappear. The toes muſt always be kept inclined outward, and the child muſt be taught to bend its knee without elevating the heel.

At laſt, the young patient ſhould wear half-boots, the outer edge of which muſt be higher than the inner one. They are alſo to be made without heels.

With regard to machines, we ſhall only obſerve that ſome practitioners confine the foot in a natural poſture with leg-irons of different conſtructions. Some maintain the part in a right poſition, with boxes of tin, or copper, or with ſtrong leather boots. Others uſe a more complicated apparatus, which conſiſts of metal ſhoes, in which the foot is confined, and of a wheel fixed by a ratchet, for the purpoſe of keeping the toes turned outward.

The inconveniences of ſuch methods are, that when the machines do not allow room for the ankle to move, the joint becomes ſtiff, and that when there is room, a due degree of ſupport is not afforded. Mr. Sheldrake has ingeniouſly obviated theſe difficulties, by deviſing a kind of ſpring, which is the operating power, and which is ſo advantageouſly made, that when the limb is moved, the apparatus acts with increaſed force. See Cloſſius über die Krankheiten der Knochen, Tübingen, 1798. Sheldrake on the Club-foot.

FOOT, *Fracture of.* See FRACTURE.

FOOT, *Luxation of.* See LUXATION.

FOOT, in the *Manege*, is the extremity of a horſe's leg, from the coronet to the lower part of the hoof. The four feet are diſtinguiſhed by four different names; the two fore-feet are by ſome called the hands of a horſe; but that term is in diſuſe, the common expreſſion being the far fore-foot, to denote the right foot before; and the near fore-foot, the ſtirrup-foot, and the bridle hand-foot, to denote the left foot before.

Of the two hinder feet, the right is called the far hinder-foot; and when ſpears were uſed, it was called the ſpear-foot, becauſe in reſting the ſpear the ſocket of it anſwered the right hinder-foot. The left hind foot is called the near foot behind. See *Veterinary* ANATOMY.

FOOT-*derobé*. A horſe's foot has this appellation when it is worn and waſted by going without ſhoes, ſo that for want of a hoof, it is a hard matter to ſhoe him.

A horſe's foot is ſaid to be worn and waſted, called in French *uſé*, when he has but little hoof, and not enough for ſhoeing.

FOOT, *to gallop upon a good*, or put a horſe upon a good

foot, called in French *ſur le bon pied.* See *Falſe* GALLOP.

FOOT, *Fat.* A horſe is ſaid to have a fat foot, when the hoof is ſo thin and weak, that unleſs the nails be driven very ſhort, he runs the riſk of being pricked in ſhoeing. The Engliſh horſes are very ſubject to this diſorder.

FOOT-*ſoldier*, implies that claſs of military perſons who are included in the roll of privates in marching regiments, and in all corps which act on foot, in contra-diſtinction to ſuch as are mounted, and come under the deſignation of *horſe-ſoldiers*, more commonly called *cavalry*.

No recruit ought to be paſſed into any regiment of foot, whoſe ſtature ſhould be under five feet ſix inches, or whoſe form, health, and ſenſes might appear to be in any inſtance defective. In time of war, indeed, ſome little relaxation from that ſtrictneſs which ought to obtain where candidates are abundant, muſt be admitted; but ſuch ſhould be under certain circumſtances only. It is a fact that, at the termination of a war, when many regiments are diſbanded, thoſe who return to their homes are rarely able to obtain a livelihood, owing to their having been reduced greatly, in regard to their phyſical powers, by the fatigues and hardſhips attendant upon a profeſſion to which their conſtitutions were unequal, and wherein they would not have been admitted, but from the abſolute neceſſity exiſting during times of emergency; when any human being becomes acceptable! The ſervices demanded of a foot-ſoldier are ſevere indeed; eſpecially in the regiments of artillery. In that highly reſpectable corps, much circumſpection is uſed in the ſelection of recruits, as well as in their ſubſequent training; it being peremptorily neceſſary, that every individual, beſides poſſeſſing the proper ſtature, form, and conſtitution, ſhould be active and intelligent, ſince on the preſence of mind, ingenuity, and profeſſional ſkill of the artilleriſt, though of the loweſt ranks, the moſt important conſequences have often been found to depend.

The pay of a foot-ſoldier correſponds with the rank of the corps, or branch of the ſervice, in which he may ſerve. In the artillery it amounts to 1*s.* 3$\frac{1}{2}$*d.* per diem; in the foot-guards to 1*s.* 1*d.*; and in regiments of the line to 1*s.* But in addition to this, they are ſerved with bread, in a very liberal proportion, and experience many little indulgences, eſpecially in being ſupplied by publicans, &c. on whom they may be billetted, with beer and victuals at fixed rates, ſuch as occaſion their room, rather than their company, to be a deſideratum with their hoſts.

Formerly every foot-ſoldier was armed cap-a-pee; but it being ſoon perceived that one efficient implement, well handled, was far ſuperior to that variety which at leaſt encumbered, if it did not diſtract the attention of the individual bearing the motley armour, the weapons uſed by foot-ſoldiers are now confined to the muſket and bayonet; which may not improperly be conſidered as but one. The only caſe in which a ſword ſeems admiſſible is in rifle corps; wherein, from the want of an efficient bayonet, ſome ſuch defence againſt an enemy coming to cloſe quarters is abſolutely neceſſary.

FOOT, in *Mining*, ſignifies to reach the bottom of a ſtratum; thus to "foot a coal," is to ſink a ſhaft through it to its under ſtratum or floor.

FOOT *of the eye's director*, in *Perſpective*, is that point in the directing line made by a vertical plane paſſing through the eye and the centre of the picture.

FOOT *of the vertical line*, is that point in the interſecting line, made by a vertical plane paſſing through the eye and the centre of the picture.

FOOT, in the *Greek* and *Latin Poetry*, denotes a metre, or meaſure, compoſed of a certain number of long and ſhort ſyllables.

The ſpondee, iambic, trochee, and pyrrhic, are diſyllabic feet; *i. e.* they conſiſt of two ſyllables each; the dactyl, anapſtæ, moloſſus, tribrach, bacchius, antibacchius, amphibrachys, and creticus, are triſyllabic, or conſiſt of three ſyllables each; the proceleuſmaticus, choriambus, and epitrite, are quadriſyllabic, or compoſed of four ſyllables. See each under its proper head, SPONDEE, IAMBIC, &c.

There are alſo other feet, invented by grammarians, of five, ſix, or more ſyllables; but they are not worth the reciting.

Hexameter verſes conſiſt of ſix feet; pentameters, only of five.

A foot in poetry ſeems to reſemble a bar in muſic. A *trine* among the ancients was a portion of that foot or bar; as with us a bar is divided into accented and unaccented parts. "Modern muſic, ſays Mr. Harris, Diſc. on Muſ. Paint. and Poet. p 73, 1ſt edit. has many different lengths of notes in common uſe, all which may be infinitely compounded, even in any one time or meaſure. Poetry, on the other hand, has but two lengths or quantities, a long ſyllable and a ſhort, which is its half; and all the variety of verſe ariſes from ſuch feet and metres, as theſe two ſpecies of ſyllables, by being compounded, can be made to produce." What is here ſaid of verſe, is equally applicable to ancient muſic, which was ſtrictly confined to verſe: and it ſeems as if whole pages could not place the difference between the rhythm of ancient and modern muſic, in a clearer point of view. See TRINE, RHYTHM, ACCENT, and TACT. Beating time with the foot, ſee ARSIS and THESIS, and NOTATION *of Poetical Feet* in Greek and Latin verſe. The different meaſures of poetry being called *feet*, the Greeks called ὑπορχημα a kind of poetry compoſed, not only to be ſung to the ſound of flutes and citharas, but to be danced at the ſame time. The Italian term ballata, the French ballade, and the Engliſh word ballad, had formerly the ſame import; implying ſeverally a ſong, the melody of which was to regulate the time of a dance. And the different meaſures of poetry being called feet, both in ancient and modern languages, ſuggeſts an idea that dancing, if not anterior to poetry and muſic, had a very early and intimate connection with them both. The poet Simonides defined poetry an eloquent dance: and dancing, a ſilent poetry.

FOOT, *Even and odd*, par and impar. In poetry, and particularly in iambic verſes, feet are denominated *odd* and *even*, in reſpect of their ſituation in the verſe. Thus, the firſt, third, and fifth, foot of the verſe, are uneven; becauſe thoſe numbers are not capable of being divided into two equal parts.

In the ancient tragedy, the iambic verſes, which prevailed therein, only allowed uneven feet to the ſpondees; ſo that the ſecond, the fourth, and ſixth feet, were to be iambics, becauſe they were even. This regular mixture of ſpondees in the uneven feet rendered the verſe the more ſolemn and noble.

The comic poets, the better to diſguiſe their verſe, and make it more like proſe, took the contrary courſe; putting ſpondees where the tragic poets would only have allowed iambics.

FOOT is alſo a long meaſure, conſiſting of twelve inches. The foot long is divided into twelve inches, and the inch into barley-corns. Thus the Engliſh ſtandard foot (31 Edw. I.) is = 12 lineal Engliſh inches, = 36 barley-corns, = 16 digits, = 4 palms, = 3 hands, = 5$\frac{1}{3}$ nails, = 1$\frac{1}{2}$ ſpans,

ſpans, = 1.5154 Gunter's links, = .938306 pieds, or feet of France, = .3047 metres of France.

Geometricians divide the foot into ten digits, and the digit into ten lines, &c.

The French divide their foot, as we do, into twelve inches; and the inch into twelve lines. See *French* MEASURES.

The foot ſquare is the ſame meaſure, both in length and breadth, containing 144 ſquare, or ſuperficial inches, = 2.295684 ſquare links; and the glazier's foot in Scotland is = 64 ſquare Scotch inches.

The cubic, or ſolid foot, is the ſame meaſure in all the three dimenſions, containing 1728 cubic inches Engliſh = 6.128 ale gallons = 3.478309 cubic links = .0283 cubic metres or ſteres of France. See *French* MEASURES.

The foot is of different lengths in different countries. The Paris royal foot exceeds the Engliſh by nine lines and a half; the ancient Roman foot of the Capitol conſiſted of four palms, equal to eleven inches and ſeven tenths Engliſh; the Rhinland, or Leyden foot, by which the northern nations go, is to the Roman foot as 950 to 1000. The portions of the principal feet of ſeveral nations, compared with the Engliſh and French, are here ſubjoined.

The Engliſh foot being divided into one thouſand parts, or into twelve lines, the other feet will be as follow:

		Th. Pts.	F.	Inch.	Li.
London - -	Foot	1000	0	12	0
Paris foot, the royal, by Greaves		1068	1	0	9.7
Paris foot, by Dr. Bernard		1066	1	0	1
Paris foot, by Graham, from the meaſure of half the toiſe of the Chatelet, the toiſe containing ſix Paris feet -		1065.41⅔	0	0	0
By Monnier, from the ſame data - - -		1065.351	0	0	0
From both theſe it may be fixed at - - -		1065.4	1	0	9.4
Amſterdam - -	Foot	942	0	11	3
Antwerp - -	—	946	0	11	2
Dort - - - -	—	1184	1	2	2
Rhinland, or Leyden	—	1033	1	0	4
Lorrain - -	—	958	0	11	4
Mechlin - -	—	919	0	11	0
Middleburgh - -	—	991	0	11	9
Straſburgh - -	—	920	0	11	0
Bremen - -	—	964	0	11	6
Cologn - -	—	954	0	11	4
Franckfort on the Mayn	—	948	0	11	4
Spaniſh - -	—	1001	0	11	0
Toledo - -	—	899	0	10	7
Roman - -	—	967	0	11	6
Bononia - -	—	1204	1	2	4
Mantua - -	—	1569	1	6	8
Venice - -	—	1162	1	1	9
Dantzick - -	—	944	0	11	3
Copenhagen -	—	965	0	11	6
Pragne - -	—	1026	1	0	3
Riga - -	—	1831	1	9	9
Turin - - -	—	1062	1	0	7
The Greek - -	—	1007	1	0	1
Old Roman - -	—	970	0	0	0
Roman foot, from the monument of Coſſutius in Rome, by Greaves - - -		967	0	0	0
From the monument of Statilius, by the ſame - -		972	0	0	0
Of Villalpandus, deduced from the congius of Veſpaſian		986	0	0	0

Mr. Raper, who has induſtriouſly collected a variety of authorities relating to the meaſure of the old Roman foot, determines the mean to be nearly 968 thouſandth parts of the London foot. And by an examination of the ancient Roman buildings in Deſgodetz's Edifices Antiques de Rome, Paris, 1682, he concludes, that the Roman foot before the reign of Titus exceeded 970 parts in 1000 of the London foot; and in the reigns of Severus and Dioclesian fell ſhort of 965. Phil. Tranſ. vol. li. art. 69. p. 774, &c.

The Paris foot being ſuppoſed to contain 1440 parts, the reſt will be as follow:

Paris - -	Foot		1440
Rhinland -	—		1391
Roman -	—		1320
London - -	—		1350
Swediſh - -	—		1320
Daniſh - -	—		1403
Venetian - -	—		1540⅖
Conſtantinopolitan	—		3120
Bononian - -	—		1682⅔
Straſburg - -	—		1282⅝
Norimburg -	—		1346¼
Dantzick - -	—		1721½
Hall - -	—		1320

In Scotland, this meaſure of length, though conſiſting of twelve inches, exceeds the Engliſh foot, ſo that 185 of the former is equal to 186 of the latter. Accordingly the Scotch foot = 12 Scotch inches, = $12\frac{1}{15}$ Engliſh inches, according to ſome, and $12\frac{12}{185}$ Engliſh inches according to others. The glazier's foot in Scotland = 8 Scotch inches. For a further account of the foot, ancient and modern, and its proportions in different countries, ſee MEASURE.

FOOT-*bank*, or *foot-ſtep*, in *Fortification*. See BANQUETTE.

FOOT-*pace*, in *Architecture*, is a flat ſpace in ſome ſtairs inſtead of winders, always ſituated between the ſtarting place and the landing.

When the foot-pace occupies one quarter of a revolution at the turning it is called a quarter pace: and if it occupy half a revolution, it is called a half pace.

Foot-paces are introduced in order to ſave the expence of winders, and to give reſt to the aſcendant in advancing up ſtairs.

FOOT *of the foreſt*, *pes foreſtæ*, in our *Ancient Cuſtoms*, contained 18 inches; or $1\frac{1}{2}$ of the common foot.

"Notandum eſt, quod pes foreſtæ uſitatus tempore Ric. Oyſell, in arrentatione vaſtorum, factus eſt, ſignatus et ſculptus in pariete cancellæ eccleſiæ de Edwynſtone, et in eccleſia Beatæ Mariæ de Nottingham: Et dictus pes continet in longitudine octodecim pollices, &c." Ex Regiſt. Abb. de Novo. Loco in Com. Nott.

FOOT, *Fore*. See FORE-*foot*.

FOOT-*geld* was an ancient amercement, for cutting out the balls of the feet of great dogs in the foreſt; to prevent their running after the king's deer.

FOOT-*guards*. See GUARDS.

FOOT-*hooks*, in a *Ship*. See FUTTOOKS.

FOOT, *Horary*. See *Univerſal* MEASURE.

FOOT-*buſks*, among *Gardeners*, are the ſhort heads out of which flowers grow. See CALYX.

FOOT-*irons*, in *Engineery*, are pieces of iron plate, which the navigators or canal-diggers tye on to that part of the ſole of their ſhoes which ſtrikes the top of their ſpade or grafting-tool, in digging hard ſoil. See CANAL.

FOOT

Foot *of a ſail*, denotes the lower edge or bottom.

Foot-*level*, an inſtrument which ſerves to do the office both of a level, a ſquare, and a foot rule.

The foot-level, repreſented *Plate* IV. *Surveying*, *fig.* 1. conſiſts of two branches, about an inch broad; opening and ſhutting like a two-foot rule.

Theſe branches are hollowed half way up the ſide of each to receive a kind of tongue, or thin piece of braſs, which is faſtened to one of them, by means whereof the branches may be ſhut cloſe together. The uſe of this tongue is ſuch, that when the end of it is placed in the branch it is not faſtened to, where there is a pin that holds it, the two branches will ſtand at right angles; to the head of the inſtrument is likewiſe added a ſquare piece of braſs; by means whereof it does the office of a ſquare. At the bottom of the angle of the ſaid piece of braſs is a little hole, wherein is faſtened a line with the plummet; which falling on a perpendicular line drawn on the tongue, ſhews whether any thing the inſtrument is applied to be level or not. See Level.

Foot, *lieutenant-colonel of*. See Lieutenant.

Foot-*rule*. See Rule.

Foot-*ropes*, are thoſe to which the foot of the ſail is ſewed. They are alſo the ſame with the horſes of the yards. See Horse.

Foot-*waleing* denotes the whole inſide planks or lining of a ſhip, uſed to prevent any part of the ballaſt or cargo from falling between the floor-timbers.

Foot-*halt*, in *Rural Economy*, is the name of an affection in the foot of the ſheep, which does not yet ſeem to be well underſtood. It ſhould be well cleaned from all ſorts of dirt, and kept tied up with ſome diſcutient application. See Sheep.

Foot-*paths*, the walks, paths, or other tracks which are made in fields, by walking through them when the land is under the plough, or ſhut up for the purpoſe of hay or paſture; alſo the walks on the ſides of public roads formed for foot paſſengers. In the former caſes they are not unfrequently highly inconvenient and injurious to the farmer, from the miſchief that is done in paſſing them by tearing up or beating down different ſorts of crops.

Foot-*plough*, in *Agriculture*, a name formerly much uſed to ſignify a kind of ſwing plough.

Foot-*rot*, in *Rural Economy*, an affection or diſorder in the feet of ſheep. It moſtly commences between the claws of the fore-feet, with a ſlight inflammation and ſwelling. In this way the ſheep becomes lame, and ſome moiſture oozes out between the claws, which has a highly diſguſting ſmell; and in proportion as the diſeaſe becomes more inveterate, it gets under the hoof, producing proud fleſh. It has been commonly ſuppoſed to be infectious, on account of its ſpreading with ſuch rapidity when not promptly removed. Moſt of the long woolled and Merino breeds of ſheep, are ſaid to be very ſubject to this diſeaſe; but other ſorts of ſheep are likewiſe found to frequently ſuffer from it.

In its removal, the part affected ſhould be pared and well cleaned without touching the quick, and then a cauſtic ſolution of the following kind dropped upon it, the foot being kept well wrapped up from the dirt. Two ounces of blue vitriol, the ſame quantity of roach alum, and one ounce of verdigris, with a quarter of an ounce of muriated quickſilver, ſhould be diſſolved in a quart of good diſtilled vinegar. But there are many who make uſe of butter of antimony, applying it to the part by means of an iron ſkewer, after being pared in the manner ſtated above. It is ſaid to be a very effectual remedy in this affection

It is always a proper precaution to ſeparate the ſheep that are thus affected from the reſt of the flock. And it has been ſtated that the change of the ſheep into a more ſhort dry paſture, is of great uſe in obviating the complaint. See Sheep.

Foot-*trenches*, in *Agriculture*, a term ſometimes employed to ſignify ſmall ſuperficial drains not more than a foot in width.

FOOTA, in *Geography*, a country of Africa, near the ſource of the Gambia. N. lat. 10° to 11°. W. long. 10° to 11°.

Foota Torra, a country of Africa, between the rivers Senegal and Gambia, N. of Woolly, and N.W. of Bondou.

FOOTE, Samuel, in *Biography*, a celebrated Engliſh comedian and dramatic writer, was born in the year 1717 at Truro, in Cornwall, where his father was in the commiſſion of the peace. He received his education at Worceſter college, Oxford, whence he removed to the Temple. But diſliking the dry ſtudy of the law, he turned his attention to the ſtage, and made his firſt debut in the character of Othello, in the Moor of Venice. He opened on his own account, in 1747, the little theatre in the Haymarket, with a piece written by himſelf, entitled "The Diverſions of the Morning." The next ſeaſon he ſucceeded beyond his expectations, by the favourable reception of another of his own compoſitions, "An Auction of Pictures;" in which he holds up to the mirror of ridicule many of the moſt diſtinguiſhed characters of the time. During this period, he continued to perform ſome of the principal comic characters at Covent Garden and Drury Lane theatres. Having, in a hunting party with the duke of York, the misfortune to fall from his horſe, by which he fractured his leg, and was conſtrained to ſuffer amputation; the duke ſo far ſympathized with his loſs, as to procure him a patent for life to act comedies at the Haymarket, annually from the 15th of May to the 15th of September; on which occaſion, in 1766, he conſiderably enlarged the theatre. In a piece which he brought out in 1776, he made a moſt pointed attack on the ducheſs of Kingſton's character, which made him many enemies, who cruelly retaliated upon him by charging him with an unnatural crime; and though he was honourably acquitted of the offence, yet the ſtigma on his fame made ſuch a deep impreſſion on his mind as to impair his health; and he was ſeized with a paralytic affection, which terminated fatally. Previous to that event, he had determined on quitting England, and ſpending the remainder of his days in France; but died ſuddenly at Dover, on his way thither, October 22, 1777. He appears to have had a preſentiment of his death, in which he was not diſappointed. Prior to his departure for the continent, he viewed attentively the portrait of his friend Weſton, a celebrated actor, which he kept in his cabinet, and with tears in his eyes was heard to exclaim "Poor Weſton!" and to add in the ſame tone of dejection; "in a ſhort time others ſhall ſay, poor Foote!" His remains were buried in Weſtminſter abbey. In him the nation loſt an actor of fine imagination, and a favourite of nature. As a writer, he poſſeſſed a fund of wit, and a vaſt aptitude to ſeize and improve the ridiculous; but took unwarrantable liberties in expoſing the natural failings or peculiarities of manners in living characters. So little did he attend to method in compoſition, that it is ſaid he could never form a regular plan, or wind up properly a plot. His pieces are principally farces, or farci-comedies, which from their wit and point have procured for him the title of the *Engliſh Ariſtophanes*. Of theſe, twenty with his name are publiſhed under the title of "The Comic Theatre," three vols. 12mo. out of which it has been

been obſerved that the "Young Hypocrite" is the only one wholly of his own compoſition. See Biographica Dramatica, and Cooke's Memoirs of Samuel Foote.

FOP, probably derived from the *vappa* of Horace, applied in the firſt ſatire of his firſt book to the wild and extravagant Nævius, is uſed among us to denote a perſon who cultivates a regard to adventitious ornament and beauty to exceſs.

FOPPENS, John Francis, in *Biography*, a learned Flemiſh divine, was born about the year 1689. Of his early life no particulars have been recorded. He was one of the profeſſors of theology at Louvain, obtained preferment in the church, and high reſpect from his contemporaries on account of his erudition and virtues. He was author of "Bibliotheca Belgica," in two vols. 4to. 1739. He publiſhed a new edition of Miræus's "Opera Hiſtorica et Diplomatica," with notes and tables in two volumes folio. He was likewiſe author of "Hiſtoria Epiſcopatus Antwerpienſis:" "Hiſtoria Epiſcopatus Sylvæducencis;" and "Chronologia Sacra Epiſcoporum Belgii ab anno 1561, ad annum 1764," 12mo. a work in verſe with hiſtorical notes. He died in 1761, in the ſeventy-ſecond year of his age.

FORA, in *Geography*, a river of Naples, which runs into the Adriatic. N. lat. 42° 26'. E. long. 14°.

FORABOSCO, Girolamo, in *Biography*, a painter, who practiſed the art both in hiſtory and portraiture, but principally the latter, and that with conſiderable ſucceſs. He was born at Venice about the year 1600, but the preciſe time is not known. The principal ſcene of his exertions was Venice, where many of his performances are ſtill preſerved; particularly portraits of the Doge Contarini, painted in 1655; and of the Doge Peſaro in 1659. His moſt juſt characteriſtics are natural and brilliant colouring, and freedom of execution. The period of his death is alike unknown with that of his birth.

FORADADA, in *Geography*, a ſmall iſland in the Mediterranean, near the iſland of Majorca, where the ſon of the king of Aragon formerly erected a college for the purpoſe of inſtructing ſome Franciſcan monks in the Arabic language, for converting the Moors.

FORAGE. See Forrage.

FORAMEN, in *Anatomy*, a hole. The term is employed moſtly in the ſkeleton, and is applied to the openings which penetrate a bone. It is uſed, therefore, moſt commonly in the head, as the apertures are moſt numerous there. A complete liſt of the foramina of the head is ſubjoined to the article Cranium.

Foramen *Commune anterius and poſterius*, are two openings in the brain. See Brain.

Foramen *Epiploicum*, an opening that leads into the cavity of the great omentum. See Epiploon.

Foramen *of Monro*, a name given to a ſlit-like paſſage leading from the lateral ventricle through the foramen commune anterius to the third ventricle of the brain; which Dr. Monro did not diſcover. See Brain.

Foramen *Ovale*, of the heart; a paſſage of communication in the fœtus, between the two auricles. See Heart.

Foramen, in *Natural Hiſtory*, is a term applied to the apertures obſervable in ſome ſpecies of *echini*, diſtinct from the mouth and vent: in the compreſſed or flat echini they are often large pervious holes, formed by the local coaleſcence of the oppoſite ſides of the ſhell, and are from two to ſix in number.

FORAMINULENTUS, Tractus Spiralis, in *Anatomy*, a part of the external ſurface of the cochlea, perforated by very numerous ſmall openings for tranſmitting the filaments of the auditory nerve. See Ear.

FORBACH, in *Geography*, a town of France, in the department of the Moſelle, and chief place of a canton in the diſtrict of Sarreguemines; 7 miles N.W. of it. The place contains 1,715, and the canton 9,472 inhabitants, on a territory of 212½ kiliometres, in 25 communes.

FORBES, Patrick, in *Biography*, was born in the year 1564. He was one of the Scotch nobility, under the title of lord of Corſe, and baron of O'Neil in the county of Aberdeen. He was educated partly at Aberdeen, and partly at St. Andrew's. When he was able to take an active part in the buſineſs of life, the affairs of the church of Scotland were in a ſtate of great confuſion, and he ſoon made himſelf conſpicuous by the encouragement which he held out to able and pious miniſters, and by the inſtructions which, notwithſtanding his being a layman, he perſonally delivered to the people. He was alſo well known by the conferences which he held for the converſion of the papiſts, who would hear nothing from the pulpit. Such ſervices, in behalf of the proteſtant cauſe, were not unnoticed or forgotten in times of difficulty, and he was repeatedly urged, by perſons of high rank in the church and ſtate, to engage in the work of the miniſtry. After much heſitation on his part, he was, in the forty-eighth year of his age, ordained preſbyter, and admitted miniſter of Keith, where he diſcharged the paſtoral functions with great acceptability and applauſe. In 1618, he was nominated by the king to the ſee of Aberdeen, which he accepted, though it is ſaid, with much real and unaffected reluctance. His zeal was equal to the diſcharge of the moſt important and extenſive duty, but he did not well underſtand the principles of toleration, which are alſo the principles of pure Chriſtianity. He joined his brethren in infringing on the rights of thoſe who were attached to particular ceremonies, by enjoining certain obſervances relative to the reception of the euchariſt, and other matters to which they could not conſcientiouſly conform. He was not, however, a perſecutor, and ſcorned to make uſe of vigorous meaſures to carry his point. Some time after his promotion to the biſhopric he was elected chancellor of the univerſity of Aberdeen, and under his ſuperintendance and patronage that ſeat of learning roſe to conſiderable diſtinction; he repaired and ornamented the buildings, increaſed the library of the univerſity, revived the ſeveral profeſſorſhips of divinity, canon law, and phyſic; and procured, by his influence, a new profeſſorſhip of divinity. The good biſhop lived long enough to be amply repaid for all his attention and liberality, by the number of able and worthy men who were educated there. He died in 1635, being in his ſeventy-firſt year, leaving behind him a "Commentary on the Revelations," which was printed in 1613: and a work entitled "Exercitationes de verbo Dei, et Diſſertationes de verſionibus vernaculis." In his conduct as a biſhop, he appears to have been uniformly influenced by an honeſt regard to the obligations of the character which he had aſſumed, and what he conceived to be the beſt means of promoting the intereſts of piety and virtue. If, at any time, he erred in the means of doing good, it was an error of judgment, and he is ſaid by biſhop Burnet to have "greatly allayed, and almoſt conquered, not only the diſtempered judgments, but the perverſe and turbulent humours of divers perſons in his dioceſe." He was careful in the choice of clergymen, and was anxious to make proviſion for their ſupport, and that of their ſucceſſors. He was vigilant and ſtrict in examining candidates for orders, and frequently viſited his dioceſe to enquire into the conduct of thoſe who exerciſed the important office of miniſters of religion.

religion. In his viſitations he proceeded without pomp, attended by a ſingle ſervant, that he might be more readily informed of what belonged to his care. He would frequently attend the ſermons of his clergy, in ſuch a way as to excite no ſuſpicion that he was more than a common hearer, to aſcertain their uſual ſtrain of preaching, and after ſervice he would encourage or admoniſh the miniſter, as he ſhould judge proper. Biog. Brit.

Forbes, John, ſon of the preceding, was born at Aberdeen about the year 1593, where he was chiefly educated, but he made choice of Heidelberg as the place to finiſh his ſtudies under the celebrated David Pareus. Before he returned to his native country, he viſited other German univerſities, and made himſelf maſter of the Hebrew language, and of all the departments of knowledge uſually connected with theological purſuits. His great learning excited the attention of Burnet, who ſays, that perhaps he was excelled by none of that age. At Aberdeen he was appointed to the new profeſſorſhip of divinity which his father had been the means of eſtabliſhing, and diſcharged the duties connected with the office with great reputation, till he was deprived of it by the preſbyterian party in the reign of Charles I. Being determined not to abandon the epiſcopal principles, he ſought refuge in Holland, where he wrote his "Hiſtorico-Theological Inſtitutions," which conſtituted a moſt learned and valuable work of the kind. On his return to Scotland he retired to his eſtate of Corſe, where he ſpent his time in making additions and improvements to his "Inſtitutions," which, however, he did not live to publiſh. He died in his fifty-fifth year. Beſides the work already referred to, he was author of "Irenicum Amatoribus Veritatis et Pacis in Eccleſia Scoticana," "Annotations" to a Latin tranſlation of his father's Commentary upon the Apocalypſe, "Ten books of Moral Theology," which were all collected and publiſhed in two vols. folio at Amſterdam in 1703.

Forbes, William, the firſt biſhop of Edinburgh, was born in the year 1585. He was educated at Aberdeen, the place which gave him birth; and ſo diſtinguiſhed were his abilities, that he was very ſoon appointed profeſſor of logic in the new inſtitution of Mariſchal college, and diſcharged the duties of the place with much ſucceſs and high reputation. After this he ſpent four years in the ſtudy of divinity, eccleſiaſtical hiſtory, and Hebrew, at different German univerſities. From thence he went to Leyden, where he obtained the eſteem and friendſhip of Scaliger, Grotius, Voſſius, and the other learned men of that univerſity. From Holland he paſſed to England, and was appointed Hebrew profeſſor of Oxford. His health ſoon required him to return to his native country, where he became celebrated as a preacher; and when king James, in concurrence with the deputies of the clergy, had determined that the manner of conferring academical honours ſhould be reſtored to the ancient courſe, Mr. Forbes was admitted to the degree of doctor of divinity. The exertions of public ſpeaking being more than his conſtitution could bear, he reſigned the miniſterial duties, and was nominated to the poſt of principal of Mariſchal college; and almoſt immediately afterwards he was created dean of the faculty of theology, and made rector of the univerſity. He next accepted, though not without reluctance, of an invitation to Edinburgh; but the ſentiments of the people were ſo diſcordant from thoſe which he held on ſubjects of church government and diſcipline, that his popularity and uſefulneſs ſoon declined. He accordingly reſigned his charge, and returned to Aberdeen, where the ſentiments of the clergy and people were more congenial with his own. In 1633, when Charles I. was crowned at Edinburgh, Dr. Forbes was appointed to preach before him: the monarch was ſo highly pleaſed with his ſervices, that he created a new ſee, *viz.* that of Edinburgh, in order to make Forbes a prelate. This honour, which was ill reliſhed by the people, he did not long enjoy, being cut off by a fever in 1634, in the fiftieth year of his age, and within three months of his conſecration. He ſpent his life in endeavouring to effect peace and union among Chriſtians; and, after his death, a treatiſe of his was publiſhed, entitled, "Conſiderationes modeſtæ et pacificatæ Controverſiarum de Juſtificatione, &c." According to biſhop Burnet, he was "a great and ſublime divine, who preached with ſo much zeal and ardour, that, frequently forgetting the meaſure of time, he continued his ſermons for two or three hours." Biog. Brit.

Forbes, Duncan, a celebrated lawyer, and diſtinguiſhed judge, commonly called lord Forbes, was the younger ſon of a reſpectable family at Culloden, in the ſhire of Inverneſs, born in the year 1685. His natural inclination led him to the army; but his friends diſcovering a ſuperiority of genius, adviſed him to devote his attention to the ſtudy of literature, in which he made a conſiderable progreſs. The narrow circumſtances of a ſecond brother induced him to conſult with himſelf on the moſt probable means of raiſing a fortune, and ſupporting the credit and reputation of his family. Prudence quickly pointed to the profeſſion of law; and having been admitted to the Scottiſh bar, he ſoon obtained great and merited encouragement; but where he never proſtituted that nervous and perſuaſive eloquence, for which he was notable, to ſupport an illegal or litigious cauſe. For even in the early part of life, when ſtraitened as to pecuniary circumſtances, he had laid down as one rule for the direction of his conduct, a generous contempt of money: a maxim he conceived eſſential to the formation of what he conſtantly aſpired to, an unblemiſhed character. By noble means like theſe he ſoon became eminently diſtinguiſhed, and roſe to the higheſt honours of his profeſſion. In 1717, he was appointed the king's ſolicitor-general for Scotland, and ſoon after unanimouſly elected to repreſent that country in the Britiſh ſenate; a truſt he diſcharged with ſo much honour and fidelity, as to obtain the thanks of his conſtituents, and the favour of his ſovereign; who nominated him, in the year 1725, to the dignified office of lord-advocate. As he advanced in years, his uſefulneſs increaſed; and his great capacity and unſullied reputation were the ſole reaſons aſſigned for his exaltation to the preſident's chair, which he filled with ſuch legal diſcernment and unbiaſſed judgment as will add a conſiderable portion of weight to its future deciſions. He not only ſhone in the character of a judge, but his patriotiſm and loyalty were equally conſpicuous. His zeal for the ſafety, welfare, and tranquillity of his country were on all occaſions apparent; but in no inſtances more than during the trying periods of the rebellion in behalf of the pretender, in the years 1715 and 1745: and for his reaſons, ſee his letter to the lord Lovat, who afterwards, for treaſonable conduct, ſuffered decapitation. Even in the vacations, he was conſtantly engaged with unwearied diligence in promoting the intereſts of agriculture, trade, and manufactures; and with unabated aſſiduity defending and promulgating the great truths of religion. After a life devoted to the cauſe of honour and virtue, and extended ſufficiently long for himſelf, though not for his country, he died in 1747, lamented by thoſe who had the pleaſure of his acquaintance, and regretted by all the friends of liberty and of truth. His lordſhip was well verſed in the original languages of the Scripture, particularly

ticularly the Hebrew,; as is evident from "a Letter to a Biſhop on the Writings and Diſcoveries of Hutchinſon," and which contains the cleareſt ſyſtematic view of that author's peculiar tenets ever yet publiſhed. He wrote alſo "Thoughts concerning natural and revealed Religion," and "Reflections on Infidelity;" the whole of which have been collectively printed in one volume, 12mo. 1750. His Thoughts on Religion and Letter to a Biſhop were tranſlated into French, by the celebrated writer Pierre Houbigant; and though containing ſentiments ſo repugnant to the national belief of France, yet they obtained a very extenſive circulation in that country. Life of Duncan Fourbes, 8vo. London Magazine for the year 1747. And Nouveau Dictionnaire Hiſtorique.

FORBES, in *Geography*, a town of Bohemia, in the circle of Bechin: 8 miles S.E. of Budweiſs.

FORBES's *Iſlands*, three iſlands in the South Pacific ocean, about 5 leagues from Bolt Head, a cape on the N.E. coaſt of New Holland. S. lat. 12° 25'.

FORBIN, CLAUDE, in *Biography*, a diſtinguiſhed French naval commander, was born in 1656, and entered the ſea-ſervice when he was very young. In 1686, he accompanied the French ambaſſador De Chaumont to Siam, and was left there as admiral of the country. Upon his return, he diſtinguiſhed himſelf in various actions in the Adriatic, the Channel, and the North ſea, and took prizes of great value. He became formidable to the Engliſh; attacked their fleet bound for Liſbon, took and deſtroyed part of the convoy, and captured ſeveral of the merchant ſhips. About the year 1708, he was the active friend of the pretender, and undertook to convey him ſafe to Scotland; but admiral Byng obliged him to retire. In 1710, a penſion being ſettled on him, he took up his reſidence near Marſeilles, where he died in 1733. Forbin was highly regarded by his country for courage and diligence in the diſcharge of his duty. He was generous and diſintereſted. Going to court to return thanks for a reward which the king had beſtowed upon him, he took occaſion to diſplay the ſervices of John Barth, the famous Dunkirk captain, whom he thought neglected. The liberality of his mind ſtruck the monarch ſo forcibly, that he exclaimed to his miniſter, that he rarely met with examples of this kind at his court. Forbin was author of "Memoirs," in 2 vols. 12mo. Moreri.

FORCADO, or RIO DE FORCADOS, in *Geography*, a river of Africa, which riſes far inland to the N.N.E., with many windings, in moſt places two miles wide, but of depth that allows only veſſels which draw ſeven or eight feet water. It runs into the Atlantic, 45 miles S.S.E. from the river Formoſa, N. lat. 6°.

FORCALQUIER, FORUM CALCARIUM, a town of France, and principal place of a diſtrict, in the department of the Lower Alps, ſituated in a delightful tract, watered by the Laye; formerly the capital of a country independent on Provence, and united to it in 1193; 7 leagues S.S.W. of Siſteron. The place, which is noted for three annual fairs, contains 2,539, and the canton 9,418 inhabitants, on a territory of 247½ kiliometres, in 14 communes. N. lat. 43° 57'. E. long. 5° 51'.

FORCAS, a town of Walachia; 3 miles N. of Caracalla.

FORCE, LA, a town of France, in the department of the Dordogne, on the Dordogne; the chief trade of which conſiſts in cattle, grain, and wine; 6 miles W. of Bergerac.

FORCE, in *Mechanics*. The nature of force being entirely unknown, it can only be defined by its effects. Whatever produces or tends to produce motion, or a change of motion in any body, is called a force. We are accuſtomed to conſider velocity as a meaſure of force, upon the ſuppoſition that under exactly ſimilar circumſtances the velocity is proportional to the force; an hypotheſis moſt highly probable, but not eaſily demonſtrable. Velocity is in itſelf a compound idea, ariſing from a certain relation between time employed and ſpace deſcribed. If a body A, ſuppoſed a material point, move uniformly, and without changing its direction from one point *a* to another *b*, the line *a b* is the ſpace deſcribed by the body A. If another body B move uniformly in the ſame manner from *c* to *d*, the line *c d* is the ſpace deſcribed by the body B. Now theſe ſpaces can eaſily be compared, either by their being repreſented or related to us in ſome ſtandard meaſure with which we are acquainted. In the ſame manner, the time in which each line is deſcribed may be defined by ſome known ſtandard meaſure, as a ſecond, a minute, &c.: the times and ſpaces may then be reſpectively expreſſed in abſtract numbers. And from conſidering the relation of theſe numbers to each other, has ariſen our idea of velocity, which in uniform motion is the relation between the ſpace and time employed to deſcribe it; and conſidering velocity as an abſtracted number, it is ſaid to be equal to the ſpace divided by the time. And thus different velocities may be compared.

Judging of force by its effect, we are naturally led to conſider velocity, or the ſpace deſcribed in a given time as its meaſure. But ignorant as we are of its nature, there is no mathematical contradiction in ſuppoſing that force may be expreſſed by other functions of the velocity, as for example, that it may be proportional to the ſquare or cube of the velocity. La Place has ſhewn, by a very ingenious inveſtigation, how we may experimentally be convinced of the proportionality of force to velocity, or at leaſt that ſince the difference *muſt be*, if any, extremely ſmall, it is highly improbable that any ſhould exiſt. It can be ſhewn, that if any conſiderable variation exiſted in this law, the relative motions of bodies on the earth's ſurface would be ſenſibly affected by the motion of the earth, that is, that the effect of a given force would vary very much according as its direction coincided with or was oppoſed to the direction of the earth's motion. The effects of the ſame apparent forces would vary likewiſe in different ſeaſons of the year, as the velocity of the earth is about one thirtieth greater in winter than in ſummer. Now ſince no variation of this kind is diſcernible, we may ſafely infer the proportionality of force to velocity. To comprehend the reaſoning on which the above concluſion is obtained, we may ſuppoſe two bodies moving upon one ſtraight line with equal velocities; and that by impreſſing on one of them a force which increaſes the primitive force, its relative velocity to the other body remains the ſame as if both of them had primitively been in a ſtate of repoſe. It is evident that the ſpace deſcribed by the body in conſequence of its primitive force, and of that which is added to it, becomes equal to the ſum of the ſpaces which each of them would have cauſed it to deſcribe in the ſame time, which ſuppoſes the force proportional to the velocity.

This law, and the law of *inertia*, which expreſſes the tendency of a body to perſevere in a ſtate either of reſt or motion, may be conſidered as derived from obſervation and experiment. They are the moſt ſimple and natural that can be imagined, and are ſufficient to ſerve as a baſis for the whole ſcience of mechanics.

The direction of a force is the ſtraight line which it tends to make a body deſcribe.

Conceiving two forces to act on a material point, it is

evident, that if the two forces act in the same direction, they will increase the effect of each other; but if they act in opposite directions, the point will only move in consequence of their difference, and it would remain at rest if the forces were equal. If the directions of the two forces make an angle with each other, the resulting force will take a mean direction, and it can be demonstrated geometrically; that if, reckoning from the point of intersection of the two directions of the forces, we take on these directions straight lines to represent them, and then form a parallelogram with these straight lines, its diagonal will represent, both as to its direction and magnitude, their resulting force. The resulting force thus determined (and which represents likewise the velocity of the moving point) may therefore be substituted as an equivalent force to the two composing forces; and reciprocally for any force whatever, we may substitute any two forces which, according to the above rule, would compose that force. Any force therefore may be decomposed into two others parallel to two axes situated in the same plane, and perpendicular to each other. To do this, it is sufficient to draw from the first extremity of the line representing the force two lines parallel to these axes, and to form with these lines a rectangle, the diagonal of which will be the force required to be decomposed. The two sides of this rectangle or parallelogram will represent the forces into which the given force may be decomposed parallel to these axes. If the force is inclined to a plane given in position, then taking to represent it a line in its direction, the extremity of which is on the surface of the plane, the perpendicular which falls from the other extremity will be the primitive force decomposed in the direction perpendicular to the plane. The straight line which in the plane joins the other extremity of the line representing the force with the perpendicular (or the orthographic projection of the line on the plane) will represent the primitive force decomposed parallel to the plane. This second partial force may be itself decomposed into two others, parallel to two axes in the same plane perpendicular to each other. Thus, every force may be decomposed into three others parallel to three axes perpendicular to each other, which axes are in the language of modern geometry called *rectangular co-ordinates*.

Hence arises a very simple method of having the resulting force of any number of forces, which are supposed to act upon a material point; for by decomposing every one of them into three others parallel to three axes given in position, and perpendicular to each other, it is clear that all the forces parallel to the same axis will be reduced to one single force, equal to the sum of the forces which act in one direction, minus the sum of those which act in a contrary direction: thus the point will be solicited by three forces perpendicular one to the other. If now three straight lines in each of their directions be taken to represent them, reckoning from the point of intersection (called the *origin of the co-ordinates*,) and on these straight lines we form a rectangular parallelopipedon, the diagonal of this solid will represent both the quantity and direction of the resulting force of all the forces which act upon the point.

This simple method has been uniformly followed by La Grange in the "Mechanique Analytique," and by La Place in the "Mechanique Celeste." It was first adopted by Maclaurin.

The principle of the composition of forces is of the most extensive utility in mechanics; it is sufficient alone to determine the law of equilibrium in every case. For by composing successively all the forces two by two, and taking the resulting force as a new force, we arrive at a force which must be equivalent to all the rest, and which, in case of equilibrium, must equal *zero*, when the system under consideration has no fixed point; but if there be an immoveable point by the conditions of the problem, then the resulting force arising from all the producing forces must necessarily pass through that point.

It is admitted by all writers on this subject, that the most abstruse propositions relating to the doctrine of forces may be deduced from a few simple principles; yet in the choice of these, few authors are found entirely to agree. The most natural and advantageous method seems to be that in which the relation which subsists between different forces in a state of equilibrium is first investigated, and then the consideration extended to a body in motion. In the case of a body solicited by several forces, but remaining in equilibrium, each force is supposed to produce only a tendency to motion, which tendency is measured by the motion it would produce, if it were not impeded by the action of the others; and expressing the effect of any one force by unity, the effect of the others relatively to this may be expressed by numbers or by lines.

La Place assumes only the two principles mentioned above, which he regards as experimental facts. Dr. Young, in his Lectures, is inclined to consider them as capable of demonstration; but this slight difference of opinion is but of small importance to the science, since all admit the same principles, and agree that they are established in the most satisfactory manner.

La Grange founds the whole doctrine of the equilibrium of forces on the well-known principle of the lever, on the composition of motion, and on the principle of virtual velocity. The principle of the lever may be derived from the composition of forces, and even from much less complicated considerations.

Archimedes is the earliest author upon record who attempted to demonstrate the property of the lever; he assumes the equilibrium of equal weights at equal distances from the fulcrum as an axiom in mechanics, and reduces to this simple and primitive case that of unequal weights, by supposing these, when they are commensurable, divided into equal parts, separated and placed on different points of the lever at equal distances, so that the whole lever may be loaded with a number of small equal weights at equal distances from the fulcrum.

The principle of the straight and horizontal lever being admitted, the law of equilibrium in other machines may be deduced from it: there is, however, some difficulty in referring the inclined plane to this principle; and the laws relating to it were, for a long time, unknown to mathematicians.

Stevinus, mathematician to prince Maurice of Nassau, was the first that gave a demonstration of it, by a very indirect, but at the same time a very curious method of reasoning.

He considers the case of a solid triangle resting upon its horizontal base; its sides then become two inclined planes: he then imagines a flexible chain consisting of a number of small equal weights threaded together, and so thrown over the triangle, that the upper part may rest on the two inclined planes, and the lower part hang suspended freely underneath, in the same manner as if attached to the lower extremities of the base. He then remarks, that if the chain is not in equilibrio, it will begin to slide along the plane, and the same cause subsisting, it should continue to slide for ever, producing a perpetual motion; but this implying a contradiction, we must conclude it to be in equilibrio, and if so, since the efforts of all the weights applied to one side exactly counterbalance all

thoſe applied to the other, and the number of weights are in the ſame ratio as the lengths of the planes; he concludes, that the weights will be in equilibrio on the inclined planes when they are to each other as the lengths of the planes: but when the plane is vertical, the power is equal to the weight; therefore, in every inclined plane, the power is to the weight as the height of the plane to its length.

The virtual velocity is that which a body in equilibrium is diſpoſed to receive, in caſe the equilibrium is diſturbed; or that which the body will really receive in the firſt inſtant of its motion: and the principle of virtual velocities, ſo much uſed by writers on the continent, in its moſt general form, is this. If a ſyſtem, compoſed of any number of bodies or points which are drawn in any direction by any forces whatever, be in equilibrium, and a ſmall motion be given to the ſyſtem by virtue of which every point deſcribes an infinitely ſmall ſpace, which will expreſs its virtual velocity, then the ſum of the forces, multiplied each by the ſpace deſcribed by the point to which it is applied, in the direction of the force, will be equal to zero; eſtimating as poſitive the ſmall ſpaces deſcribed in the direction of the forces, and negative thoſe deſcribed in a contrary direction.

Galileo ſeems to have been the firſt writer on mechanics who was acquainted with this principle, in his treatiſe, "Della Scienza Mecanica," and in his dialogues he propoſes it as a general property in the equilibrium of machines.

Des Cartes likewiſe deduced the equilibrium of different forces from a principle ſimilar to the above, but preſented under another point of view, and ſomewhat leſs general According to him, neither a greater nor leſs force is required to lift a weight to a certain height, than to lift an heavier weight to a height proportionally leſs, or a ſmaller weight to a height proportionally greater. So that two weights will be in equilibrio, when the perpendicular ſpaces deſcribed by them are reciprocally proportional to the weights; but in the application of this principle we muſt only conſider the ſpaces deſcribed in the firſt inſtant of motion, or we ſhall not attain the accurate law of equilibrium.

Torricelli, the celebrated diſciple of Galileo, is the author of another principle, which is nearly to the ſame effect, or is rather a neceſſary conſequence of the principle of Galileo. It is, that when two weights are ſo connected, that, being placed in any manner, their centre of gravity neither riſes nor falls; then in all theſe ſituations they will be in equilibrio. Torricelli applies this principle to the inclined plane, but it can be demonſtrated to hold good in all machines generally. From this ariſes another principle, which ſome authors have recurred to, to ſolve various problems relating to the equilibrium of forces. When a ſyſtem of ponderable bodies is in equilibrio, the centre of gravity is the loweſt poſſible. For it can be ſhewn by the theory "De Maximis & Minimis," that the centre of gravity of a body is the loweſt, when the differential of its deſcent is zero; that is, when the centre of gravity neither aſcends nor deſcends by an infinitely ſmall change in the poſition of the ſyſtem.

John Bernouilli is the firſt author who perceived the great utility of generalizing this principle of virtual velocity, and applying it to the ſolution of problems, as may be ſeen in one of his letters to Varignon, dated 1717, and which this latter has inſerted in the ninth ſection of his "Nouvelle Mechanique," which is entirely employed in ſhewing the truth of this principle, and its great utility when applied to the ſolution of different caſes in ſtatics.

From the ſame ſource originated another principle, propoſed by Maupertuis in the Memoirs of the Academy for 1740, under the name of the "Law of Repoſe," and which was afterwards extended by Euler, and explained in the Memoirs of the Academy of Berlin for 1751. Of the ſame nature is the principle aſſumed by M. Courtivron in the Memoirs of the Academy for 1748 and 1749; and which conſiſts in this, that of all the ſituations which a ſyſtem of bodies can ſucceſſively take, that in which the *vis viva* is a maximum or minimum is likewiſe that in which the ſyſtem muſt be placed, to remain in equilibrio; the *vis viva* of a ſyſtem being defined the ſum of the reſpective maſſes of which the ſyſtem is compoſed, multiplied each into the ſquare of its velocity.

But of all theſe methods, that of virtual velocity (from which indeed all the others are derived) ſeems to be the moſt generally uſeful. Practical examples of the analytic proceſſes, by which general formulæ or equations for the equilibrium of any ſyſtem of forces may be determined, are given by La Grange; and La Place demonſtrates the principle on which the calculus is founded.

It ſhould be obſerved that force is here ſuppoſed to be the product of the maſs of a material point, by the velocity it would receive if entirely free. If we confine theſe conſiderations to the caſe of a ſingle material point, the conditions of equilibrium will be found analogous to thoſe above-mentioned, but much ſimplified.

The moſt elementary equation to expreſs the ſtate of equilibrium of a material point acted on by any number of forces is, that every force multiplied by the element of its direction is equal zero; that is, if we ſuppoſe the point to change its poſition an infinitely ſmall quantity in any direction, then in the caſe of equilibrium, if every force be multiplied by the elementary ſpace which the point has approached to, or receded from, the force eſtimated in its direction, the product will be zero.

This ſuppoſes the point or particle free; but if it is conſtrained to move on a curve ſurface, it will then experience a re-action from this ſurface equal and contrary to the preſſure which the particle exerts on the ſurface, and which will be perpendicular to it, or in the direction of the radius of the curve. This re-action, therefore, may be conſidered as a new force, and the re-action multiplied by the elements of its direction muſt be added to the former equation; but if the variation of poſition, inſtead of being taken arbitrarily, be taken upon the curve, ſo as not to alter the conditions of the problem, ſince the elementary variation of the radius is evidently equal to zero, the preceding equation ſtill holds good.

Moreover, if the magnitude or intenſity of any force, multiplied by the diſtance of its direction from any fixed point, be called its *moment* relative to that point, then it is found that the ſum of the moments of the producing forces is always equal to the moment of the reſulting force; and in the caſe of equilibrium, the ſum of the moments of all the forces is equal to zero.

When the forces which act on a point, or a body, or a ſyſtem of bodies, are not ſo proportioned as to maintain the ſyſtem in equilibrium, motion neceſſarily takes place, and the laws of this motion may be deduced by extending the principles which were employed in the inveſtigation of the ſtate of equilibrium: this is the method employed by La Grange, and ſubſequently by La Place. La Grange, with the principle of virtual velocities, combines the principle of d'Alembert, which is extremely ſimple; indeed it may be

conſidered

conſidered as an axiom, but which, though very obvious, remained long unobſerved.

It is this: if ſeveral bodies have a tendency to motion, with velocities and in directions which they are conſtrained to change, in conſequence of their reciprocal action on each other, then theſe motions may be conſidered as compoſed of two others, one which the bodies actually take, and the other ſuch, that had the bodies been acted on by theſe alone, they would have remained in equilibrium.

To illuſtrate this theorem by an example; ſuppoſe two unelaſtic bodies or balls, whoſe maſſes are M and m, meet in the ſame direction with velocities V, v, reſpectively, required the common velocity after the ſhock.

Decompoſe the velocity V into x and $V - x$,
and the velocity v into x and $v - x$.

The velocities $V - x$ and $v - x$ will be deſtroyed, but as they alone would have maintained the bodies in equilibrio, they muſt be inverſely as their maſſes; hence but one in this caſe muſt be taken with the contrary ſine: hence

$$V - x : -v + x :: m : M$$
$$MV - Mx = -mv + mx$$
$$MV + mv = Mx + mx$$
$$x = \frac{MV + mv}{M + m}.$$

If a body or material point M (*Plate* XXVIII. *Mechanics*, *fig.* 6.) be ſuppoſed to move from A to B in the line AB by the action of ſome accelerating force P, its velocity, during any ſmall elementary ſpace bq, may be conſidered as uniform, and expreſſed by $\frac{dx}{dt}$, x being the ſpace at the time at the commencement of a new inſtant dt, (in which is deſcribed the ſpace qr). The increaſe of force or velocity which M receives may be expreſſed by $P \cdot dt$; P repreſenting the intenſity of the force. The velocity, therefore, at the *commencement* of this new inſtant, will be $\frac{dx}{dt} + P \cdot dt$; but this initial velocity may, by d'Alembert's theorem, be decompoſed into two others, of which one will remain and the other be deſtroyed; and the velocity deſtroyed will be ſuch, that if M had been ſolicited by that alone, it would have remained in equilibrium. Now the velocity remaining is evidently $\frac{dx}{dt} + d \cdot \frac{dx}{dt}$, and the velocity deſtroyed therefore $P \cdot dt - d \cdot \frac{dx}{dt}$; ſince theſe two quantities together equal $P \cdot dt + \frac{dx}{dt}$.

If the point M therefore had been ſolicited only by the force $P \cdot dt - d \cdot \frac{dx}{dt}$, it would have remained in equilibrium; hence

$$P \cdot dt - d \cdot \frac{dx}{dt} = 0$$

$$\text{and } P = \frac{d^2x}{dt^2}.$$

which is the general differential expreſſion for the accelerating force.

Since two forces $P \cdot dt$, and $d \cdot \frac{dx}{dt}$, acting on the point M, keep it in equilibrium, then if the point be ſuppoſed to vary its poſition an infinitely ſmall quantity δx, which may be here taken equal dx, according to the elementary theorem of La Place, each force multiplied into the element dx ſhould equal zero; hence $dx \left\{ d \cdot \frac{dx}{dt} - P \cdot dt \right\} = 0$.

And by integration $\frac{d^2x}{dt^2} = C +$, twice the integral of $P \cdot dx$. But $\frac{d^2x}{dt^2}$ is the ſquare of the velocity. Therefore the ſquare of the velocity is always equal to twice the integral of the accelerating force multiplied into the element of the ſpace; or according to our notation $v\dot{v} = F \cdot \dot{x}$; a theorem of extenſive application in the doctrine of accelerating forces. This principle is analogous to that which, when extended to a ſyſtem of bodies, is called the principle of the conſervation of the *vis viva*.

In the above examples we may obſerve that the theorem of d'Alembert is not of itſelf ſufficient to ſolve a problem, ſince it is always neceſſary to derive ſome condition relating to the equilibrium from other conſiderations. The difficulty of determining the forces, and the law of the equilibrium of theſe forces, renders this application ſometimes more difficult, and the proceſs more tedious, than if the ſolution were performed by ſome principle leſs ſimple and direct.

It was by combining the above principle of d'Alembert with that of virtual velocity, that La Grange was enabled to deduce the general equations relating to the forces which act on a ſyſtem of bodies. He thus deſcribes the nature of the method.

To form an accurate conception of the manner in which theſe principles are applied, we ſhould recollect that the general principle of virtual velocity conſiſts in this; that when a ſyſtem of material points, ſolicited by any force, is in equilibrium, if the ſyſtem receive a ſmall alteration in its poſition, by virtue of which every point deſcribes an infinitely ſmall ſpace, the ſum of each force, multiplied by the ſpace deſcribed by the point to which it is applied, according to the direction of the force, is always equal to zero.

If now we conſider the ſyſtem as in motion, and ſuppoſe the motion which every point has during an inſtant as compoſed of two, of which one is that which the point has the following inſtant, then it follows that the other muſt be deſtroyed by the reciprocal action of the points or bodies upon each other, and by that of the moving forces by which they are ſolicited. Thus there will be an equilibrium between theſe forces, and the preſſures or reſiſtances which reſult from the motions which are loſt by the bodies from one inſtant to another. Hence it follows, that to extend to the motion of a ſyſtem of bodies, the formulæ of its equilibrium, it is ſufficient to add the terms due to theſe laſt-mentioned forces.

If now we conſider the velocities which every particle has in the direction of three fixed rectangular co-ordinates, the decrement of theſe velocities will repreſent the motions loſt in theſe directions, and their increments will be the motions loſt in the oppoſite directions. Therefore the reſulting preſſures or forces of theſe motions deſtroyed will be expreſſed in general by the maſs multiplied into the element of the velocity, and divided by the element of the time, and their directions will be directly oppoſite to thoſe of the velocities.

By theſe means the terms required may be expreſſed analytically, and a general formula obtained for the motion of a ſyſtem of bodies, which will comprehend the ſolution of all the problems in dynamics, and of which a ſimple expanſion will give the neceſſary equations for each problem.

But one of the greateſt advantages derived from the formula thus obtained is, that it gives directly a number of

general equations, which contain the principles or theorems known under the appellations of the

Conſervation of the *vis viva*,
Conſervation of the motion of the centre of gravity,
Conſervation of equal areas,
And the principle of the leaſt action.

The firſt of theſe principles, the conſervation of the *vis viva*, was diſcovered by Huygens, but under a form ſomewhat different to that which we now give it. The principle, as employed by him, conſiſted in the equality between the aſcent and deſcent of the centre of gravity of ſeveral ponderable bodies which deſcend conjointly, and afterwards aſcend ſeparately by the velocity each had acquired. Now by the known properties of the centre of gravity, the ſpace deſcribed by it in any direction is expreſſed by the ſum of the products of the maſs of each body, by the ſpace it has deſcribed in the ſame direction, divided by the ſum of the maſſes. On the other hand, by the theorems of Galileo, the vertical ſpace deſcribed by a heavy body in its deſcent is proportional to the ſquare of the velocity acquired, and with which it will aſcend to the ſame height: thus the principle of Huygens is reduced to this, that in the motion of a ſyſtem of bodies, the ſum of the maſſes by the ſquares of the velocities at every inſtant is the ſame, whether the bodies have deſcended conjointly in any manner whatever, or have each deſcended freely through the ſame vertical heights. Hitherto this principle had only been regarded as a ſimple theorem of mechanics; but when J. Bernouilli had adopted the diſtinction eſtabliſhed by Leibnitz, between the preſſures which act without producing actual motion, and the living forces, as they were termed, which produced motion, as likewiſe the meaſure of theſe forces by the products of the maſſes by the ſquares of the velocities, he ſaw nothing in the principle in queſtion but a conſequence of the theory of the *vis viva*, and a general law of nature; in conſequence of which the ſum of the *vis viva* of ſeveral bodies preſerves itſelf the ſame as long as they act on each other by ſimple preſſures, and is always equal to the ſimple *vis viva* reſulting from the action of the actual forces which move the body. He gave it the name of the "conſervatio virium vivarum," and employed it with ſucceſs in the ſolution of ſeveral problems that before him had not been effected.

His ſon, the celebrated D. Bernouilli, afterwards deduced from this principle the law of the motion of fluids in vaſes, a ſubject which before had only been treated in a vague and unſatisfactory manner. In the Berlin memoirs for 1748, he explained and rendered this principle very general, ſhewing how it might be applied to the motion of bodies ſolicited by mutual attraction, or drawn towards fixed centres by forces proportional to any function of the diſtance whatever.

The advantage of this principle conſiſts in its affording immediately an equation between the velocities of the bodies and the variable quantities which determine their poſition in ſpace, ſo that when by the nature of the problem theſe variable quantities are reduced to one, this equation alone is ſufficient for its ſolution, which is the caſe in that relating to the centre of oſcillation. In general the conſervation of the *vis viva* gives always a firſt integral of the different differential equations of each problem, which is often of great utility.

The ſecond principle is that of Newton, given as an elementary propoſition in his "Principia." He demonſtrates, that the ſtate of repoſe or motion of the centre of gravity of ſeveral bodies, is not altered by the reciprocal action of theſe bodies in any manner whatever; ſo that the centre of gravity of bodies which act upon each other either by cords or levers, or by the laws of attraction, independent of any exterior action or obſtacle, remains always in repoſe, or moves uniformly in a ſtraight line.

D'Alembert has extended this theorem, and ſhewn that if every body of the ſyſtem is ſolicited by a conſtant accelerating force acting either in parallel lines or directed towards a fixed point, and varying with the diſtance, the centre of gravity will deſcribe the ſame curve as if the bodies were free; and it might be added, that the motion of this centre will be the ſame as if all the forces of the bodies were applied to it each in its proper direction.

It is evident that this principle ſerves to determine the motion of the centre of gravity, independently of the reſpective motions of the bodies, and thus it will always afford three finite equations between the co-ordinates of the bodies and the times, and which will be the integrals of the differential equations of the problem.

The third principle is much leſs ancient than the two preceding, and appears to have been diſcovered about the ſame time by Euler, Bernouilli, and the chevalier d'Arcy, but under different forms.

According to the two firſt, the principle conſiſts in this, that in the motion of ſeveral bodies about a fixed centre, the ſum of the products of the maſs of each body, by the velocity of rotation round the centre, and by its diſtance from the ſame centre, is always independent of any mutual action which the bodies may exert upon each other, and preſerves itſelf the ſame as long as there is no exterior action or obſtacle. Daniel Bernouilli gave this principle in the firſt volume of the Memoirs of the Academy of Berlin, in 1746, and d'Alembert the ſame year, in his "Opuſcula." The principle of M. d'Arcy, as given to the Academy of Paris in 1746, but not printed till 1752, is, that the ſum of the products of the maſs of each body, by the area traced by its radius vector about a fixed point, is always proportional to the times. This principle is nothing more than a generalization of the beautiful theorem of Newton, of the equality of areas deſcribed by centripetal forces, and to perceive the analogy, or rather identity, with that of Euler and Bernouilli, it is ſufficient to recollect that the velocity of rotation is expreſſed by the element of the circular arc divided by the element of the time, and that the firſt of theſe elements multiplied by the diſtance from the centre, gives the element of the area deſcribed about this centre; ſo that this laſt principle is only the differential expreſſion of that of M. d'Arcy. This author afterwards gave this principle another form, which renders it more ſimilar to the preceding. The ſum of the products of the maſſes by the velocities, and by the perpendiculars drawn from the centre to the direction of the forces, is always a conſtant quantity.

Under this point of view he eſtabliſhed a ſpecies of metaphyſical principle, which he calls the conſervation of action, to oppoſe, or rather ſubſtitute it for, the principle of the leaſt action, as if theſe vague and arbitrary denominations could conſtitute the eſſence of the laws of nature, or by ſome ſecret virtue could raiſe ſimple reſults of the known laws of mechanics to the rank of final cauſes.

But however this may be, the principle in queſtion takes place in every ſyſtem of bodies which act on each other in any manner whatever, whether by cords, inflexible lines, attractions, &c. and moreover ſolicited by forces directed to a centre; and this, whether the ſyſtem be entirely free, or conſtrained to move about this centre. The ſum of the products of the maſſes by the areas deſcribed about this centre, and projected on any plane whatever, is always proportional to the time; ſo that referring theſe areas to three rectangular

rectangular planes, three differential equations are obtained of the firſt order between the time and the co-ordinates of the curves deſcribed by the bodies; and it is, properly, in theſe equations that the nature of the principle exiſts.

The fourth principle is that of the leaſt action, ſo called by Maupertuis, and which the writings of ſeveral illuſtrious authors have ſince rendered celebrated. Conſidered analytically the principle is this, that in the motion of bodies which act one upon the other, the ſum of the products of the maſſes by the velocities, and by the ſpaces deſcribed, is a minimum. The author has deduced from it the laws of reflection and refraction of light, as likewiſe thoſe of the ſhock of bodies, in two memoirs, one of the Academy of Sciences for 1744, the other two years afterwards, in thoſe of Berlin.

But it muſt be confeſſed, that theſe applications are too partial to eſtabliſh the truth of a general principle, and, beſides, have ſomething in them too vague and arbitrary, which renders the conſequences uncertain as to the exactneſs of the principle itſelf: ſo that this principle ought not to be claſſed with thoſe above explained. But there is another point of view in which it may be conſidered more general and exact, and which alone merits the attention of geometricians. Euler gave the firſt idea at the end of his treatiſe on Iſoperimetrical problems printed at Lauſanne in 1744, ſhewing that in trajectories deſcribed by central forces, the integral of the velocity multiplied by the element of the curve is always a maximum or a minimum.

This property, as explained above, was only known by Euler to belong to inſulated bodies; La Grange extended it afterwards to the motion of bodies which act on each other in any manner whatever. And there reſults this new general principle, that the ſum of the products of the maſſes by the integrals of the velocities, multiplied by the elements of the ſpaces deſcribed, is conſtantly a maximum or a minimum.

By combining this principle with that of the conſervation of the *vis viva*, a ſolution of many difficult problems in dynamics may be obtained. Examples are to be found by La Grange in the ſecond volume of the Memoirs of the Academy of Turin.

Such is the general outline of the hiſtory and nature of the principles of dynamics, as given by La Grange. The ſubject is treated much in the ſame manner by La Place in the "Mechanique Celeſte," but the inveſtigation is carried ſtill further. With La Grange he adopts the principle of d'Alembert, and reſolves every motion into two, one which the particle had in the preceding inſtant, and the other ſuch as would have ſuſtained it in equilibrio.

La Place, however, differs from La Grange in not admitting the principle of virtual velocity to be aſſumed as a fundamental axiom, but demonſtrates it by a regular train of inductions; having eſtabliſhed nearly the ſame formulæ or differential equations, and deduced all the above general principles in the manner already deſcribed.

In addition to theſe principles others, in the nature of corollaries, are introduced, many of which are very deſerving of attention. From the principle of the conſervation of areas it follows, that in the motion of a ſyſtem of bodies ſolicited only by their mutual attraction, and by forces directed to the origin of the co-ordinates, there exiſts a plane paſſing through this origin, and which poſſeſſes theſe remarkable properties. 1. That the ſum of the areas, traced on this plane by the projections of the radii vectores of the bodies, and multiplied by their reſpective maſſes, will be the greateſt poſſible. 2. That this ſame ſum is equal to zero upon all the planes perpendicular to it. As the principle of the *vis viva*, and of areas ſubſiſts relatively to the centre of gravity, even ſuppoſing it to have a rectilinear and uniform motion; it follows, that a plane may be determined paſſing through this moveable origin, on which the ſum of the areas, deſcribed by the projections of the radii vectores, and multiplied reſpectively by their maſſes, may be the greateſt poſſible. It appears, that this plane is parallel to that which paſſes through the fixed origin, and ſatisfies the ſame conditions: moreover, a plane paſſing through the centre of gravity, and determined according to the preceding conditions, remains always parallel to itſelf during the motion of the ſyſtem, a circumſtance of great importance and utility. It may be added, that any plane parallel to this, and paſſing through any one of the bodies, poſſeſſes analogous properties.

La Place proceeds to examine in what manner theſe reſults would be changed, by ſuppoſing other relations to ſubſiſt between the force and velocity. Force may be expreſſed in an infinite number of ways relatively to the velocity beſides the ſimple law of proportionality, without implying any mathematical contradiction. If the force be ſuppoſed to be ſome other function of the velocity, (expreſſed analytically thus, $F = \phi v$) then the principle of the *vis viva* is found to obtain in all the relations mathematically poſſible between the force and velocity; the *vis viva* of a body being defined the product of its maſs, by the double of the integral of its velocity, multiplied by the differential of the function of the velocity which expreſſes the force.

It is in the law of nature only, that the motion of the centre of gravity is preſerved uniform and rectilinear.

The conſervation of areas, likewiſe, would not ſubſiſt in any other law than in that of nature; but a principle, analogous to that of the leaſt action, will be found to belong to every poſſible relation between force and velocity.

This principle of the leaſt action is not ſo obvious as others we have mentioned, being much more remote from the elementary theorems from which they are all derived; but if it can be directly and mathematically deduced from the ſame ſimple principles, it can have no more claim to the dignity of a final cauſe than any other remarkable property of numbers, ſince the reverſe would imply a mathematical contradiction. The fact, however, is curious, and deſerving of attention; it may be analytically ſtated thus: ſuppoſe a material point, in conſequence of the action of ſeveral forces, to move from one point to another, then the path or curve deſcribed is found to have this remarkable property, that the integral or continued product of the velocity (as determined by previous conſiderations) multiplied into the element of the curve, will be leſs than in any other curve paſſing through the ſame points. As this propoſition can only be intelligible to thoſe who are in ſome degree familiar with the language of the differential calculus, we ſhall endeavour to illuſtrate it by taking a particular caſe as an example. Let us ſuppoſe the point M (*fig.* 2.) projected horizontally in the direction M *s*, and at the ſame time attracted by the force of gravity in the direction M S; its path, as is well known, will be the parabola M M'. At any point *m*, if x be aſſumed to expreſs the diſtance M *m'*, the velocity at that point, *m*, will be expreſſed by $\sqrt{h + x}$; *h* being ſome conſtant quantity previouſly determined, and in this inſtance depending on the force of gravity and on the force of projection. Now, if we conceive the curve M M' to be divided into an infinite number of ſmall portions or elements, and that each of theſe be multiplied by the expreſſion $\sqrt{h + x}$, which denotes the velocity, and which will have a different value for every element into which it is to be multiplied, then it is aſſerted, that the ſum of all theſe ſmall factors, (or what in the language of analyſis is called their *integral*) will be leſs than if the ſame operation had

had been performed on any other line or curve paſſing through M M′. It may appear, at firſt ſight, that the ſum of theſe factors would have been leſs had the body moved from M to M′ by the ſhorteſt path, or in the ſtraight line M M′. Let us examine this caſe, and ſee whether we ſhould, by this ſuppoſition, inevitably obtain a leſs product than by the former one. If we divide the line into the ſame number of ſmall elements as the curve, it is evident that each of theſe will be ſmaller, and ſo far our object being to obtain a minimum, the advantage is in favour of the ſtraight line; but if we examine the multipliers $\sqrt{h+x}$, we ſhall find that they increaſe rapidly in value as they deſcend, and if we conſider the figure, we may obſerve that in the ſtraight line half the elements are multiplied by greater values of $\sqrt{h+x}$. Now this effect is obviated by the curve, as the greater number of its elements are placed in the upper part of the figure, where the multipliers $\sqrt{h+x}$ are comparatively but of ſmall value. Were the curve however to be made too convex, as the dotted line in the figure, this advantage might be deſtroyed by the increaſed value of the elements, which might more than counterbalance the effect of the diminiſhed values of $\sqrt{h+x}$. It will not be difficult now to comprehend the exiſtence of ſome curve, in which the ſum of the factors thus determined ſhall be leſs than in any other. In the preſent caſe it is found to be a parabola, and in every inſtance it can be ſhewn, that the curve anſwering to the above conditions of a minimum, is identical with that which a body is known to deſcribe by the uſual rules of mechanical inveſtigation. Admitting, therefore, the principle of the leaſt action as an eſtabliſhed theorem, problems may be ſolved by it, and the trajectories of bodies moving in ſpace determined; but it is of very little practical utility, ſince the neceſſary calculations are much more complex and difficult than the more uſual methods of inveſtigation. The reader will find ſome inſtances of theſe ſolutions under the article of *Analytic* FUNCTION. See likewiſe ISOPERIMETRICAL *Problems*.

The above explanation refers only to the caſe of a ſingle body, nor did Maupertuis, the inventor of this principle, extend it farther. Euler eſtabliſhes the generality of this principle in his treatiſe on the Iſoperimetrical problems, and ſhews that in all trajectories deſcribed by the action of centripetal forces, the integral of the velocity, multiplied by the element of the curve, is always a maximum or a minimum. La Grange firſt extended this principle to a ſyſtem of bodies, acting on each other, and demonſtrated, that the ſum of the products of the maſſes by the integrals of the velocities, multiplied by the elements of the ſpaces deſcribed, is always either a maximum or a minimum.

Theſe are the great and leading principles of the doctrine of forces, which have been at different times excogitated by the moſt eminent writers on theſe ſubjects; moſt of them are nothing more than developements of theorems eaſily derived from the Newtonian laws of motion, and many of them eſtabliſhed indeed by Newton himſelf; but there is a great advantage in this generalization of mechanical principles, as it enables us to take a more enlarged and comprehenſive view of the ſubject, than when the attention is confined to the detail of a ſingle problem.

Forces, which become the ſubject of mathematical computation, may very properly be divided into three ſeparate claſſes.

1ſt. Thoſe which, acting inſtantaneouſly, or at leaſt for a ſhort interval of time, impart uniform motion to a particle on which they act, provided it be not ſolicited by any other force, and at the ſame time free to move in any direction.

2d. Forces which act conſtantly, and whoſe intenſity remains the ſame: a material particle, free to obey the action of ſuch a force, deſcribes its path with a motion *uniformly accelerated*.

3d. Forces whoſe intenſities are continually varying, but according to ſome known law. The motion produced by the action of theſe forces is very complicated, and the circumſtances relating to it can only be inveſtigated by means of the integral calculus, or by ſome analogous methods.

Every force, whoſe mode of action is too arbitrary and uncertain to be included in either of the above claſſes, may be conſidered as in great meaſure foreign to the preſent ſubject of inveſtigation.

Caſe 1. When the forces meet in the ſame point.

When ſeveral forces, as P, Q, S, &c. (*fig.* 3.) whoſe directions are M P, M Q, M S, and intenſities M *a*, M *b*, M *c*, are exerted on any point M, the reſulting force is eaſily obtained, by combining the forces by parallelograms two and two, till a final reſulting force is obtained, which in this caſe, as appears by the figure, is in the direction M R, and whoſe magnitude is the diagonal M *d*. This proceſs may be ſimplified by taking M *a* (*fig.* 4.) equal and parallel to any force P, *a b* equal and parallel to any force Q, *b c* to a force S, &c. then M *c* ſhall be the reſulting force. If the forces terminate in M, after being carried round in a polygon, it would indicate that the point M was in equilibrium; and it is evident that if for the reſulting force we ſubſtitute its equal, in a contrary direction, the point M will likewiſe be in equilibrium.

Neither of theſe methods are of great practical utility, though extremely well adapted to illuſtrate the principle on which forces are eſtimated; we are therefore to conſider by what mode they may moſt commodiouſly be introduced into analytic calculation.

Let the angle P M R (*fig.* 5.) $= \theta$, Q M R $= \varepsilon$
M *a d* $= \alpha$, then P : Q :: ſin. ε : ſin. θ
P : R :: ſin. ε : ſin. α
Q : R :: ſin. θ : ſin. α.

$$\text{Therefore } \frac{P}{\text{ſin. }\varepsilon} = \frac{Q}{\text{ſin. }\theta} = \frac{R}{\text{ſin. }\alpha}.$$

Hence three forces are in equilibrio, when each is proportional to the ſine of the angle formed by the direction of the two others. Since the direction of the reſulting force depends only on the ratio, and not on the abſolute magnitude of the producing forces, it follows that if ſeveral forces are in equilibrium, and they are made to vary proportionally, they will ſtill remain in equilibrium.

If P $=$ Q; $\varepsilon = \theta$; and R $= 2$ P cos. θ

If the direction of the forces P, Q, are at right angles.

Then $R^2 = P^2 + Q^2$
And P $=$ R cos. θ
Q $=$ R ſin. θ
Q $=$ P . tang θ.

Theſe equations are often of great utility in transforming forces into others that are rectangular. For to reſolve any force R into two others which ſhall be rectangular, it is ſufficient to obſerve that P $=$ R cos. θ, Q $=$ R ſin. θ, or that each producing force is the product of the reſulting force R, by the coſine of the angle which it makes with this producing force.

Hitherto we have ſuppoſed the forces to act in one plane. Suppoſe now three forces P, Q, S, acting on the point M in directions not in the ſame plane, and firſt let theſe directions be rectangular, that is, let P and S be at right angles, and Q perpendicular to their plane. The producing forces P and S, the reſulting force T, determined by the equations P $=$ T cos θ; S $=$ T ſin. θ, where θ is the angle formed by T and P. In the ſame manner Q and T have their reſulting

ing force R, given by the equations R fin. $\gamma = T$; R cos. $\gamma = Q$; γ being the angle formed by R and Q. Subſtituting R fin. γ for T in the two firſt equations, we have $P = R$ cos. θ. fin. γ; $S = R$ fin. θ. fin. γ; $Q = R$ cos. γ.

The ſum of the ſquares of theſe equations gives $R^2 = P^2 + Q^2 + S^2$. The values of θ and γ are eaſily found, which compleat the problem. It is more convenient to employ the angles α, β, and γ, which the direction of the reſulting force R forms with the reſpective forces P, S, and Q. Now it is known that cos. θ. fin. γ = cos. α; and fin. θ. fin. γ = cos. β. Therefore, inſtead of the preceding equations, we have $P = R$ cos. α; $S = R$ cos. β; $Q = R$ cos. γ; from whence α, β, γ, are obtained.

General caſe in which the forces are ſuppoſed to have any directions whatever in ſpace.—Let A S, A P, A Q, (*fig.* 6.) be three rectangular co-ordinates paſſing through any arbitrary point A: let A P be the axis of x, A S that of y, and A Q of z. The plane P A S will be the plane of $x\,y$ (ſee *Analytic* GEOMETRY), S A Q that of $y\,z$, and P A Q that of $x\,z$. Of theſe axes two, as x, y, may be ſuppoſed horizontal, and z vertical.

Let the forces be repreſented by P′, P″, P‴, &c. whoſe directions form with the axis of

x	the angles	-	α', α'', α'''
y	-	-	β', β'', β'''
z	-	-	γ', γ'', γ'''.

By reſolving each of theſe forces into three others, whoſe directions are parallel to the axes, we have for the producing forces parallel to the axes

x	P′. cos. α',	P″. cos. α'',	P‴. cos. α'''
y	P′ cos. β',	P″ cos. β'',	P‴ cos. β'''
z	P′ cos. γ',	P″ cos. γ'',	P‴ cos. γ'''

Each of theſe collections of forces are equivalent to a ſingle force, equal to their ſum. Since they are in the direction of the ſame ſtraight line, let X, Y, Z, be the three forces parallel to the reſpective axes, and we have

$$X = P' \cos. \alpha' + P'' \cos. \alpha'' + P''' \cos. \alpha'''$$
$$Y = P' \cos. \beta' + P'' \cos. \beta'' + P''' \cos. \beta'''$$
$$Z = P' \cos. \gamma' + P'' \cos. \gamma'' + P''' \cos. \gamma'''$$

Let α, β, γ, be the unknown angles which the reſulting force R forms with the three axes; then R cos. α, R cos. β, R cos. γ, will be the equivalent producing forces in the directions of x, y, z; hence R cos. $\alpha = X$, R cos. $\beta = Y$, R. cos. $\gamma = Z$.

To obtain the value of R and its direction, add together the ſquares of theſe equations, and R^2 (cos.^{2} α + cos.^{2} β + cos.^{2} γ) = $X^2 + Y^2 + Z^2$, but cos.^{2} α + cos.^{2} β + cos.^{2} $\gamma = 1$: therefore

$$R = \sqrt{(X^2 + Y^2 + Z^2)} \text{ and}$$
$$\cos. \alpha = \frac{X}{R}, \quad \cos. \beta = \frac{Y}{R}, \quad \cos. \gamma = \frac{Z}{R}.$$

which equations indicate that the reſulting force is the diagonal of a parallelopiped, whoſe three edges are X, Y, and Z.

Let now x', y', z', be the co-ordinates of the point to which theſe forces are applied, the projections of the reſulting force upon the three co-ordinate planes will paſs through that of the point. The equations of the projections of this line will therefore be

$y - y' = a\,(x - x')$	upon the axis of $x\,y$
$z - z' = b\,(x - x')$	$x\,z$
$b\,(y - y') = a\,(z - z')$	$y\,z$

a and b being the tangents of the angles which the axis of x forms with theſe projections on the planes of $x\,y$ and $x\,z$. If, therefore, through the point A, the lines A P, A S, A Q, be drawn parallel to the axes x, y, z, the projection for the reſulting force R, on the plane P A S, will be A T; therefore, the tangent a of the angle T A P = θ,

$$\text{or tang. } \theta = \frac{Y}{X} = a.$$

In the ſame manner $\frac{Z}{X} = b$.

The equations of the projections are therefore

$$\left.\begin{array}{l} X\,(y - y') = Y\,(x - x') \\ Y\,(z - z') = Z\,(x - x') \\ Z\,(y - y') = Y\,(z - z') \end{array}\right\}$$

If the ſyſtem be in equilibrium,

$$X = o, \quad Y = o, \quad Z = o.$$

On parallel forces.—Previouſly to the conſideration of parallel forces, it will be neceſſary to notice a very ſimple geometrical propoſition, and which forms, in fact, the baſis of what La Place and other French writers call the "Theorie des Moments." The terms momentum and moment have been uſed by different authors to expreſs very different ideas. It is often uſed to expreſs the effort, action, energy, or impetus of a power to communicate motion to a body or ſyſtem of bodies; but modern writers, particularly the mathematicians of the continent, underſtand by moment the product of a power or force multiplied by the diſtance of its direction from a given point, line, or plane.

If a point E, (*fig.* 7.) be taken any how ſituated with reſpect to the parallelogram A B C D, and the perpendiculars E F, E G, E H, be drawn from E to the two ſides, and to the diagonal, A D × E G will be equal to A C × E H + A B × E F. Join E A, E B, E D. Produce D B to I; I H = D L will be the height of the triangle A C D, A C being the baſe.

$$\triangle E A D = \frac{A D \times E G}{2}$$

$$\triangle E A B = \frac{A B \times E F}{2}$$

$$\triangle A B D = A C D = \frac{A C \times I H}{2}$$

$$\triangle E B D = \frac{B D \times E I}{2} = \frac{A C \times E I}{2}$$

$$E A D = \frac{A D \times E G}{2} = \frac{A B \times E F}{2} + \frac{A C \times I H}{2} + \frac{A C \times E I}{2}$$

$$A D \times E G = A B \times E F + A C \times E H.$$

Or, $R \times E G = P \times E F + Q \times E H$.

If the point E be taken within the parallelogram, then $R \times E G = P \times E F - Q \times E H$.

The force P, multiplied by the diſtance E F, is called the moment of the force P relatively to the point E; hence by the preceding propoſition it appears that, according to this definition, the moments of the producing forces are equal to the moment of the reſulting forces; and in caſe of equilibrium, the ſum of the moments of all the forces are equal to nero.

If the point E be taken in the direction of one of the producing forces, as P, then E F = o;

$$R \times E G = Q = E H$$
$$R : Q :: E H : E G.$$

If E be taken in the direction of the reſulting forces E G = o, and $P \times E F = Q \times E H$, hence

$$P : Q :: E H : E F.$$

This propoſition, which is quite independent of any idea of motion, rotation, or force, may be deduced generally, by means of the analytic equations already demonſtrated for finding the reſulting force, from any number of producing forces ſoliciting a point; but the property being entirely geometrical, that form for the demonſtration has been preferred.

ferred. The above propoſition is a very important one in the general equations of equilibrium. The ſame propoſition may be extended to parallel forces, by ſuppoſing the point A to recede to an infinite diſtance by the revolutions of A P, A Q, round any two points M, N; then the figure will take the form as deſcribed in (*fig.* 7). And ſince

$$P \times EF = Q \times EH$$
$$R \times EG = Q \times EH$$
$$P : Q :: EH : EF$$
$$R : Q :: EH : EG$$

Corol. ſince $P : GH :: Q : EF :: R : FH$

$$P + Q : GH + EF :: R : FH$$

And $P + Q = R$.

and $P - Q = R$, when they act in oppoſite directions.

Or the ſame propoſition may be demonſtrated thus, without the neceſſity of conſidering the point as removed to an infinite diſtance.

Let two parallel forces, p and q, (*fig.* 8.) acting in the ſame direction, be applied to the two extremities E, F, of the line E F, to which they are perpendicular; then ſuppoſe two new forces p', q', applied at the extremities E, F, in oppoſite directions; p' being equal to q'. It is evident theſe forces will not tend to alter the ſtate of the ſyſtem, being equal and oppoſite: reſolve p' and p, q' and q, into P and Q, and let theſe forces produced meet in A. Through A draw B C parallel to E F, and A O perpendicular to it. Decompoſe the forces P and Q according to the directions A B, A O, and A C, A O; the firſt will be p' and p, the ſecond q and q', ſince the circumſtances of this are the ſame at A as E and F; the two forces q' and p' deſtroy each other; the reſulting force acting in the direction A O is therefore $p + q$. Since P is the reſulting force of two rectangular forces p and p', the tangent of the angle $PEp' = \frac{p}{p'} = \frac{AO}{EO}$; hence $p' = p \cdot \frac{EO}{AO}$; in the ſame manner $q' = q \cdot \frac{OF}{OA}$; therefore $p \times EO = q \times OF$, which is the known principle of the lever.

If the two parallel forces P and Q are oblique to the line of application E G, and if their reſulting force be R, then draw B D perpendicular to the force, and ſuppoſe B, C, D, the points of application; and ſince $P \times BC = Q \times CD$, and E F and F G are proportional to B C, C D; $P \times EF = Q \times FG$, which ſhews that the preceding propoſition does not require the direction of the forces to be perpendicular to the line of application. Therefore, in general, the reſulting force of two parallel forces is equal to their ſum and parallel to them, and divides the line to which they are applied in two parts, reciprocally proportional to theſe forces.

If $EG = a$, $EF = p$, $FG = q$

$a = p + q$, $R = P + Q$, $Pp = Qq$.

of which ſix quantities, three being given, the remainder may be found.

Let us next conſider the effect of any ſyſtem of parallel forces P′, P″, P‴, acting on different points of any body whatever: let x', y', z', x'', y'', z'', be the reſpective co-ordinates of theſe points to the three rectangular planes; let D, K, (*fig.* 9.) be the points of application of the forces P′, P″, and G that of their reſulting force R, and let a', b', c', be the three co-ordinates of G; then

$$AB = x', \quad BC = y', \quad CD = z'$$
$$AH = x'', \quad HI = y'', \quad IK = z'$$
$$AE = a', \quad EF = b', \quad FG = c'$$

$R' = P' + P''$, and if D K be produced till it meets the plane of xy in L; $R' \times LG = P' \times LD + P'' \times LK$; and ſince L G, L D, L K, are proportional to their projections $R'a' = P'x' + P''x''$, for the ſame reaſon

$R'b' = P'y' + P''y''$, and $R'c' = P'z' + P''z''$.

In which equations great attention muſt be paid to the ſigns which are neceſſarily poſitive; they are ſufficient to give both the magnitude and direction of the reſulting force.

This reſulting force R′ muſt be taken with the next force P‴ to obtain a new force, and this proceſs continued till all the forces are combined; R′ being ſubſtituted for P′ and P″, and combined with P‴, we have

$$R'' = R' + R'', \qquad R''a'' = R'a' + P'''x'''$$
$$R''b'' = R'b' + P'''y''', \quad R''c'' = R'c' + P'''z'''$$

ſubſtituting for R′, R′ a', R′ b', R′ c' their values, the values of R″, R″ a'', R″ b'', R″ c'' are obtained, and finally the reſulting force R; and its direction is obtained in the following equations:

$$R = P' + P'' + \&c.$$
$$Rx = P'x' + P''x'' + \&c.$$
$$Ry = P'y' + P''y'' + \&c.$$
$$Rz = P'z' + P''z'' + \&c.$$

The firſt equation gives the magnitude of the force; the co-ordinates x, y, z, of the point of application, are

$$x = \frac{P'x' + P''x'' + \&c.}{P' + P'' + \&c.}$$
$$y = \frac{P'y' + P''y'' + \&c.}{P' + P'' + \&c.}$$
$$z = \frac{P'z' + P''z'' + \&c.}{P' + P'' + \&c.}$$

Theſe equations being independent of the direction of the forces, it is evident that the point which has x, y, z for its co-ordinates, will remain the ſame, even when the forces take other parallel directions, provided that the points of application remain the ſame; therefore there exiſts a point through which the reſulting force always paſſes, when the forces turn round the point of their application. This point may be termed the *centre of parallel forces*.

It now only remains to inveſtigate the general caſe, where any number of forces are ſuppoſed to act on a body in any directions whatever.

Firſt, let the figure be ſuppoſed a plane, and the forces likewiſe ſituated in the plane of the figure.

Let P′, P″ &c., repreſent the forces; x', y', x'', y'', the co-ordinates of the points on which they act; α', α'', the angles which theſe co-ordinates make with the axis of x. Let P′ be reſolved into two forces X′, Y′, parallel to the axes x, y, and P″ into X″, Y″, &c. then

$P' \cos. \alpha = X'$, $P'' \cos. \alpha'' = X''$, &c.

$P' \sin. \alpha = Y'$, $P'' \sin. \alpha'' = Y''$, &c.

There will therefore be two collections of parallel forces, which may each be compoſed into a ſingle force. Let X be the ſingle reſulting force parallel to the axis x, and b its diſtance from it, Y and a the force and diſtance of the other parallel to the axis y; then

$$X = X' + X'' + \&c; \quad Y = Y' + Y'' + \&c.$$

$Xb = X'y' + X''y'' + \&c$; $Ya = Y'x + Y''x'' + \&c$;

The forces X, Y, may now be combined into a ſingle one, which will be applied in their point of interſection, whoſe co-ordinates are a and b.

As the point of application of R may be taken in any part of its direction, it is neceſſary to determine the equation of the ſtraight line repreſenting this direction, ſince it paſſes

paſſes through two points, whoſe co-ordinates are a, b, its equation is $Y - b = \text{tang. } a\,(x - a)$; or ſince tang. $a = \frac{Y}{X}$, $X\,y - Y\,x = X\,b - Y\,a$, and by ſubſtitution for the values of $X\,b - Y\,a$, $X\,y - Y\,x = X'\,y' - Y'\,x' + X''\,y'' - Y''\,x'' + \&c.$

Here x and y are the co-ordinates of the point of application of the reſulting force $X'\,y' - Y'\,x'$, the difference of the moments of the forces X', Y'; the ſame of the other forces: therefore, if p', p'', r, repreſent the perpendiculars let fall from the origin to the directions of the forces

$$X = X' + X'', \quad Y = Y' + Y''$$
$$R\,r = P'\,p' + P''\,p'' + \&c. \quad . \quad . \quad . \quad . \quad (m)$$

If π repreſent the ſum of the moments, $R \cos. \alpha = X$, $R \text{ ſin. } \alpha = Y$, $R\,r = \pi = X\,\gamma - Y\,x$.

The conditions of equilibrium of this ſyſtem are obtained by ſuppoſing it to exiſt, and then one of the forces P to be removed; the reſulting force R may then be conſidered as $= -P$, and the equation $X\,y - Y\,x = \pi$, ſhould be that of the force P. Hence by ſubſtitution the equations of equilibrium are obtained

$$\left.\begin{array}{l} X' + X'' + \&c. = o \\ Y' + Y'' + \&c. = o \\ P'\,p' + P''\,p'' + \&c. = o \\ \text{or } X'\,Y' - Y'\,x' + X''\,y'' - Y''\,x'' + \&c. = o \end{array}\right\} (n)$$

In the ſame form are the terms of P, &c.

If the ſyſtem be fixed by a point about which it may take a motion of rotation, the equilibrium may ſubſiſt without the forces deſtroying each other, provided the reſulting force paſſes through the fixed point. If this point be the origin of the ordinates, $x = o$, $y = o$, and $\pi = o$; and $P'\,p' + P''\,p'' + \&c. = o$.

If the equilibrium does not ſubſiſt, it may eaſily be eſtabliſhed, by adding a force whoſe intenſity and direction will be found by the above formulæ. It would be only neceſſary to introduce a new force P, which ſatisfies the equation (m); if p be its diſtance from the fixed point, P and p muſt be taken ſuch, that $P\,p + P'\,p' + P''\,p'' = o$, which problem is indeterminate as one of the quantities may be of any value whatever; ſome condition therefore may be added, as for inſtance, that the preſſure on the fixed point may equal in quantity and direction ſome given force, &c.

Let us imagine a ſolid body ſituated in ſpace, the reſpective points of which are ſolicited by any ſyſtem of forces, whoſe intenſity and directions are expreſſed by the ſame ſymbols or notation as before, but ſince the forces are not ſuppoſed to meet in any one point, the poſition of each muſt be determined by that of one of the points of its direction; for inſtance, the point of its application to the ſyſtem; let x', y', z', x'', y'', z'', be the co-ordinates of theſe points of the forces P', P'', &c. Reſolve each force at the point of its application into three others parallel to the axes of the rectangular co-ordinates; let X', Y', Z', be the three reſolved forces of P'; X'', Y'', Z'', thoſe of P'', &c. that is, let

$$P' \cos. \alpha' = X'; \quad P'' \cos. \alpha'' = X''$$
$$P' \cos. \beta' = Y'; \quad P'' \cos. \beta'' = Y''$$
$$P' \cos. \gamma' = Z'; \quad P' \cos. \gamma' = Z'.$$

Let a plane be imagined fixed in the ſolid body, and moveable with it; let this be the plane of $x\,y$, and ſuppoſe each force produced till it meet this plane; the equations of the ſtraight line repreſenting the force P' are $x - x' = A\,(z - z')$; $y - y = B\,(z - z')$; and, as above, $A = \frac{X'}{Z'}$, and $B = \frac{Y'}{Z'}$.

To obtain the point, where the point in which the line in-

terſects the plane of $x\,y$, make $z = o$, which gives for the co-ordinates a', b', of this point

$$a' = \frac{Z'\,x' - X'\,z'}{Z'}, \quad b' = \frac{Z'\,y' - X'\,z'}{Z'}.$$

And by changing the accents, analogous values are obtained for the other forces.

If every force be ſuppoſed to be applied at the point where its direction interſects the plane of $x\,y$, it may be reſolved into two, one in the direction of the plane, and the other parallel to the axis z. Now the equilibrium cannot take place except it ſubſiſt ſeparately in each of theſe collections of forces. The equations which expreſs this ſtate are thus attained.

The parallel forces to z ſhould ſatisfy the three equations

$$P' + P'' + \&c. = o \quad . \quad . \quad . \quad . \quad . \quad . \quad .$$
$$P'\,x' + P''\,x'' + \&c. = \text{tang. } \alpha\,(P'\,z' + P''\,z'' + \&c.)$$
$$P'\,y' + P''\,y'' + \&c. = \text{tang. } \beta\,(P'\,z' + P''\,z'' + \&c.)$$

and as the force Z' is applied to a point, of which a' and b' are the co-ordinates, the moments of Z' are $Z'\,a'$ and $Z'\,b'$, or $Z'\,x' - X'\,z'$, and $Z'\,y' - Y'\,z'$.

In like manner are obtained thoſe of Z''; hence

$$Z' + Z'' + \&c. = o$$
$$Z'\,x' - X'\,z' + Z''\,x'' - X''\,z'' + \&c. = o$$
$$Z'\,y' - Y'\,z' + Z''\,y'' - Y''\,z'' + \&c. = o.$$

The forces ſituated in the plane ſhould alſo ſatisfy the three equations (n) of the laſt problem. To apply them, every force muſt be reſolved into two others, parallel to x and y; P' into X', Y', and P'' into X'', Y'', and a', b', ſubſtituted for x', y', and $a''\,b''$ for x'', y''.

The ſtate of equilibrium, therefore, of a ſolid body, will be expreſſed by ſix equations.

$$\left.\begin{array}{l} X' + X'' + X''' + \&c. = o \\ Y' + Y'' + Y''' + \&c. = o \\ Z' + Z'' + Z''' + \&c. = o \end{array}\right\} (M)$$

$$\left.\begin{array}{l} X'\,y' - Y'\,x' + X''\,y'' - Y''\,x'' + \&c. = o \\ X'\,z' - Z'\,x' + X''\,z'' - Z''\,x'' + \&c. = o \\ Z'\,y' - Y'\,z' + Z''\,y'' - Y''\,z'' + \&c. = o \end{array}\right\} (N)$$

If the ſyſtem contains a fixed point or fixed axis, it may be in equilibrium without the forces deſtroying each other; it would be ſufficient for the reſulting force to be directed to this axis or this point.

If the ſyſtem is retained by a fixed axis, for inſtance that of z, it has no tendency to impreſs any motion on the body, and may therefore be neglected; it is ſufficient that the forces that act in the plane of $x\,y$ be in equilibrium about their fixed origin. And we may conclude that a ſolid body is in equilibrium whenever the two collections of producing forces, which are in planes perpendicular to this axis, have the ſum of their moments equal relatively to two rectangular planes paſſing through this axis.

If the ſyſtem is retained by a ſingle point (the origin of the co-ordinates) the above equations muſt ſubſiſt, but are not ſufficient; the forces parallel to z muſt no longer be neglected, and their reſulting forces muſt paſs through the origin or fixed point.

Of the equations (M), (N), the former are called equations of *tranſlation*; becauſe, when they ſubſiſt, the body has no tendency to take any motion of tranſlation. The latter three are called equations of rotation; becauſe it is neceſſary they ſhould take place, to prevent the body from taking a rotatory motion; and all the ſix muſt ſubſiſt at once, to ſecure a perfect equilibrium. If the equilibrium does not take place, but there is one reſulting force only as R; then if R be reſolved into X Y Z, the ſix equations will ſubſiſt, provided the forces $-X - Y - Z$ are added to the reſt. The three firſt equations give, as in the former problems,

$$R = \sqrt{\left\{ X^2 + Y^2 + Z^2 \right.},$$

$$\text{Cos. } \alpha = \frac{X}{R},\ \text{cos. } \beta = \frac{Y}{R},\ \text{cos. } \gamma = \frac{Z}{R};$$

so that nothing remains but to employ the three equations, N, to determine the value of the co-ordinates x, y, z, and then to determine the point of application of R. Let

$$L = (X' y' - Y' x') + \&c.$$
$$M = (Z' x' - X' z') + \&c.$$
$$N = (Y' z' - Z' y') + \&c.$$

X, Y, Z, L, M, N, will be known quantities, and the equations (N) will give,

$L = Xy - Yx$; $M = Zx - Xz$; $N = Yz - Zy$; by which X, Y, Z are determined, and by multiplying these equations by Z, Y, and X, and adding,

$$LZ + MY + NX = o;$$

without which equation the three preceding equations cannot subsist together: it therefore expresses the conditions of the data of the problem, necessary for all the forces to be reducible into a single one.

Hence it appears that a system of forces in space cannot be generally maintained in equilibrium by a single force. But when the equation $LZ + MY + NX$ subsists, then there will be a single resulting force, whose direction and intensity may be found; and its point of application may be anywhere in the straight line whose equations are $Xy - Yx = L$, &c. In other cases, there will be two resulting forces, which cannot be combined into one.

If the body is fixed either on a centre or an axis, a force must be introduced into the system, which shall satisfy the three equations (M) in the first case, and (N) in the second. The problem will then be indeterminate; and other conditions may be required, such as that a certain pressure shall be produced on a given point or axis, &c. &c.

The pressure which a fixed point or axis sustains from the action of a system is always equal, and in a contrary direction to the force which must be employed to produce equilibrium in the system, in case it was free. The rules, therefore, for the investigation of the pressure on a point or axis, are the same as those for finding the resulting force of a number of producing forces.

The fixed axis of a system of bodies is often sustained on two points, at its extremities, or elsewhere; and it is sometimes required to determine the pressure on these points. Let EF (*fig.* 10.) be the fixed axis; A, B, the points on which it is supported; R M, the resulting force. Then to determine the pressure on A and B, the force R must be resolved into two others applied to the points A, B, according to the rules given above.

In the case of equilibrium about a fixed axis, every force parallel to the axis may be neglected; but to determine the pressure on certain points of this axis, these forces must be taken into consideration. For instance, suppose it were required to determine the pressure which a force R, (*fig.* 11.) parallel to the axis A B, produced on two fixed points, A, B.

Let $AC = BD = r$, $AB = a$; and suppose at the point A, two forces, M, Q, applied in the directions A M, A Q; and at the point B, the force S directed towards B S, so as to produce equilibrium in the system C A B D, then the efforts exercised on A and B will be determined. If the point A be taken as the origin of the co-ordinates x, y; A B for the axis x; A C that of y; the equations of equilibrium become

$$R - M = o;\ S - Q = o;\ Rr - Sa = o.$$

From the first it appears that the body or system is solicited in the direction A B, the same as if the force R acted directly in that line; and the other equations give $S = Q = \frac{Rr}{a}$. Hence, the force R tends to turn the axis on the points A and B, with an equal action in opposite directions.

On the Motion of Bodies directed to Centres of Force.—To solve these problems, we must refer to the general differencial equations of varied motions. These are $\frac{d^2x}{dt^2} = \frac{dv}{dt} = F$; $x = \varphi(t)$; $v = \frac{dx}{dt}$; $F.dx = v\,dv$; where x = space, and t = time.

If a body descend from a state of rest towards a centre of force, if the intensity of this force at a given distance be known, and likewise the law of its variation; then the velocity at any point, and the time of descending through any given portion of the space, may be found by a proper application of the above equations. The artifice consists in obtaining an expression for the accelerating force in terms of x, the space described; which expression being multiplied by dx, the double of its integral will be the square of the velocity, since $F\,dx = v\,dv$. And when the velocity is obtained, it may be substituted in this expression $\frac{dx}{v}$, for v; and the integral of it will be equal to the time employed, since $dt = \frac{dx}{v}$.

Force may become an object of calculation, as the cause of motion, when it is either instantaneous, constant, or variable, according to some given law.

If a force acts on any particle of matter instantaneously, or, if after acting on it a certain time, its action ceases, the motion produced is uniform; and we apprehend that it is of this uniform motion alone that the human intellect can form a very accurate conception. For though no one doubts that we are able to compute, justly and accurately, the effects of forces which produce continued varied motion, yet it is always done by some artifice to assist the imagination, and by resolving this variable motion into a number of elementary partial ones, which are supposed infinite: but being fully aware of the error this artificial method might produce, we endeavour to investigate and assign a limit to this error, which fortunately we are not only able to do, but to correct it entirely, so as to add to our first calculation the advantage of mathematical precision.

Let any person, unacquainted with the fluxional or differential calculus, attempt to solve the easiest of the following problems, and he will be insensibly led to the method of limits. He will first divide the space or the time into ten finite parts, next into one hundred, then one thousand; and finding that the error continually diminishes, he will endeavour to find the law of the series, and to what term it continually approaches as a limit, and which will be the answer to the problem, when, instead of a limited number of finite elements, it is supposed divided into a number of infinitely small ones.

Let C (*fig.* 12) be a centre, toward which bodies are attracted with forces which are inversely proportional to the squares of the distance from C. Let a particle begin to descend from A, by the action of a central force residing in C. It is required to ascertain the velocity acquired at any given point O of its descent.

Let f represent some standard force, as that of gravity, and G be the distance at which C exerts a force equal to f. Let $GC = r$. $AC = a$, $AO = x$.

Then F (the force at O) : f (force at G) :: CG^2 : CO^2
$r^2 : (a-x)^2$.

Therefore, $F = \frac{f \cdot r^2}{(a-x)^2}$; but since $F\,dx = v\,dv$,

dx

$dx \cdot \frac{f \cdot r^2}{(a-x)^2} = v\,dv$; and $\frac{v^2}{2} = \int \cdot \frac{f \cdot r^2}{(a-x)^2} + C = \frac{f r^2}{a-x} + C$; and ſince when $x = o$. $v = o$, $C = \frac{f r^2}{a}$, and $v^2 = 2\left(\frac{f r^2}{a-x} - \frac{f r^2}{a}\right) = \frac{2 f r^2 x}{a \cdot a - x}$, and $v = \sqrt{\frac{2 f r^2}{a}} \times \sqrt{\frac{x}{a-x}}$.

To obtain the time t, we muſt refer to the general equation $dt = \frac{dx}{v}$, and ſubſtitute the value of v, above found, in the expreſſion $\frac{dx}{v} = \frac{dx}{\sqrt{\frac{2 f r^2}{a} \cdot \frac{x}{a-x}}} = \sqrt{\left(\frac{a}{2 f r^2} \cdot \frac{a-x}{x}\right)} \cdot dx = dt \cdot t = \int \sqrt{\left(\frac{a}{2 f r^2} \cdot \frac{a-x}{x}\right)} = \sqrt{\frac{a}{2 f r^2}} \cdot \sqrt{\frac{a-x}{x}}$; and multiplying the latter fraction by $a - x = \sqrt{\frac{a}{2 f r}} \cdot \frac{a-x}{\sqrt{a x - x^2}}$.

To integrate this fraction, ſuppoſe $x = \frac{1}{2}a - z$, the integral is then that of the fraction $\frac{-\frac{1}{2}a - z}{\sqrt{\frac{1}{4}(a^2 - z^2)}} - dx$, which may be divided into $\int \frac{-z\,dx}{\sqrt{\frac{1}{4}(a^2 - z^2)}} = \sqrt{(\frac{1}{4}a^2 - z^2)}$, and $\int \frac{-\frac{1}{2}a\,dz}{\sqrt{\frac{1}{4}(a^2 - z^2)}} = \frac{1}{2}a$. arc $\left(\text{cos.} = \frac{2z}{a}\right)$. The conſtant quantity $C = o$, becauſe when $x = o$, $t = o$, $z = \frac{1}{2}a$; ſubſtituting for z its value $\frac{1}{2}a - x$; $t = \sqrt{\frac{a}{2m}}\left\{\sqrt{a x - x^2} + \frac{1}{2}a \times \text{arc}\left(\text{cos.} = \frac{a - 2x}{a}\right)\right\}$.

For the method of finding this fluent geometrically, ſee Atwood's treatiſe on Rectilinear Motion, p. 66.

Example.—Let a body begin to deſcend from a ſtate of reſt at A (*fig.* 13.) towards C. Let the force be ſuch as, if continued uniform, would cauſe A to deſcend one foot in one ſecond, required the velocity when it arrives at O $= \frac{1}{2}$ A C.

F (force at O) : f (force at A $= 1$) :: A C^2 : C O^2 :: $a^2 : (a-x)^2$

$$F = \frac{a^2}{(a-x)^2}$$

$$F \cdot dx = \frac{a^2}{(a-x)^2} \cdot dx = v\,dv$$

$$\frac{v^2}{2} = \frac{a^2}{a-x} + C; \text{ when } x = o, v = o$$

$$\frac{v^2}{2} = \frac{a^2}{a-x} - a = (\text{when } x = \tfrac{1}{2}a)\ \frac{a^2}{\frac{1}{2}a} - a = a$$

$v^2 = 2a$, and $v = \sqrt{2a}$.

Suppoſe a material particle at A (*fig.* 14.) to be ſolicited by two forces, one producing motion from A towards B, uniformly accelerated; the other tending to move it towards D, and acting in an inverſe ratio of the diſtance of the particle A from B; required the circumſtances of the motion which will take place from the action of theſe forces.

Let A B $= a$, A N $= s =$ the ſpace deſcribed at the end of the time t. Let γ be the accelerating force of repulſion from A towards D, and g the conſtant force which acts in the contrary direction N B. Let m be the value of the force γ, at any diſtance B aſſumed as unity. Then by the nature of the queſtion $\frac{\text{N B}}{1}$, or $\frac{a+s}{1} = \frac{m}{\gamma}$, and $\gamma = \frac{m}{a+s}$. The force f, which acts on the particle at the end of the time t, is the difference of the two forces, or $f = \gamma - g$. Hence $f = \frac{m}{a+s} - g$; $f\,d\,s = v\,d\,v$; $d\,s = v\,d\,t$: by means of theſe equations, two out of the four quantities s, t, v, f, may be eliminated.

The firſt and ſecond equations give $v\,d\,v = \left(\frac{m}{a+e} - g\right) d\,s$; and by integration $\frac{v^2}{2} = m$. hyp. log. $(a+e) - g\,s + C$; at the point A $v = o$, $s = o$; hence $C = -m$. hyp. log. a.

Therefore $v = \pm \sqrt{\left\{2m \times \text{hyp. log.}\left(\frac{a+s}{a}\right) - 2g\,s\right\}}$

To obtain the relation between s and t, the value of v thus found, muſt be ſubſtituted in the differential equation $v = \frac{ds}{dt}$, and the integral found as in the former example.

This problem relates to the caſe of a piſton moving in a cylinder, containing in the part A B an elaſtic fluid. The piſton being acted on by the action of gravity, and likewiſe by the action of the external air, will tend to deſcend with a conſtant force g, and the action γ of the elaſtic fluid will be the leſs, as the ſpace containing it is greater, or as the piſton is farther from B.

To obtain the maximum of velocity, $d\,v$ muſt $= o$, or $f = \frac{m}{a+s} - g = o$, and $a + s = \frac{m}{g} =$ B N, beyond which point v decreaſes, the motion is retarded, and ceaſes when m . hyp. log. $\left(\frac{a+s}{a}\right) = g\,s$, when it is again accelerated, and but for the effect of friction the body would thus oſcillate for ever.

We are next to inveſtigate a general formula for curvilinear motion, and to conſider the method of its application.

When a body deſcribes a curve in conſequence of the action of certain forces, we may, in imagination, reſolve this curve into an indefinite number of elementary ſpaces, and ſuppoſe each to be the ſide of an infinitely ſmall polygon, ſo that the body changes at every inſtant the direction of its motion, which is always that of the tangent or prolongation of the ſide of the ſmall polygon. To eſtimate the velocity at any moment, we may conceive the forces to ceaſe to act in the ſame manner as in the caſe of rectilinear motion, and then the velocity v may be repreſented by $\frac{ds}{dt}$.

Whatever be the forces which act on the body, they may always be resolved into three, which are parallel to three rectangular co-ordinates; it is evident that each of the producing forces will have an effect independent of the two others, and consequently we may apply to each the theorems established for rectilinear motion; it is thus that we learn the nature of the motion, and determine the trajectory which the body describes, when the intensity and direction of the forces are given. Curvilinear motion is thus reduced to two or three rectilinear motions, according as the curve is of the single or double curvature.

When the trajectory lies in the same plane, the motion may be represented by two equations, $x = \varphi(t)$; $y = f(t)$: by eliminating t, a relation is obtained between x and y, which will be the equation of the curve described. If the curve be of double curvature, the motion will be represented by three equations, $x = \varphi(t)$, $y = f(t)$, $z = \downarrow(t)$; and by eliminating t, two equations will be obtained in terms of x, y, and z, which will be those of double curvature described by the body. The equations $x = \varphi(t)$, $y = f(t)$, $z = \downarrow(t)$.

Let P', P'', be constant forces, which act on the material particle M, at the end of the time t. Let α', α''; β', β''; γ', γ''; be the angles formed by their directions with the respective axes of x, y, z. Let each force be resolved into three others parallel to these respective axes, namely, X, Y, Z, then each of these forces will impress on the body an elementary impulsion, each in its own direction. Hence these equations;

$$\begin{aligned} X &= P' \cos.\ \alpha' + P'' \cos.\ \alpha'' + \&c. \\ Y &= P' \cos.\ \beta' + P'' \cos.\ \beta'' + \&c. \\ Z &= P' \cos.\ \gamma' + P'' \cos.\ \gamma'' + \&c. \end{aligned}$$

At the end of the time t, the point M, in that point of its trajectory which has for its co-ordinates x, y, z, will have in the direction of x a velocity $= \frac{dx}{dt}$, so that in this point we may conceive the body in repose, and receiving in the direction of the axis x an impulsion producing the velocity $\frac{dx}{dt}$; this velocity should increase during the time dt, by a quantity $= d\left(\frac{dx}{dt}\right)$, by the effect of the constant forces P, P'', &c. so as to become $= \frac{dx}{dt} + d\left(\frac{dx}{dt}\right)$. But, as we have already seen, the velocity communicated in the direction of the axis x is equal $\frac{dx}{dt} + X\,dt$; and as the effects of the other rectangular forces are independent, the forces X, Z, do not change this. Hence the velocities $X\,dt$, $d\left(\frac{dx}{dt}\right)$ are equal. Reasoning in the same manner as to the other forces, we have the following equations.

$$\left.\begin{aligned} X\,dt &= d\left(\frac{du}{dt}\right) \\ Y\,dt &= d\left(\frac{dy}{dt}\right) \\ Z\,dt &= d\left(\frac{dz}{dt}\right) \end{aligned}\right\} (A')$$

Or taking dt constant,

$$\left.\begin{aligned} X &= \frac{d^2x}{dt} \\ Y &= \frac{d^2y}{dt} \\ Z &= \frac{d^2z}{dt} \end{aligned}\right\} (B')$$

which are the general formulæ of motion for a body moving in free space.

These equations are sufficient to investigate all the circumstances of the motion of a material point, that is, to assign its velocity and situation in its trajectory at any given instant. Suppose the forces to act in some plane, *viz.* that of x and y, X and Y being given either constant or variable, we have then only to eliminate t, the time from the two equations $X = \frac{d^2x}{dt^2}$, $Y = \frac{d^2y}{dt^2}$. This being effected, and the integrations made, an equation is obtained between x and y; similar relations may be obtained between x and t, and y and t, then $\frac{dx}{dt}$, $\frac{dy}{dt}$ will give the velocities in the directions of the axes of x and y; whence the real velocity may be concluded, which will be $v = \frac{ds}{dt} = \sqrt{\left\{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right\}}$.

A formula, more useful on many occasions, may be thus obtained.

In the equations

$$X = \frac{d^2x}{dt^2};\quad Y = \frac{d^2y}{dt^2};\quad Z = \frac{d^2z}{dt^2}$$

Multiply by dx, dy, dz, as follows:

$$X\,dx + Y\,dy + Z\,dz = \frac{dx\,d^2x + dy\,d^2y + dz\,d^2z}{dt^2};$$

but the numerator of the second member of this equation is the differential of $\frac{1}{2}(dx^2 + dy^2 + dz^2)$, or of $\frac{1}{2}ds^2$; therefore, by taking the integrals, we have $\frac{ds^2}{dt^2} = v^2 = C + 2\int(X\,dx + Y\,dy + Z\,dz)$. This equation, which is similar to that we have already used in the case of rectilinear motion, cannot give an exact solution, except $X\,dx + Y\,dy + Z\,dz$ be an exact differential; or, to use the language of fluxions, except its exact fluent can be found.

If, therefore, X, Y, Z, be functions of x, y, z, the following conditions should subsist, $\frac{dX}{dy} = \frac{dY}{dx}$, $\frac{dX}{dz} = \frac{dZ}{dx}$, $\frac{dY}{dz} = \frac{dZ}{dy}$, and $v^2 = 2\varphi + C$.

The constant quantity C depends on the initial velocity, or on the velocity at some given instant. This last equation comprehends the principle of the "conservatio virium vivarum."

This proposition is in fact the same as the 39th prop. of the first book of Newton's Principia. The reader will find a very ample geometrical demonstration, accompanied with many valuable remarks on these theorems, in Dr. Robinson's Mechanical Philosophy, and in the Supplement to the Encyclop. Britan.

One of the most simple examples of the application of these

theſe equations, is the motion of a projectile in an unreſiſting medium. Let the velocity of the material point M (*fig.* 15.) = V in the direction of the angle θ, with the axis of x; let it be propoſed to determine the curve it deſcribes. Let the axis of y be vertical, as there is no other force but that of gravity: $X = o$; $Z = o$; $Y = -g$; therefore $\frac{d^2x}{dt^2} = o$, $\frac{d^2z}{dt^2} = o$, $\frac{d^2y}{dt^2} = -g$; and by integration

$$\frac{dx}{dt} = c; \frac{dz}{dt} = c''; \frac{dy}{dt} = c' - gt.$$

The firſt of theſe equations, divided by the ſecond, gives by integration

$$c''x = cz$$

equation to a ſtraight line, which ſhews that the projection of the trajectory upon the horizontal plane of xy is a ſtraight line, and that the curve is in a vertical plane, paſſing through the axis of y.

The equations $\frac{dx}{dt} = c$, $\frac{dy}{dt} = c' - gt$, by integration give $x = ct$; $y = c't - \frac{1}{2}gt^2$.

No conſtant quantities need be added ſince when $t = o$, $x = o$, $y = o$. To determine the other two conſtant quantities, c and c', at the commencement of motion, ſince $\frac{dx}{dt}$, $\frac{dy}{dt}$, are the velocities at every inſtant, if the velocity V is vertical, when $t = o$, $\frac{dx}{dt} = o$, and $\frac{dy}{dt} = V$, hence $c = o$, $c' = V$. But when the force producing the velocity V is in the direction of the angle θ, with the axis of x, then when $t = o$, $c = V$, cos. θ and $c' = V$ ſin. θ.

Of the expreſſions for x and y, one is the equation of uniform motion, the other of uniformly varied motion; eliminating t from theſe equations, we find $y = \frac{c'}{c}x - \frac{gx^2}{2c^2}$; ſubſtituting for c and c' their trigonometrical values, the equation to the trajectory

$$y = x \text{ . tang. } \theta - \frac{gx^2}{2V^2 \text{ . cos.}^2\theta}.$$

For V ſubſtitute its value $2gh$, (h being the height due to the velocity V,) and

$$y = x \text{ . tang. } \theta - \frac{x^2}{4h \text{ . cos.}^2\theta}$$

equation to a parabola.

In the ſolution of theſe problems we are to obſerve, that when the nature of the curve is required, it is to be found by determining the relation between x and y, and by combining the differential equations with ſome value of v or t, given by the nature of the problem. On the other hand, when the curve is known, from a given relation between x and y, then the values of v and t are to be determined, by combining the ſame general differential equations with the element of the curve, which repreſents the element of the ſpace, and which is known in terms of x or y by the equation to the curve.

If, in the above problem, the projectile be ſuppoſed to move in a medium, the law of whoſe reſiſtance is known, the inveſtigation of the curve becomes much more difficult. The expreſſions for the forces X, Y, Z, will no longer be of the ſimple form, as in our example; the term t will be more difficult to eliminate, and the ſubſequent integrations infinitely more complex: but the general principle will remain preciſely the ſame. See PROJECTILE.

The ſame principles apply to the motion of bodies in trajectories; the particular caſes of this application will be given under TRAJECTORY, the general nature of the method being as follows.

General theory of the trajectories deſcribed by bodies acted on by centripetal forces.—Suppoſe a material particle projected in any direction, and continually drawn towards a given point by a force varying as ſome function of the diſtance, and whoſe intenſity is likewiſe known at ſome given diſtance: from theſe data we are to inveſtigate the principle by which the curve may be determined.

Let three rectangular co-ordinates be drawn through the centre of force; and let P repreſent the abſolute intenſity of the force at a given inſtant; the radius vector drawn from the centre of force to the point M, in which the body is at that inſtant, makes with each axis a certain angle; the coſines of theſe angles are $\frac{x}{r}$, $\frac{y}{r}$, $\frac{z}{r}$; the forces, therefore, that reſult from the reſolution of the force P, and which are equivalent to it, are $\frac{Px}{r}$, $\frac{Py}{r}$, $\frac{Pz}{r}$.

If, therefore, the element dt be ſuppoſed conſtant, then, by the preceding formulæ, (ſince the forces tend to diminiſh the co-ordinates,)

$$\frac{d^2x}{dt^2} = -\frac{Px}{r}; \frac{d^2y}{dt^2} = -\frac{Py}{r}; \frac{d^2z}{dt^2} = -\frac{Pz}{r} \quad (1)$$

To integrate theſe equations, multiply the firſt by y, the ſecond by x, and ſubtract the firſt product from the ſecond: then

$$\frac{x\,d^2y - y\,d^2x}{dt^2} = o;$$

and

$$\begin{aligned} x\,dy - y\,dx &= c\,dt \\ z\,dx - x\,dz &= c'\,dt \\ y\,dz - z\,dy &= c''\,dt. \end{aligned}$$

Multiply theſe equations by x, y, z, reſpectively, and add, then $c''x + c'y + c = o$, which equation belongs to the trajectory, and indicates that this curve is a plane paſſing through the centre of force. Therefore, in the ſolution of the problem, we may conſider only the two axes of x and y. Let F D M (*fig.* 16.) be the curve; M the point in which the moving body is found at the end of the time t; A the centre of the forces A P = x, P M = y, A M = r. The angle M A $x = u$, the right-angled triangle for the tranſformation of its ordinates into polar co-ordinates, (ſee *Analytic* GEOMETRY,) gives

$$\left.\begin{aligned} r^2 = x^2 + y^2;\ x = r \text{ cos. } u;\ y = r \text{ ſin. } u \\ dx = -r \text{ ſin. } u\,du + \text{cos. } u\,dr \\ dy = r \text{ cos. } u\,du + \text{ſin. } u\,dr \end{aligned}\right\}$$

See alſo *Analytic* FUNCTION, where theſe differential equations are explained.

Therefore, $x\,dy - y\,dx = r^2\,du$;

and $r^2\,du = c\,dt$.

But $\int . r^2 . du$, or $\int . (x\,dy - y\,dx)$ is the double of the area M A H contained by the two radii vectores M A, A H, the poſition of one of which is fixed: therefore, this area $= \frac{1}{2}ct +$ A, taking the radius A H as fixed and belonging to M, when $t = o$.

Hence it appears, that whatever be the central force, the area deſcribed will always be proportional to the time.

By equation (1) $\frac{d^2x}{dt^2} = -\frac{Px}{r}$,

$$\frac{d^2y}{dt^2} = -\frac{Py}{r}$$

multiply by dx, dy respectively, and add: and then since $x\,dx + y\,dy = r\,dr$

$$\frac{dx\,d^2x + dy\,d^2y}{dt^2} = -P\,dr.$$

But as the intenſity of the force P is ſuppoſed to vary by hypotheſis, as ſome function of the diſtance r, the integral of $P\,dr$ may be found.

Suppoſe $\int.(P\,dr) = \varphi + C$, then

$$\frac{dx^2 + dy^2}{dt^2} = -2(\varphi + C) = v^2.$$

This equation contains the principle of the vis viva; it is in ſubſtance the ſame as the 40th Prop. Sect. VIII. of Newton's Principia, from which it is inferred, that if two bodies have at any one diſtance the ſame velocity, when acted on by any centripetal force, they ſhall always have the ſame velocity at any other equal diſtances.

By the transformation of the co-ordinates we obtain theſe equations,

$$r^2\,du = c\,dt,\quad dr^2 + r^2\,du^2 = -2(\varphi + C)\,dt^2,$$

and by eliminating dt, the differential equation of the trajectory becomes

$$du = \frac{c\,dr}{r\sqrt{\{-r^2(\varphi + C) - c^2}},$$

the integration of which quantity gives the curve required; but this can only be effected in particular caſes.

This is the celebrated inverſe problem of centripetal forces, and is the 42d Prop. of the 1ſt Book of Newton's Principia. A geometrical ſolution, with many illuſtrations, is given by Dr. Robiſon, in the article *Dynamics*, Sup. Encyclop. Britan.

Of Forces which act on a body conſtrained to move on a given ſurface.—Let a material particle deſcend from the point B, (*fig.* 17.) and deſcribe the curvilinear ſpace B M, arriving at M at the end of the time t: let A x be the horizontal, A y the vertical axis; ſo that A P $= x$, P M $= y$, B M $= s$: let B C $= k$. The velocity v, in the direction of the element of the curve, is $v = \frac{ds}{dt}$, and the augmentation by the force of gravity is dv in the time dt; but this force tends to communicate the velocity $g\,dt$ in the element of time dt, in the direction M G; let this velocity be decompoſed into two, one in the direction of the normal, and which is evidently deſtroyed by the reſiſtance of the curve; and the other in the direction of the tangent M H $= g\,dt \cdot \frac{dy}{ds}$, ſince $\frac{dy}{ds}$ is the coſine of the angle formed by the tangent T M with the axis of y. Therefore the augmentation of velocity is $dv = g\,dt \cdot \frac{dy}{ds}$; hence $v\,dv = g\,dy$, and by integration $v^2 = 2g(\gamma + C)$. Now at the point B, $\gamma = k$, where the velocity is either zero, or ſuch as is due to ſome given height h, according as the particle had or had not ſome initial velocity; therefore, either $v = 0$ or $v^2 = 2gh$, when $\gamma = k$; hence $C = -k$ or $h - k$. Therefore $v^2 = 2g(y - k)$, or $v^2 = 2g(\gamma + h - k)$.)

In the firſt caſe $v^2 = 2g \times$ M I; therefore, a gravitating particle has the ſame velocity in the direction of the tangent at any part of the curve, as if it had fallen freely from the ſame height, and that whatever be the nature of the curve.

From the above equations we obtain

$$v = \sqrt{\{2g(\gamma - k)\}} \text{ and } \frac{ds}{dt} = \sqrt{\{2g(\gamma - k)}, \text{ and}$$

$$dt = \frac{ds}{\sqrt{\{2g(\gamma - k)}}.$$

From the equation of the curve ds will be known in terms of y and dy, and t will then be obtained by integration.

The caſe of the ſimple pendulum may be taken as an eaſy example of the application of this method; a more complete inveſtigation will be reſerved for its proper place under the article Pendulum.

General theory of the Pendulum.—The equations are $\frac{d^2s}{dt^2} = \frac{dv}{dt} = \varphi$; φ being the conſtant force eſtimated in the direction of the tangent of the curve; s the arc deſcribed at the end of the time t; and $v = \frac{ds}{dt}$ = the velocity acquired. Let g be the force of gravity acting on the material point M, ſuſpended at the extremity of the line C M, ſuppoſed without weight and inflexible, C the point of ſuſpenſion, A P $= x$ the vertical abſciſſa, P M $= y$ the ordinate of the centre of oſcillation, A C $= a$ the length of the pendulum, A D $= b$ the verſed ſine of the arc B A B (*fig.* 18.); B the point of departure, s the arc A M, and v the velocity acquired in the point M at the end of the time t.

The velocity v, due to the height D P $= b - x$, is

$$v = \frac{ds}{dt} = \sqrt{2g(b - x)};$$

but the arc decreaſing as the time t increaſes,

$$dt = \frac{-ds}{\sqrt{2g(b - x)}};$$

but ds muſt be expreſſed in terms of dx, in order to effect the neceſſary integration. The ſquare of the element of the arc being expreſſed by $ds^2 = dx^2 + dy^2$,

$$ds = dx\sqrt{1 + \left(\frac{dy}{dx}\right)^2};$$

the equation to the circle being

$$x^2 + y^2 - 2ax = 0,$$

$$\text{and } ds = \frac{a\,dx}{y} = \frac{a\,dx}{\sqrt{2ax - x^2}},$$

we obtain $dt = \frac{-a\,dx}{\sqrt{2g(bx - x^2)(2a - x)}}$.

The determination of the time therefore depends on the integration of the above expreſſion, which we ſhall not enter into at preſent. This integration effected, gives

$$t = \tfrac{1}{2}\sqrt{\left(\frac{a}{g}\right)} \cdot \left\{1 + (\tfrac{1}{2})^2\frac{b}{2a} + \left(\frac{1\cdot 3}{2\cdot 4}\right)^2\frac{b^2}{2^2a^2} + \left(\frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}\right)^2\frac{b^3}{2^3a^3} + \&c.\right\} \text{ arc } \left(\cos. = \frac{2x - b}{b}\right).$$

At the limit $x = b$, likewiſe $t = 0$, and when $x = a$ arc $\left(\cos. = \frac{2x - b}{b}\right) = \pi$ or 3π, 5π, &c.; π being the ſemi-circumference whoſe rad. $= 1$. Subſtituting T for the value of t reſulting from the definite integral,

T =

$$T = \tfrac{1}{2}\sqrt{\left(\frac{a}{g}\right)}\cdot\left\{1 + \left(\tfrac{1}{2}\right)^2\frac{b}{2a} + \left(\frac{1\cdot 3}{2\cdot 4}\right)^2\frac{b^2}{2^2a^2} + \left(\frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}\right)^2\frac{b^3}{2^3a^3} + \&c.\right\}\pi.$$

When b or the arc of oſcillation is very ſmall, b may be neglected, and the whole oſcillation 2 T becomes $2T = \pi\sqrt{\frac{a}{g}}$. See PENDULUM; and for the curve of quickeſt deſcent, ſee CYCLOID and *Analytic* FUNCTION. For the motion on an inclined plane, which is a more ſimple caſe of the ſame kind; ſee INCLINED *Plane*.

In the above examples the motion has been ſuppoſed to ariſe from the action of gravity alone, but the theory may be generalized and extended to any forces whatever.

A body cannot be conſtrained to move in a curve ſurface without exerting a re-action on the curve, which will always be perpendicular to the ſurface. Inſtead of this re-action, let us ſuppoſe a normal force N, whoſe intenſity and direction will continually vary, but will always be equal and oppoſite to the preſſure; let this force be included with the others, and with them finally reduced to two, X and Y; the moving particle or body will then be in the ſame ſtate as if free, and will deſcribe a trajectory ſuited to the action of theſe forces. Let B M Z (*fig.* 19.) be the curve; X, Y, the forces parallel to the axes A x, A y; M the place of the body at the end of the time t; B M $= s$, A P $= x$, P M $= y$, and N equal to the normal force expreſſing the reaction of the curve: $\frac{dy}{ds}$, $\frac{dx}{ds}$, are the coſines of the angles which the normal makes with the axes x and y, therefore the producing forces equivalent to N in the direction of theſe axes are $-N\frac{dy}{ds}$, and $N\frac{dx}{ds}$; the firſt is negative, becauſe it tends to diminiſh the value of x. The body may therefore be conſidered as free and ſolicited by the forces $X - N\frac{dy}{ds}$, and $Y + N\frac{dx}{ds}$, and the equations of varied motion already given become

$$\left.\begin{aligned} &\frac{d^2x}{dt^2} = X - N\frac{dy}{ds};\ \frac{d^2y}{dt^2} = Y + N\frac{dx}{ds} \\ &d\left(\frac{dx}{dt}\right) = \left(X - N\frac{dy}{ds}\right)dt;\ d\left(\frac{dy}{dt}\right) = \left(Y + N\frac{dx}{ds}\right)dt \end{aligned}\right\}(m)$$

By combining with theſe the equation of the curve, three relations are obtained between the four variable quantities x, y, t, and N, ſo that by integration and elimination equations are obtained between any two of them.

To find the velocity, multiply the firſt of the above equations by dx, and the ſecond by dy, and add them, the terms containing N will then diſappear, and an equation, ſimilar to thoſe already found, will be obtained, *viz.*

$$v^2 = C + 2\int(X\,dx + Y\,dy) \text{ or}$$
$$v^2 = C + 2\varphi,$$

which contains the principle of the *vis viva* as was obſerved above. See MECHANICS.

The value of C depends on the values of v and φ at ſome given inſtant; let v' and φ' be theſe values at that inſtant, then making $v = v'$, and $\varphi = \varphi'$, $A = v'^2 - 2\varphi'$, and v at the ſecond point is given ſince $v^2 = v'^2 + 2(\varphi - \varphi')$, now the value of φ and φ' depend on the co-ordinates of the extreme points, ſo that the velocity at the ſecond inſtant is given by the velocity at the firſt, and by the poſition of theſe points; we may hence infer, that the velocity does not depend on the form of the curve deſcribed, but only on the reſpective poſitions of the point of departure, and of the point at which the body arrives; ſo that had the body been conſtrained to move in any other curve paſſing through theſe points, the velocity acquired at the ſecond point will be the ſame. It appears likewiſe from this, that the preſſure againſt a curve ſurface does not diminiſh or change the velocity.

If the body is not ſolicited by the continual action of any force, but ariſes only from ſome primitive impulſion, its velocity will be conſtant, for when $X = o$, $Y = o$, $C = v^2$.

The caſe of gravity is included in this reſult; for if $X = o$, $Y = g$, and $v^2 = C + 2g\gamma$, for if B be the point of departure from a ſtate of reſt, (*fig.* 20.) then making $Y = BC = k$ as before, $v = o$ and $C = -2gk$ and $v^2 = 2g(y - k) = 2g \times MI$. The ſame as found above.

The preſſure which the body exerts on the curve is equal and oppoſite to the force N; to determine it let dt be taken as conſtant, and dx as variable, then the preceding equations (m) become

$$-\frac{dx}{dt}\cdot d^2t = X - N\cdot\frac{dy}{ds}$$
$$\frac{dt\cdot d^2y - dy\cdot d^2t}{dt^2} = Y + N\frac{dx}{ds}.$$

To exterminate d^2t, multiply the firſt by dy, the ſecond by ds, and ſubtract, then ſince $ds^2 = dx^2 + dy^2$ $\frac{dx\,d^2y}{dt^2} = Y\,dx - X\,dy + N\left(\frac{dx^2 + dy^2}{ds}\right) = Y\,dx - X\,dy + N\,ds$. The value of N might be determined in terms of X and Y, and of the differentials depending on the nature of the curve, but the formula may be rendered more ſimple, by introducing the radius of curvature R, which is always equal to $\frac{ds^3}{dx\,d^2y}$. By ſubſtituting therefore for $dx\,d^2y$ its value $\frac{ds^3}{R}$, we obtain this equation;

$$N = \frac{v^2}{R} + \frac{X\,dy - Y\,dx}{ds}. \quad (n)$$

When, therefore, a material point is conſtrained to move on a curve ſurface, whoſe equation $y = \varphi x$ is given, we muſt to the general equation

$$\frac{ds^2}{dt^2} = v^2 = C + 2\int(X\,dx + Y\,dy + Z\,dz)$$

and for X, Y, y and dy, ſubſtitute their values in terms of x; and deduce the value of v; with which quantity, by a ſimilar ſubſtitution in the preceding formula (n), we ſhall obtain by integration the velocity in the direction of every axis at the end of a given time t.

It appears by equation (n), that the preſſure $-N$, which the body exerts againſt the curve it deſcribes, is compoſed of two parts; one entirely depending on the velocity of the body, the other on the accelerating forces by which it is ſolicited; the other is the ſum of the forces $-X\frac{dy}{ds}$, $Y\frac{dx}{ds}$, which combined, produce the accelerating forces in the direction of the normal. If the body is not ſubject to the action of any accelerating force, its motion can only ariſe from an original impulſion, and will therefore be uniform; the preſſure therefore will be expreſſed by the firſt

part of the equation, and if h expreſs the height due to the velocity v,

$$N = \frac{v^2}{R} = \frac{2gh}{R}$$

N then becomes what is called the centrifugal force; it is that part of the preſſure which ariſes from the velocity alone: in general this force varies at every inſtant, but becomes conſtant when the body deſcribes the circumference of a circle, ſince v and R are in that caſe conſtant.

On the motion of a point reſtrained to move on a curve ſurface. Let the differential equation to the ſurface be

$$dz = p\,dx + q\,dy,$$

p and q being the coefficients of the partial differences of z taken reſpectively relative to x and y, (ſee *Analytic* FUNCTION.)

(Let $M = \sqrt{1 + p^2 + q^2}$). Now the angles which the normal to a curve ſurface makes with the axes of x, y, and z, are $\frac{p}{M}$, $\frac{q}{M}$, $\frac{1}{M}$, (ſee *Analytic* GEOMETRY.) Conceive a force N to be added in the direction of the normal, equal and contrary to the preſſure, its producing forces in the direction of the axes will be $-\frac{pN}{M} - \frac{qN}{M}$ and $\frac{N}{M}$; the two firſt terms are negative, becauſe they tend to diminiſh the co-ordinates x and y, ſuppoſing the convexity of the ſurface to be towards the planes xz, and yz; the point may now be conſidered as free, and ſolicited by the three accelerating forces $X - \frac{Np}{M}$, $Y - \frac{Nq}{M}$, and $Z + \frac{N}{M}$. Inſtead of the former equations (A′) (B′) of curvilinear motion, we have (ſuppoſing dt conſtant,)

$$\frac{d^2x}{dt^2} = X - \frac{Np}{M}$$

$$\frac{d^2y}{dt^2} = Y - \frac{Nq}{M}$$

$$\frac{d^2z}{dt^2} = Z + \frac{N}{M}.$$

Of the meaſure of Force.—Early in the laſt century a controverſy was carried on relative to this ſubject, with a keenneſs which was not perfectly conſiſtent with the dignity of true philoſophy. Now that all difference of opinion has nearly or entirely ceaſed, we are enabled to take an impartial review of the ſubject, and it appears that the queſtion turned much on a diſpute about the meaning of words, each party admitting all the facts produced by the other, and each party ſolving all problems relating to the ſubject by the ſame means, and obtaining the ſame reſult. Newton had defined the meaſure of force to be the maſs of a body multiplied into its velocity, and for the purpoſes of thoſe philoſophical inveſtigations in which Newton was engaged, this definition was both convenient, and at the ſame time mathematically juſt; but there is another point of view, in which it appears that the effects of force may, without any impropriety, be ſaid to depend on the maſs multiplied into the ſquare of the velocity; it is this product which has been called the *vis viva*, and which has been ſo repeatedly mentioned in the preceding pages. Bernouilli and Leibnitz conſidered the *vis viva* as the true and univerſal meaſure of force, in oppoſition to the Newtonian definition. It is now generally admitted that theſe great mathematicians were led into a miſtake, by not ſufficiently taking into conſideration all the circumſtances of the queſtion of diſpute. But it muſt be admitted that the meaſure adopted by them, and called the *vis viva*, merits attention, and in all caſes of practical machinery it is often the moſt accurate, and always the moſt uſeful; and does not imply the leaſt contradiction to the Newtonian definition, only the force thus meaſured ſhould be diſtinguiſhed by ſome peculiar name, as for example the *vis mechanica*, the Newtonian meaſure being applied to the *vis motrix*, as ſuggeſted by Mr. Wollaſton in the Bakerian Lecture for the year (1805), from which the following is an extract.

Let a ball of clay, or any other ſoft and wholly inelaſtic ſubſtance, be ſuſpended at reſt, but free to move in any direction with the ſlighteſt impulſe; and let there be two pegs, ſimilar and equal in every reſpect, be inſerted into its two oppoſite ſides; let there be alſo two other bodies, A and B, of any magnitude, which are to each other in the proportion of two to one, ſuſpended in ſuch a poſition, that when perfectly at reſt, they ſhall be in contact with the extremities of the oppoſite pegs, without preſſing on them. Now if theſe bodies were made to ſwing, with motions ſo adapted, that in falling from heights in the proportion of one to four they might ſtrike at the ſame inſtant againſt the pegs oppoſite to them, the ball of clay would not be moved from its place to either ſide; nevertheleſs the peg impelled by the ſmaller body B, which has the double velocity, will be found to have penetrated twice as far as the peg impelled by A.

It is unneceſſary to make the experiment preciſely as here ſtated, ſince the reſults are admitted as facts by both parties, but upon theſe facts they reaſon differently.

One ſide, obſerving that the ball of clay remains unmoved, conſiders the proof indiſputable, that the action of the body A is equal to that of B, and that their forces are properly meaſured by their moments, which are equal, becauſe their velocities are in the ſimple inverſe ratio of the bodies. Their opponents think it equally proved, by the unequal depths to which the pegs have penetrated, that the cauſes of theſe effects are unequal, as they find to be the caſe in their eſtimation of the forces by the ſquares of the velocities.

One party is ſatisfied, that equal *momenta* can reſiſt equal preſſures during the ſame *time*; the other party attend to the ſpaces through which the ſame moving force is exerted, and finding them in the proportion of two to one, are convinced that the *vis viva* of a body in motion is juſtly eſtimated by its magnitude, and the ſquare of its velocity jointly.

The former conception of a quantity dependent on the continuance of a given *vis motrix* for a certain *time*, may have its uſe, when correctly applied, in certain philoſophical conſiderations; but the latter idea of a quantity reſulting from the ſame force, exerted through a determinate *ſpace*, is of greater practical utility, as it occurs daily in the uſual occupations of men; ſince any quantity of work performed is always appreciated by the extent of effect reſulting from their exertion; for it is well known, that the raiſing any great weight forty feet would require four times as much labour, as would be requiſite to raiſe an equal weight to the height of ten feet; and that in its ſlow deſcent, the former would produce four times the effect of the latter, in continuing the motion of any kind of machine. Moreover, if the weights ſo raiſed were ſuffered to fall freely through the heights that have been aſcended, by means of four and of one minutes' labour, the velocities acquired would be in the ratio of two to one; and the ſquares of the velocities in proportion to the quantities of labour from which they originated, as four to one; and if the forces acquired by their deſcent were employed in driving piles, their more ſudden effects produced would be found to be in that ſame ratio.

This

This ſpecies of force has been, firſt by Bernouilli, and afterwards by Smeaton, very aptly denominated mechanic force; and when by force of percuſſion is meant the quantity of mechanic force poſſeſſed by a body in motion to be eſtimated by its quantity of mechanic effect, I apprehend that it cannot be controverted, that it is in proportion to the magnitude of the body, and to the ſquare of its velocity jointly.

But of this quantity of force Newton no where treats, and has accordingly given no definition of it. If, after defining what he meant by the *quantitas acceleratrix*, and *quantitas motrix*, he had had occaſion to convey an equally diſtinct idea of the *quantitas mechanica*, reſulting from the continued action of any force, he might not improbably have proceeded conformably to the definition given by Smeaton, and have added, "quantitas mechanica eſt menſura proportionalis ſpatio per quod data vis motrix exercetur;" or, if ſpeaking with reference to the accumulated energy communicated to a body in motion, "proportionalis quadrato velocitatis quam in dato corpore generat."

But if we attend to the firſt words of his preface to the firſt edition of his "Principia," he evidently had no need of ſuch a definition; "Nos autem non artibus ſed philoſophicæ conſulentes, deque potentiis non in manualibus ſed naturalibus ſcribentes," &c. and again nearly to the ſame effect in the ſcholium which follows the laws of motion; "Cæterum mechanicam tractare non eſt hujus inſtituti."

Dr. Wollaſton proceeds to obſerve, that if it be of any real utility to give the name of force to this complicated idea of *vis motrix* extended through time, as well as that of momentum to its effects when unreſiſted, it would be requiſite to diſtinguiſh this force always by ſome ſuch appellation as *momental* force; for it is to be apprehended, that for want of this diſtinction, many writers themſelves, and it is certain, that many readers of diſquiſitions on this ſubject, have confounded and compared together *vis motrix*, *momentum*, and *vis mechanica*; quantities, that are all of them totally diſſimilar, and bear no more compariſon to each other than lines to ſurfaces, or ſurfaces to ſolids.

In practical mechanics, however, it is, at leaſt very rarely, that the momentum of bodies is in any degree an object of conſideration; the ſtrength of machinery being in every caſe to be adapted to the *quantitas motrix*, and the extent and value of the effect to be produced depending on the *quantitas mechanica* of the force applied, or in other words to the ſpace through which a given *vis motrix* is exerted.

The comparative velocities given by different quantities of mechanic force to bodies of equal or unequal magnitude, have been ſo diſtinctly treated of by Smeaton, (Phil. Tranſ. vol. 66. p. 450.) in a ſeries of moſt direct experiments, that it would be a needleſs waſte of time to re-conſider them in this place. So alſo, on the contrary, the quantities of extended mechanic effect, producible by bodies moving with different quantities of impetus, have been as clearly traced by the ſame accurate experimentaliſt; (vol. 72. p. 337.)

But there is one view in which the comparative forces of impact of different bodies were not examined by Smeaton, and it may be worth while to ſhew that when the whole energy of a body A is employed without loſs in giving velocity to a ſecond body B, the impetus which B receives is, in all caſes, equal to that of A, and the force transferred to B, or by it to any third body C, (if alſo communicated without loſs, and duly eſtimated as a mechanic force,) is always equal to that from which it originated.

As the ſimpleſt caſe of entire transfer, the body A may be ſuppoſed to act upon B in a direct line, through the medium of a light ſpring, ſo contrived, that the ſpring is prevented by a ratchet from returning in the direction towards A, but expands again entirely in the direction towards B, and by that means exerts the whole force which had been wound up by the action of A in giving motion to B alone. In this caſe, ſince the moving force of the ſpring is the ſame upon each of the bodies, the accelerating force acting upon B at each point, is to the retarding force oppoſed to A at the correſponding points, in the reciprocal ratio of the bodies; and the ſquares of the velocities produced and deſtroyed by its action through a given ſpace will conſequently be in that ſame ratio. The momentum, which is in the ſimple reciprocal ratio of the bodies, might conſequently be increaſed at pleaſure by the means propoſed, in the ſubduplicate ratio of the bodies employed; and if momentum were an efficient force, capable of reproducing itſelf, and of overcoming friction in proportion to its eſtimated magnitude, the additional force acquired by ſuch a means of increaſe might be employed in counteracting the uſual reſiſtances, and perpetual motion would be effected. But ſince the impetus remains unaltered, it is evident that the utmoſt which the body B could effect in return, would be the reproduction of A's velocity, and reſtitution of its entire mechanic force, neither increaſed nor diminiſhed, excepting by the neceſſary imperfection of machinery. The poſſibility of perpetual motion is, conſequently, inconſiſtent with thoſe principles which meaſure the quantity of force by the quantity of its extended effect, or by the ſquare of the velocity which it can produce.

In eſtimating the utmoſt effect which one body can produce upon another at reſt, the ſame reſult is obtained by employing impetus as aſcenſional force, according to Huygens; for if the body A were allowed to aſcend to the height due to its velocity, and if, by any ſimple mechanical contrivance of a lever or otherwiſe, the body B were to be raiſed by the aſcent of A, it is well known that the heights of aſcent would be reciprocally as the bodies; and conſequently, that the *ſquare* of the velocity to be acquired by free deſcent of B would be in that ratio, and the quantity of mechanic force would be preſerved, as before, unaltered.

It may be of uſe alſo to conſider another application of the ſame energy, and to ſhew more generally that the ſame quantity of total effect would be the conſequence, not only of direct action of bodies upon each other, but alſo of their indirect action through the medium of any mechanical advantage or diſadvantage, although the time of action might by that means be increaſed or decreaſed in any deſired proportion. For inſtance, if the body ſuppoſed to be in motion were to act, by means of a lever, upon a ſpring placed at a certain diſtance from the centre of motion, the retarding force oppoſed to it would be inverſely as the diſtance of the body from the centre; and ſince the ſpace through which the body would move to loſe its whole velocity would be reciprocally as the retarding force, the angular motion of the lever and ſpace through which the ſpring muſt bend would be the ſame at whatever point of the lever the body acted. And converſely, the re-action of the ſpring upon any other body B would, in all poſitions, communicate to it the ſame velocity.

It may be remarked, however, that the times in which theſe total effects are produced may be varied at pleaſure, in proportion to the diſtances at which the bodies are placed from the centre of motion; and it ſhould not paſs unobſerved, that although the intenſity of any *vis motrix* is increaſed by being placed at what is called a mechanical advantage; yet, on the contrary, any quantity of mechanic force is not liable

to increaſe or diminution by any ſuch variation in the mode of its application.

Since we can, by means of any mechanic force, conſiſting of a *vis motrix* exerted through a given *ſpace*, give motion to a body for the purpoſe of employing its *impetus* for the production of any ſudden effect, or can, on the contrary, occaſion a moving body to aſcend, and thus reſolve its impetus into a moving force, ready to exert itſelf through a determinate ſpace of deſcent, and capable of producing preciſely the ſame quantity of mechanic effect as before, the force depending on impetus may juſtly be ſaid to be of the ſame kind as any other mechanic force, and they may be ſtrictly compared as to quantity. In this manner we may even compare the force of bodies in motion to the ſame kind of force contained in a given quantity of gun-powder, and may ſay, that we have the ſame quantity of mechanic force at command, whether we have one pound of powder, which by its expanſion could give one ton weight a velocity ſufficient to raiſe it through forty feet, or the weight actually raiſed to that height, and ready to be let down gradually, or the ſame weight, poſſeſſing its original velocity, to be employed in any ſudden exertion.

By making uſe of the ſame meaſure as in the former caſes, a diſtinct expreſſion is likewiſe obtained for the quantity of mechanic force given to a ſteam-engine by any quantity of coals; and we are enabled to make a compariſon of its effect, with the quantity of work that one or more horſes may have performed in a day, each being expreſſed by the ſpace through which a given moving force is exerted. In the caſe of animal exertion, however, conſiderable uncertainty always prevails, in conſequence of the unequal powers of animals of the ſame ſpecies, and varying vigour of the ſame animal. The information which the author of this paper has received, in reply to inquiries reſpecting the weights raiſed in one hour by horſes in different ſituations, has varied as far as from ſix to fifteen tons to the height of one hundred feet. But although the height at which mechanic force is generated may vary, any quantity of work exeeuted is the ſame, in whatever time it may have been performed.

In ſhort, whether we are conſidering the ſources of extended exertion or of accumulated energy, whether we compare the accumulated forces themſelves by their gradual, or by their ſudden efforts, the idea of mechanic force in practice is always the ſame, and is proportional to the *ſpace* through which the moving force is exerted or overcome, or to the *ſquare* of the velocity of a body in which ſuch force is accumulated.

Comparative table of mechanical forces, extracted from Dr. Young's lectures.—In order to compare the different eſtimates of the force of moving powers, it will be convenient to take a unit, which may be conſidered as the mean effect of the labour of an active man, working to the greateſt poſſible advantage, and without impediment. This will be found, on a moderate eſtimation, ſufficient to raiſe 10 pounds 10 feet in a ſecond, for 10 hours in a day; or to raiſe an 100 pounds, which is the weight of 12 wine gallons of water, 1 foot in a ſecond, or 36,000 feet in a day; or 3,600,000 pounds, or 432,000 gallons, 1 foot in a day. This we may call a force of 1 continued 36,000″.

Immediate force of men, without deduction for friction.

	Force.	Continuation.	Day's Work.
A man, weighing 133 pounds Fr. aſcended 62 feet Fr. by ſteps in 34″, but was completely exhauſted. Amontons.	2.8	34″	
A ſawyer made 200 ſtrokes of 18 inches Fr. each, in 145″, with a force of 25 pounds Fr. He could not have gone on above 3 minutes. Amontons.	6.	145″	
A man can raiſe 60 pounds Fr. 1 foot Fr. in 1″ for 8 hours a day. Bernouilli.	69.	8h	.552
A man of ordinary ſtrength can turn a winch with a force of 30 pounds, and with a velocity of $3\frac{1}{2}$ feet in 1″, for 10 hours a day. Deſaguliers.	1.05	10h	1.05
Two men, working at a windlaſs with handles at right angles, can raiſe 70 pounds more eaſily than one can raiſe 30. Deſaguliers.	1.22		1.22
A man can exert a force of 40 pounds for a whole day, with the aſſiſtance of a fly, when the motion is pretty quick, as about 4 or 5 feet in 1″. Deſaguliers, lect. 4th. But from the annotation it appears to be doubtful whether the force is 40 pounds or 20.	2.		.2
For a ſhort time a man may exert a force of 80 pounds with a fly, "when the motion is pretty quick." Deſaguliers.	3.	1″	
A man going up ſtairs aſcends 14 metres in 1′. Coulomb.	1.182	1′	
A man going up ſtairs for a day raiſes 205 chiliogrammes to the height of a chiliometre. Coulomb.			.412
With a ſpade a man does $\frac{12}{20}$ as much as in aſcending ſtairs. Coulomb.			.391
With a winch a man does $\frac{5}{8}$ as much as in aſcending ſtairs. Coulomb.			.258
A man carrying wood up ſtairs raiſes, together with his own weight, 109 chiliogrammes to 1 chiliometre. Coulomb.			.219
A man weighing 150 pounds Fr. can aſcend by ſtairs 3 feet Fr. in 1″ for 15″ or 20″. Coulomb.	5.22″	20″	
For half an hour, 100 pounds Fr. may be raiſed 1 foot Fr. in 1″. Coulomb.	1.152	30′	
According to Mr. Buchanan's compariſon, the force exerted in turning a winch being made equal to the unit, the force in pumping will be	.61		
In ringing	1.36		
In rowing	1.43		
Allowing the accuracy of Euler's formula confirmed by Schulze,			

ſuppoſing

	Force.	Continuation.	Day's Work.
ſuppoſing a man's action to to be a maximum when he walks $2\frac{1}{2}$ miles an hour, we have $7\frac{1}{2}$ for his greateſt velocity, $.04\ (7\frac{1}{2} - v)^2$ for the force exerted with any other velocity, and $.0160\ (7\frac{1}{2} - v)^2$ for the action in each caſe; thus, when the velocity is one mile an hour, the action is	.676		
When two miles	.964		
Three	.972		
Four	.784		
And when five	.5		

And the force in a ſtate of reſt becomes $2\frac{1}{4}$, or about 70 pounds; with a velocity of two miles, 36 pounds; with three, 24 pounds; and with four, 15.

It is obvious that in the extreme caſes this formula is inaccurate, but for moderate velocities it is probably a tolerable approximation.

Coulomb makes the maximum of effect when a man, weighing 70 chiliogrammes, carries a weight of 53 up ſtairs, but this appears to be too great a load; he conſiders 145 chiliogrammes as the greateſt weight that can be raiſed. He obſerves that in Martinique, where the thermometer is ſeldom below 68°, the labour of Europeans is reduced to one half.

Harriot aſſerts that his pump, with a horizontal motion, enables a man to do one-third more work than the common pump with a vertical motion.

Porters carry from 200 to 300 pounds at the rate of three miles an hour; chairmen walk four miles an hour with a load of 150 pounds each; and it is ſaid that in Turkey there are porters who, by ſtooping forward, carry from 700 to 900 pounds placed very low on their backs.

The moſt advantageous weight for a man of common ſtrength to carry horizontally is 111 pounds; or if he returns unladen, 135. With wheel barrows, men will do half as much more work as with hods. Coulomb.

Performance of men by machines.

	Force.	Continuance.	Day's Work.
A Man raiſed by a rope and pulley 25 pounds Fr. 220 feet Fr. in 145″. Amontons.	.436	.145″	
A man can raiſe, by a good common pump, a hogſhead of water 10 feet high in a minute, for a whole day. Deſaguliers.	.875		.875
By the mercurial pump, or another good pump, a man may raiſe a hogſhead 18 or 20 feet in a minute, for one or two minutes.	1.61	1′	
In a pile engine, $55\frac{1}{3}$ pounds Fr. were raiſed one foot Fr. in 1″, for five hours a day, by a rope drawn horizontally. Coulomb.	.64	5h	.82
Robiſon ſays, that a feeble old man raiſed ſeven cubic feet of water $11\frac{1}{2}$ feet in 1′, for eight or 10 hours a day, by walking backwards and forwards on a lever. Enc. Br.	.837	9h	.753
A young man weighing 135 pounds, and carrying 30, raiſed $9\frac{1}{4}$ cubic feet $11\frac{1}{2}$ feet high, for 10 hours a day, without fatigue. Robiſon.	1.106	10h	1.106
Wynne's machine enables a man to raiſe a hogſhead 20 feet in a minute. Y.	1.75	1′	

Force of Horſes.

Two horſes, attached to a plough on moderate ground, exerted each a force of 150 Fr. Amontons. We may ſuppoſe that they went a little more than two miles an hour, for eight hours.	5.4	8h	4.32
A horſe draws with the greateſt advantage when the line of direction is level with his breaſt; and he can draw with a force of 200 pounds, $2\frac{1}{2}$ miles an hour, for eight hours in the day.	7.33	8h	5.87
With a force of 240 only ſix hours. On a carriage, indeed, where friction alone is to be overcome, a middling horſe will draw 1000lb. Deſaguliers.	8.8	6h	5.28
The mean draught of four horſes was 36 myriogrammes each, or 794 pounds. Regnier. This muſt have been momentary. Suppoſing the velocity two feet in a ſecond, the action would have been	15.88	1″	
By means of pumps a horſe can raiſe 250 hogſheads of water, 10 feet high, in an hour. Smeaton's Reports.	3.64	1h	

A horſe can in general draw no more up a ſteep hill than three men can carry, that is, from 450 to 750 pounds, but a ſtrong horſe can draw 2000 pounds up a ſteep hill, which is but ſhort. The worſt way of applying the force of a horſe, is to make him carry or draw up hill: for, if the hill be ſteep, three men will do more than a horſe, each man climbing up faſter with a burden of 100lb. weight, than a horſe that is loaded with 300lb. a difference which is owing to the poſition of the parts of the human body being better adapted to climb than thoſe of a horſe.

On the other hand, the beſt way of applying the force of a horſe, is an horizontal direction, wherein a man can exert leaſt force: thus a man, weighing 140lb. and drawing a boat along, by means of a rope coming over his ſhoulders, cannot draw above 27lb. or exert above one ſeventh part of the force of a horſe employed to the ſame purpoſe.

The very beſt and moſt effectual poſture in a man is that of rowing; wherein he not only acts with more muſcles at once for overcoming the reſiſtance than in any other poſition; but as he pulls backwards, the weight of his body aſſiſts by way of lever. Deſaguliers.

The diameter of a walk for a horſe-mill ought to be at leaſt 25 or 30 feet. Deſaguliers.

Some horſes have carried 650 or 700 pounds, ſeven or

eight miles without reſting, as their ordinary work; and a horſe at Stourbridge carried 11 hundred weight of iron, or 1232 pounds for eight miles. Deſaguliers, Exp. Philoſ. vol. i.

	Force.	Continuance.	Day's Work.
Work of Mules.			
Cazanel ſays, that a mule works in the Weſt Indies two hours, out of about 18, with a force of about 150 pounds, walking three feet in a ſecond.	4.5	$2^h\ 40'$	1.2

Inanimate force.—According to M. Coulomb, a windmill with four ſails, meaſuring 66 feet Fr. from one extremity to that of the oppoſite ſail, and ſix feet wide, or a little more, is capable of raiſing 1000 pounds Fr. 218 feet in 1′, and of working on an average eight hours in a day. This is equivalent to the work of 34 men, as it has been above eſtimated, 25 ſquare feet of canvas performing about the daily work of a man.

Robiſon ſays, that a hundred weight of coals burned in a ſteam engine will raiſe at leaſt 20,000 cubic feet of water 24 feet high; this is equivalent to the daily labour of 8.32 men. A ſteam engine in London, with a 24-inch cylinder, does the work of 72 horſes, and a chaldron of coals in a day; each buſhel being equivalent to two horſes, and each ſquare inch of the cylinder performing nearly the work of a man.

If we calculate the quantity of motion produced by gunpowder, we ſhall find that this agent, though extremely convenient, is far more expenſive than human labour; but the advantage of gun-powder conſiſts in the great rarity of the acting ſubſtance. A ſpring or a bow can only act with a moderate velocity on account of its own weight. The air of the atmoſphere, however compreſſed, could not flow into a vacuum, with a velocity ſo great as 1500 feet in a ſecond. Hydrogen gas might move more rapidly, but the elaſtic ſubſtance produced by gun-powder is capable of propelling a very heavy cannon ball with a much greater velocity.

It is ſaid that nine tons of water, falling 10 feet, will grind and dreſs a buſhel of wheat; conſequently a man might do the ſame in $33'\ 36''$.

FORCE, *Accelerating.* See VIS *acceleratrix*, and ACCELERATION.

FORCE, *Attractive.* See ATTRACTION.

FORCE, *Central.* See CENTRAL.

FORCE, *Centrifugal.* See CENTRIFUGAL.

FORCE, *Centripetal.* See CENTRIPETAL.

FORCE *of Cohesion.* See COHESION.

FORCE, *Contractile.* See CONTRACTILE.

FORCE, *Elaſtic.* See ELASTIC, and ELASTICITY.

FORCE, *Electrical.* See ELECTRICITY.

FORCE *of Gravity.* See GRAVITY.

FORCE *of the Heart.* See HEART.

FORCE *of Inactivity.* See VIS *inertiæ*.

FORCE, *Innate.* See VIS *inſita*.

FORCE, *Magnetic.* See MAGNETISM.

FORCE, *Moving.* See VIS *motrix*, and preceding article, FORCE.

FORCE, *Repelling.* See REPULSION.

FORCE, *Reſiſting.* See RESISTANCE.

FORCE, *Retarding.* See RETARDATION.

FORCE *of Wind.* See WIND, &c.

FORCE, in *Common Law*, ſignifies an offence, by which violence is uſed either to perſons, or things.

Force is either *ſimple*, or *compound.*

FORCE, *Mixed* or *compound*, is violence committed with ſome fact, which of itſelf alone were criminal: as if any man by force enter into another man's poſſeſſion, and there kill a man or raviſh a woman, &c. See HOMICIDE.

FORCE, *Simple*, is that which has no other crime adjoined to it: if one, by force, enter into another man's poſſeſſion, without doing any other unlawful act.

FORCE is alſo divided into *true force*, or *force after a ſort.*

There are other branches; as forcible entries, forcible detaining, or holding unlawful aſſembly, routs, riots, rebellions, &c. See the ſeveral articles.

FORCE, *Freſh.* See FRESH.

FORCE, in *Grammar*, and ſome other arts, is applied to a thing which ſtands in lieu of, or has the ſame effect, as another. In our language the *ſ* between two vowels has the force or power of a *z*, and is ſometimes put for a *z*: as in horiſon, baptiſing, &c.

In Hebrew, the dageſh; and in Arabic, the teſdid, have the force of a letter ſuppreſſed. An unit before a cypher has the force of ten.

FORCE, Fr. and Eng. in *Muſic*, implies energy, ſtrength, loudneſs, intenſity. Force not only renders ſound more diſtinct, but audible at a greater diſtance; as the greater or leſs number of vibrations of a ſonorous body renders it more acute or grave, its greater or leſs deviation from the line of repoſe conſtitutes *loud* or *ſoft.* But if this deviation is too great, and an inſtrument or voice is forced, the ſound becomes noiſe, and ceaſes to be appreciable. To force the voice beyond its power, in order to be better heard in a large room or theatre, deſtroys all its proportions, by exceeding its diapaſon, or ſcale of ſounds, and becomes ſcreaming inſtead of ſinging. Forcing the tone has the ſame effect on inſtruments, whether their ſounds are produced by a bow, or by wind: and it is for this reaſon that the French ſo ſeldom ſing in tune. Rouſſeau.

FORCE, in *Painting*, is uſed to ſignify the degree of relievo of the objects in a picture, effected by the contraſt of colours employed either in oppoſition of hue, or of light and dark. In other words, it marks the degree of their approach in effect, to the natural appearance of the original in nature. Force, therefore, in this view, correſponds in meaſure with effect in painting (ſee EFFECT); but its uniſon with it is confined to this point alone.

Though it is a quality of a very uſeful kind when judiciouſly applied in a picture, it is by no means neceſſary to apply it always powerfully; as it will not only in ſome caſes be unavailing in giving value to the work, but may be of actual injury to its effect on the mind, in beauty and character of expreſſion; *e.g.* in ſubjects of a tender and delicate nature. In them the poſitive relievo of objects, which great force implies, would rather produce diſguſt, than afford delight; and inſtead of giving the ſoft and pleaſing expreſſion of their nature, would, by impoſing itſelf too powerfully on the ſight, deſtroy the effect moſt deſirable to be produced.

Even in portraits, particularly of ladies where the expreſſion is of a mild and amiable character, too eager a deſire to produce the appearance of *reality* or *force*, by deſtroying the beauty, renders the work unpleaſant. The object is more agreeably viewed, when ſeen through a ſlight degree of miſt, or when the tones of ſhade are weakened by a ſlight medium of air paſſing between the object and the obſerver.

In thoſe of men in general, particularly if their characters are ſtrongly marked, of a bold or grand kind, and expreſ-

ſion of truth, more than beauty, is aimed at, too much force cannot be given to them. A full and rich relievo heightens their importance, and gives a dignity to the other qualities of the work, which, without that, would be tame and inſipid, when compared with the originals in nature.

Its utility is very great in ſubjects of horror, wherein ſtrong contraſts of light and ſhade aid the effect of the ſubject, and ſtrengthen its impreſſion on the mind. In thoſe of ordinary intereſt, and in all repreſentations of ſtill life, it cannot fail of being beneficial; where the nearer the objects approach in brilliancy of effect to nature, the more perfect is the work.

It is beſt produced by uſing a ſtrong contraſt of light and dark; but mere contraſt alone will not produce it perfectly; a delicate gradation of ſhade and hue muſt be given, and great attention paid to the rounding of the parts to give relievo; for it is upon the relievo that force depends.

The moſt powerful, and the ſimpleſt mode of obtaining force, is by laying a light figure on a dark ground; particularly if the figure is compoſed of ſtrong and vivid colours, ſuch as red, or yellow, aided by white; and with ſome of the ſhadows darker than the ground. This contraſt, properly perfected in the execution, will produce deception; giving the appearance of a complete detachment of the figure from the ground: eſpecially if ſeen under favourable circumſtances, and the boundary of the picture is hid.

But it is not on this kind of contraſt alone that force depends; it has been often produced by ſkilful maſters, with thoſe of a leſs violent nature, at leaſt not ſo conſpicuouſly employed for the purpoſe. A picture muſt, however, in order to poſſeſs it, have great oppoſition in its parts; although it is not neceſſary that thoſe parts of different qualities come into immediate contact.

The moſt effective examples of this quality in painting among the old artiſts, are the works of Michael Angelo, Carravaggio, and Spagnoletto. But they have been both ſurpaſſed by our late royal academician Opie; whoſe figures in many of his hiſtorical works appear actually relieved from the canvas, and embodied. But whatever degree each of theſe artiſts has added of ſingularity to painting, they have not increaſed its beauty, nor heightened its effect in ſublimity of expreſſion, by the degree of force they have given to their works.

The gratification of the mind in beholding the cartoons of Raphael, when the eye is accuſtomed to their imperfect colouring, is a clear proof, that painting is not indebted to force for its moſt powerful ſenſations on the human mind; though, when properly employed, it is a very valuable aſſiſtant to the other more valuable parts of the art.

FORCELLER, in *Geography*, a town of Naples, in Abruzzo Ultra; 3 miles E. of Teramo.

FORCEPS, in *Agriculture*, is a term which is applied to a ſort of tool of the nipper kind, that is frequently employed in weeding broad-caſt crops of corn, or other ſorts; and which may be uſed for various other purpoſes.

Forceps, in *Midwifery*, an inſtrument uſed to facilitate the birth of the child, when the head is too large to paſs readily through the pelvis of the mother, and to effect this object without doing injury to either party. The forceps conſiſts of two ſeparate pieces, or blades; each of them, including the handles, about twelve inches in length; curved at their upper ends, to accommodate them to the ſhape of the head of the child; and at the end of the curvature, where the handles commence, furniſhed with a contrivance, by which they may be united, or locked together, ſo as to act as one inſtrument in moving and bringing down the head of the child. In uſing the forceps, the accoucheur is to paſs two or three fingers, generally of the right hand, into the vagina, along the ſide of the head of the child, over the ear, if practicable; and then, with the other hand, direct one of the blades of the forceps, anointed with lard, between his fingers and the head, keeping the handle of the inſtrument back towards the anus of the woman. Having puſhed up the blade beyond the ear of the child, he then withdraws his fingers, keeping the inſtrument ſteady in the paſſage, and proceeds to paſs the other blade over the other ear of the child, directly oppoſite to the firſt. The handles of the forceps are now to be brought together, and locked; taking care that neither the hair nor any of the ſoft parts of the woman are included. The handles muſt alſo be tied together, that in the courſe of extracting the child, which muſt be done ſlowly and gradually, they may not ſlip from the head, and ſubject you to the trouble of replacing them.

Some ſpecies of forceps appear to have been very early introduced into the practice of midwifery, as we find them mentioned by Hippocrates, and afterwards by Avicenna. They were probably intended to ſuperſede the uſe of hooks, and various cutting inſtruments, with which it had been uſual to open and reduce the ſize of the head of the child, when it was too large to paſs through the brim of the pelvis. They were the ſame as thoſe uſed by ſurgeons in removing ſplinters of bones; were generally armed with teeth, and the blades were united by a fixed joint. The two blades were, therefore, neceſſarily introduced into the vagina together, and there opened to take hold of the head of the child. In this way, beſides the danger, almoſt inevitable, of lacerating the os uteri of the woman, the ſcalp of the child was liable to be bruiſed and torn; and, if the reſiſtance was conſiderable, the bones of its ſkull to be cruſhed, and its life to be deſtroyed.

Such muſt have been the caſe on uſing the forceps deſcribed and delineated by Albucaſis, who is ſuppoſed to have lived about the beginning of the twelfth century, 100 years after Avicenna; or thoſe deſcribed by Ruett, ſurgeon at Zurich, in his book "De Conceptione et Generatione Hominis," publiſhed in 1554. Great credit is therefore due to Dr. Chamberlen, (ſee his life,) who firſt conceived the idea of making a pair of forceps, ſuch as has been deſcribed above, conſiſting of two moveable blades, that were to be introduced ſeparately into the uterus, and to be united and locked together, after they had taken hold of the head of the child. This was about the year 1672.

Chamberlen carefully abſtained from giving any deſcription of his invention. He does not even intimate it was an inſtrument. In his tranſlation of "Momeicrans Practica des Accouchmens," publiſhed in 1683, he ſays, "My father, brothers, and myſelf, (though none elſe in Europe that I know,) have, by God's bleſſing, and our induſtry, attained to and long practiſed a way to deliver women, when the head of the child, on account of ſome difficulty, or diſproportion, cannot paſs, without any prejudice to them or their infants," &c. Chapman firſt publiſhed a delineation and deſcription of the forceps, with the method of uſing them, in his Treatiſe on the Improvement of Midwifery, publiſhed in 1732. (See the article *Edmund Chapman*.) He made ſome improvements, he ſays, in their form. They have ſince been in general uſe, and have received various alterations, according to the fancy of different practitioners, particularly by M. Levret, by Dr. Johnſon, and Dr. Oſborne. But the moſt material and valuable improvements were made by Dr. Smellie, who gave them the hinge, or lock now generally uſed; and who ſimplified their ſtructure, and reduced them conſiderably in ſize,

ſize, which has added much to the facility and ſafety in uſing them. See his treatiſe on the Theory and Practice of Midwifery. For a more minute and particular account of the caſes in which the forceps are indicated, and of the method of applying them in every poſſible poſition of the head of the child, the reader is referred to Dr. Denman's excellent Introduction to the Practice of Midwifery, and to his Aphoriſms on the Application and Uſe of the Forceps and Vectis, which are, it is to be preſumed, in the hands of every practitioner in the art. For a delineation of the forceps, ſee *Plate of Midwifery*.

FORCEPS, in *Surgery*, is an inſtrument much employed for ſeveral purpoſes, and having accordingly various conſtructions. However, the general deſign of every ſurgical forceps is to take hold of ſubſtances, which cannot be conveniently got at with the fingers; and, of courſe, the inſtrument is always formed on the principle of a pair of pincers, having two blades, either with or without handles, according to circumſtances.

The ſmalleſt forceps is that which is employed in the operation of extracting the cataract, and which is uſeful for removing any particles of opake matter from the pupil, after the chief part of the cryſtalline lens has been taken away.

Another forceps of larger ſize is that uſed for taking up the mouths of the arteries, when it is neceſſary to tie theſe veſſels, in order to ſtop hemorrhage. This inſtrument is alſo frequently employed for taking dreſſings off ſores, removing pieces of dead bone, foreign bodies from wounds, &c. It reſembles the forceps contained in every caſe of diſſecting inſtruments, and is repreſented in the ſurgical plates. See *Plate* II.

Neither of the foregoing forceps is made with handles; each opens by its own elaſticity; and the ends of the blades only come into contact when preſſed together by the ſurgeon's fingers.

The following kinds of forceps are conſtructed with handles, by means of which they are both opened and ſhut:

1. The common forceps, contained in every pocket caſe of ſurgical inſtruments, and uſed for removing dreſſings from ſores, extracting dead portions of bone, extraneous ſubſtances, &c.

2. Larger forceps employed for extracting polypi from the noſe. See POLYPUS.

3. Forceps of different ſizes and conſtructions, uſed in the operation of lithotomy, for taking the ſtone out of the bladder, after an opening has been made into this organ. Alſo, another very ſtrong forceps with teeth, for breaking ſuch calculi as are too large to admit of being extracted whole. See plates.

FORCER, in *Mechanics*, is properly a piſton, without a valve.

There are ſeveral ways of making forcers: the moſt common of all conſiſts of a braſs cylinder, a very little leſs in diameter, at its bottom and top, than the bore of the barrel of the pump, and turned ſtill leſs at the middle, in order to let in a leathern ring or collar (made of a thick leather put round the braſs cylinder), which makes it juſt equal to the bore of the barrel, ſo as to fit it quite when it is put into it.

The ſecond ſort of forcers conſiſts of three braſs cylinders, which can be ſcrewed together. The middle one ought to be almoſt equal in diameter to the bore of the pipe, ſo as to ſlide in it without any friction. The upper cylinder and the lower muſt be a little leſs, and equal to one another. There are two leathers which muſt be put between them when they are unſcrewed: then it is evident, that if the cylinders be ſcrewed together, and the leathers, which ought to be a little bigger than the braſs cylinders, apply themſelves folding upwards round the upper cylinder, and downwards round the lower, they will become juſt equal to the bore of the barrel; and conſequently they will hinder any air from getting through the ſides of the forcer, when it moves up and down in the barrel. The uſe of the middle braſs cylinder is to hinder the leathers from turning themſelves back by the motion.

This kind of forcer has, above the other, the advantage of having a great deal leſs friction; and beſides, as the leathers, which are applied to it, may be thin ones, they are much ſmoother than thick ones, which are uſed in the other.

But the beſt way of making forcers is to have a plunger, or ſolid braſs cylinder, equal in length to the barrel of the pump, and a little leſs in the diameter than the bore, ſo that it may move freely in it without any friction. There muſt be two hollow, ſhort, braſs cylinders, or rather rings, at the top of the barrel, which can be ſcrewed together; the upper one muſt be equal in bore to the barrel, and the lower a little leſs; there are two leathers, both having in the middle a leſs hole than in the bore of the pipe; the one muſt be applied between the barrel and the lower ring, and the other between the ſame ring and the upper one; and the whole muſt be ſcrewed together. Then if the ſolid cylinder or forcer be put into it, and moved up and down, it is evident that the two before-mentioned leathers, which are applied the one to the barrel and the other to the inſide of the hollow cylinder, will hinder any air from getting between them and the ſolid cylinder.

The advantage of this kind of forcer is, that it has no other friction but at the top of the barrel, and that the inſide of the barrel need not be ſmooth, as in other kinds of pumps; but only the outſide of the forcer muſt be turned true and poliſhed, which can be done with much more eaſe, and the lower part muſt be turned a little conical, that it may be brought into the barrel, without any reſiſtance of the upper leather of the collar or jack-head. See Deſaguliers, Courſe of Experim. Philoſ. vol. ii. p. 161, 162.

FORCHEIM, in *Geography*, a town of Germany, in the biſhopric of Bamberg, on the Wiſent; 12 miles S. of Bamberg. N. lat. 49° 43′. E. long. 11°.—Alſo, a town of Germany, in the circle of Erzgeburg; 4 miles N. N. E. of Lauterſtein.

FORCHEN-SEE, a lake of Bavaria; 10 miles S. of Traunſtein.

FORCHTENBERG, a town of Germany, in the principality of Hohenlohe, ſituated on the Kocher; 6 miles N. N. E. of Ohringen.

FORCHTENSTEIN, a town of the duchy of Stiria; 3 miles S. of Windiſch-Gratz.

FORCIBLE ENTRY, a violent, actual entry into houſes, or lands, &c. with menaces or weapons, whether violence or hurt be offered to any perſon therein, or not. And forcible *holding*, or *detaining*, a withholding by violence, and with a ſtrong hand, of the poſſeſſion of land, &c. whereby he who has a lawful right of entry is barred or hindered. See ENTRY.

This was formerly allowable to every perſon diſſeiſed, or turned out of poſſeſſion, unleſs his entry was taken away, or barred by his own neglect, or other circumſtances. But this being found very prejudicial to the public peace, it was thought neceſſary, by ſeveral ſtatutes, to reſtrain all perſons from the uſe of ſuch violent methods, even of doing themſelves juſtice: ſo that the entry now allowed by

by law is a peaceable one. By the ſtatute 5 Ric. II. ſt. 1. c. 8. all forcible entries are puniſhed with impriſonment and ranſom at the king's will. And by the ſeveral ſtatutes of 15 Ric. II. cap. 2. 8 Hen. VI. cap. 9. 31 Eliz. cap. 11. and 21 Jac. I. cap. 15. upon any forcible entry, or forcible detainer after peaceable entry, into any lands, or benefices of the church, one or more juſtices of the peace, taking ſufficient power of the county, may go to the place, and there record the force upon his own view, as in caſe of riots; and upon ſuch conviction, may commit the offender to gaol, till he makes fine and ranſom to the king. And the juſtice or juſtices have power to ſummon a jury, to try the forcible entry or detainer complained of; and if the ſame be found by that jury, then, beſides the fine on the offender, the juſtices ſhall make reſtitution by the ſheriff of the poſſeſſion, without inquiring into the merits of the title; for the force is the only thing to be tried, puniſhed, and remedied by them; and the ſame may be done by indictment, at the general ſeſſions. But this proviſion does not extend to ſuch as endeavour to maintain poſſeſſion by force, where they or their anceſtors have been in the peaceable enjoyment of the lands and tenements for three years immediately preceding. Holding over by force, where the tenant's title was under a leaſe, now expired, is ſaid to be a forcible detainer. (Cro. Jac. 199.)

FORCIBLE *abduction* and *marriage*, vulgarly called "ſtealing an heireſs." By ſtat. 3 Hen. VII. cap. 2. it is enacted, that if any perſon ſhall, for lucre, take any woman, being maid, widow, or wife, and having ſubſtance, either in goods or lands, or being heir apparent to her anceſtors, contrary to her will; and afterwards ſhe be married to ſuch miſdoer, or by his conſent to another, or defiled; ſuch perſon, and all his acceſſaries, ſhall be deemed principal felons: and by ſtat. 39 Eliz. cap. 9. the benefit of clergy is taken away from all ſuch felons, who ſhall be principals, procurers, or acceſſaries before the fact. See MARRIAGE.

FORCING, in the *Wine-trade*, a term uſed by the wine-coopers for the fining down wines, and rendering them fit for immediate draught. See FINING.

The principal inconvenience of the common way of fining down the white wines by iſinglaſs, and the red by whites of eggs, is the ſlowneſs of the operation; theſe ingredients not performing their office in leſs than a week, or ſometimes a fortnight, according as the weather proves favourable, cloudy or clear, windy or calm: this appears to be matter of conſtant obſervation. But the wine-merchant frequently requires a method that ſhall, with certainty, make the wines fit for taſting in a few hours. A method of this kind there is, but it is kept in a few hands a valuable ſecret. Perhaps it depends upon a prudent uſe of a tartarized ſpirit of wine, and the common forcing, as occaſion is, along with gypſum, as the principal; all which are to be well ſtirred about in wine, for half an hour before it is ſuffered to reſt. Shaw's Lectures, p. 208.

FORCING, in *Gardening*, is the art of raiſing and producing plants, flowers, and fruits, at an earlier ſeaſon than the natural one, by means of artificial heat. It is accompliſhed, either by the gentle moiſt heat that is evolved during the fermentation and decompoſition of ſtable-dung, tanner's bark, leaves, and other ſimilar materials, or by the uſe of actual fire in ſtoves, flues, pits, and other contrivances formed for the purpoſe of producing ſuch effects.

It is the former of theſe methods that is principally employed in raiſing cucumbers, melons, and ſome other fruits; and the latter which is made uſe of in producing pine-apples, various kinds of wall-fruits, and ſeveral other ſorts of vegetable productions of the early fruit, or other kinds.

It may be obſerved, that the great difficulty in the management of this proceſs is that of adapting and regulating the heat, of whatever ſort it may be, in ſuch a manner as to promote and bring forward the plants, flowers, or fruits in the moſt perfect and healthy growth and ſtate of production, without their ſuſtaining any check or injury either by a deficiency or exceſs.

The various methods of effecting this in the moſt perfect manner are fully deſcribed under the culture of the different trees, plants and vegetables that require ſuch treatment in their growth, and production of fruit.

It is by this proceſs that different ſorts of rare vegetable productions, fruits and flowers are afforded at much earlier periods than could otherwiſe be the caſe; it of courſe conſtitutes an important branch of practical gardening in the preſent improved ſtate of the art; and is applicable in a variety of intentions, as ſhewn and deſcribed in the way hinted above. See CUCUMIS, in *Gardening*.

FORCING-*frame*, that kind of large frame-work or other erection which is made uſe of in procuring different ſorts of vegetables, fruits, and flowers at an early period by the application of artificial heat in ſome of the modes uſually employed. It is a ſort of conſtruction that is covered with ſloping glaſs ſliding frames on the top, and ſometimes in the front. It may be either fixed or moveable, but in the former caſe the walls are moſtly made of brick work, or ſome other hard durable material.

Theſe ſorts of forcing frames are uſually contrived ſo as be placed full to the ſouth ſun; and their lengths may be various, from ten to fifty or even one hundred feet; the widths being from five to fifteen, and from five to ten in height; having an upright back-wall, of wood, where they are ſmall, but when large, of brick, with a front of glaſs-work, made ſometimes in one continued range of ſlope to the top of the back-wall; and ſometimes with upright glaſs-work, head high, ranging immediately along the front, and from the top of which a glaſs roof is carried to the top of the back or main wall: when the frames are wrought by dung-heat, it is chiefly applied againſt the outſide of the back-wall, and by being formed into a bed internally; but when by bark-heat, by forming it into a bed in a pit within-ſide the frame; and when by fire heat, by having ſeveral returns of flues formed againſt the inſide of the back-wall, and ſometimes againſt thoſe of the front and both ends, for the heat to paſs along, conſtructed with proper fire places, according to the ſorts of plants that are chiefly intended to be forced, and the nature of the materials to be employed in producing the heat that may be requiſite.

In caſes where the firſt kind of material is employed in affording heat, the frame is uſually formed with an upright back and ends of deal planking, and a ſloping front of moveable glaſs-lights; the length being ten, twenty, or thirty feet, or more in different pieces; the width, from three to five or more, and five or ſix in height; the frame work being of inch and half deal planking, tongued, and cloſely joined, that no ſteam from the dung may penetrate into the frame; and raiſed five, ſix, or ſeven feet in height behind, but only ten or twelve inches in front, both ends being made anſwerable to the front and back; the glaſs-work ranging from the upright in front, ſloping upward towards the back-wall, to about a foot width at the top, where the ends ſhould reſt upon a proper frame-work of wood; and bars or bearers, three inches in width, placed in a ſloping

a ſloping manner from the back to front, for the ſupport of the lights, as in common hot-bed frames; the top of all being boarded and made wind and water tight. The frames have ſometimes within-ſide them two or three ranges of narrow ſhelves fixed up along the back and ends, for pots of ſmall plants, and the bottom levelled, on which to place pots of larger kinds; theſe ſhelves may alſo be made in a riſing manner one behind another quite from the front half way up the back wall, in order to place the loweſt plants in front and the others in order behind them, riſing gradually to the talleſt in the back rows of the frames.

In managing the working of theſe frames, after having placed the pots of plants in regular order, the lights are put on, and a ſufficient quantity of freſh hot ſtable-dung, prepared as for common dung hot-beds, is to be piled up cloſe againſt the outſide of the back and ends, a yard in width at bottom, drawing it gradually into a foot in width at the top, and finiſhing it ſomewhat in a ſloping manner to throw off the wet: as the dung ſettles or ſinks down, a freſh ſupply muſt be added at the top, to maintain the linings to the full height of the frame; additions being occaſionally made of freſh dung as the heat declines, by which means a fine growing heat will be thrown into the frame. See HOT-*bed*.

In caſes where bark is made uſe of in producing the heat, the frame may be conſtructed either of wood or brick-work, and fronted, &c. with ſaſhes of glaſs, as in the former; the length being ten, twenty, or thirty feet, or more; eight or ten in width, and ſix or eight in height; and, like the dung-heat frame, be ſix or eight feet in height behind, and one in front, the ends being made conformable and ſloping, having glaſs work frames raiſed from the front in a ſloping manner, either quite to the top of the back-wall, or inclined only about one half towards that part, meeting a tiled roof at top half way, which ſhould be raiſed high enough in front to throw the water off behind, as well as to admit as much ſun as poſſible to every part of the frame: it may likewiſe be conſtructed with an upright front of glaſs, head high, and a ſloping roof of glaſs-work, ranging from the upright front to the top of the back wall, which is the moſt eligible form, both for convenience and benefit of the plants; either of which conſtructions may be erected detached, or againſt a ſouth wall already built, which will ſerve for the back, and ſave ſome expence; the ends may either be of wood or brick, and ſhould be glazed like the front, &c. and the glaſs-work in every part be made to move on and off, as well as to ſlide backward and forward to give air, and perform other neceſſary work. At one end, near the back-wall, a door ſhould be made to enter occaſionally at, and within-ſide a pit formed for the bark-bed, three feet deep, partly ſunk, but the greater part raiſed, being continued the whole length and width, except about a foot and a half of alley to paſs in, to perform the neceſſary culture, as well as view and gather the produce of the different plants, &c.

The pit within is to be filled with new bark or tan, in order to afford a proper heat for the growth and ſupport of the plants that are to be cultivated in the frame. See HOT-*bed*.

The frame where fire-heat is to be employed muſt be formed of brick-work; at leaſt the back or main wall, for the convenience of having fire-flues, and the whole front, &c. be glaſs, like the other ſorts; the length may be from twenty to forty or fifty feet, or more, though one fire will not warm more than that length; the width from five or ſix to twelve or fifteen feet, and eight or ten in height. In this caſe the fire is burned in a furnace ſet up behind, at one end, or in the middle, thence communicating the heat by internal flues or funnels running the whole length of the back wall in three or four returns one above another, and continued in one or two flues in the front. And frames, thus conſtructed, may be contrived, either of moderate width, for one row of trees only, to range againſt the back wall, or may be made capacious enough to have a range of trained wall-trees behind, and ſome ſmall half, or full ſtandards, ranging alſo from the back to the front; or be entirely for ſtandards, eſpecially thoſe of cherry kinds.

Where it is intended to have a narrow frame, for only a row of trained trees behind, the width of from four to five or ſix feet is ſufficient, having the back or main wall formed of brick or ſtone, as juſt obſerved, eight or ten feet in height, with ſeveral flues within-ſide, returned over each other, running the whole length of the wall; in the front muſt be a low wall a foot in height, on which to lay a plate of timber, and from which are ranged glaſs frames, or lights in one continued ſlope to the top of the back wall, there received into a proper frame-work; but for the greater convenience, the lights may be in two tiers or ranges, an under and upper tier, the upper range being made to ſlide up and down over the others, but ſo that all the glaſs-work can be moved away occaſionally, to admit full air to the trees after the work of forcing is over: the whole of the bottom-ſpace within the frame ſhould be of good loamy earth, or any good garden-mould, two ſpades deep, which ſhould be dug or trenched in the common way; then a range of trees planted behind, towards the wall, two or three yards aſunder, erecting a trellis behind them, upon which to train the branches, as againſt a wall or eſpalier. Other inferior plants may likewiſe be ſet in the border or in pots, in front of the trees in the frame.

In moſt forcing frames of this conſtruction, from forty to fifty feet length may be ſufficient; but if they be made longer, two furnaces for fires are neceſſary to heat them properly. See HOT-*Houſe*.

Several different ſorts of frames of this nature may be ſeen in the appropriate plate.

With the firſt ſort of forcing-frame, various kinds of fruits may be produced, both of the dwarf-fruit-tree and other kinds, as well as different ſorts of vegetables and plants of the flowery and other kinds. And frames of this ſort may have ſuch dimenſions as to have ſubſtantial hot-beds prepared within them, for the purpoſe of receiving many different ſorts of potted plants.

But in the ſecond ſort of frame, from the heat being more regular and laſting, a ſtill greater variety of the finer ſorts of fruits, and the more tender flowers and other vegetable productions may be produced, not only long before they could be raiſed in any other way, but with much greater eaſe and convenience, as well as with greater certainty and ſucceſs.

And the laſt kind of forcing-frame is moſtly employed in furniſhing many of the finer ſorts of fruits, that require higher degrees of heat to procure them in the utmoſt perfection, than could otherwiſe be obtained; ſuch as pine-apples, grapes, peaches, nectarines, and various others, as well as many tender ſorts of vegetables, and numerous plants of the curious flower and other kinds. See HOT-*Houſe*.

FORCING-*ground*, the ſpace or portion of ground in a garden that is deſtined to the purpoſe of forcing or raiſing vegetable productions by means of artificial heat. Grounds of this ſort ſhould always be detached from the garden, and ſituated as near to the ſtable as the nature of the land will admit, in order that dung may be conveyed to them with

with as much eaſe and convenience as poſſible, litter prevented, and the diſagreeable appearance of the beds concealed from the ſight.

It is eſſentially neceſſary in moſt ſituations, and particularly in ſuch as are expoſed, to have theſe grounds incloſed with a fence, either of brick-work or paling, ſix or eight feet in height. They ſhould have ſufficient ſpace for containing a ſuitable number of frames and pits, and ſuch linings as may be neceſſary in the working of them. And it is of great advantage in raiſing many ſorts of tender crops, both of the vegetable and fruit kind, to have four or ſix-feet borders made round them in a raiſed manner; as in ſuch ſituations much ſhelter and warmth are afforded.

In caſes where melons are raiſed, it is uſual to have brick pits coped with ſtone or wood. Thoſe which are moſt convenient, according to Mr. Forſyth, are ſuch as are about twelve feet in width and two and a half in depth; the length in proportion to the number of frames employed. They are, however, often made of much ſmaller dimenſions, eſpecially where the extent of forcing-ground is but ſmall and limited. With regard to the ſize of the lights for early melons, the above author adviſes, that they ſhould be five feet in length and three in breadth; and for others, ſix feet in length and four in breadth, the former being four and the latter three light boxes. See FRAME, *Garden*.

It is found that in conſtructing the pits, nine-inch walls will be ſufficient, ſquare pieces of wood being built in the upper parts of them, where wood copings are made uſe of to nail them to. As wood decays rapidly, ſtone ſhould be preferred. Sometimes the walls are not built ſolid, but ſquare openings left, ſo as to admit the heat from the outſides, as ſhewn in the plate on forcing-frames.

It is directed by Mr. Forſyth, that there ſhould be a track or walk between the ridges of about ſix or ſeven feet in breadth, ſufficient to admit a cart to carry dung, as being more expeditious than wheeling it in. This walk ſhould be made up as high as the coping, and ſloping gently towards each end, being laid in the bottom with brick-rubbiſh, and covered over with ſea-coal aſhes or ſand. By this means, after the linings are made up, it may be kept perfectly neat and clean. A looſe drain will likewiſe be néceſſary in the middle of the bottom of the pit, for conveying off wet and the oozing from the dung, to a tank or ciſtern conſtructed for its reception. The fluid thus collected may be made uſe of in watering cabbage and other plants of the ſame kind in the kitchen garden.

FORCING-*pit*, a ſort of pit conſtructed of brick-work, with fire-flues, in various ways, according to circumſtances, for the purpoſe of making tan or other ſorts of hot-beds, and being covered with glaſs frames.

This ſort of pit is uſeful for receiving different ſorts of tender potted plants which require conſiderable degrees of heat in their cultivation and growth. See BARK-*pit*.

FORCING-*wall*, a wall conſtructed with flues for the purpoſe of conveying and communicating fire-heat, in order to ripen, at an earlier period than uſual, various kinds of tree-fruits that are planted and trained againſt it; and which are protected in the front by glazed frames fixed againſt it. See HOT-*wall*.

Walls of this ſort ſhould always be erected in warm ſheltered ſituations, and have ſouthern aſpects, in order that they may derive the greateſt poſſible advantage from the genial heat and influence of the ſun and air.

FORCING *Pump*. See PUMP.

FORCKENDORP, in *Geography*, a town of Germany, in the principality of Bayreuth; 4 miles S.S.W. of Bayreuth.

FORCULUS, *quaſi à Foribus*, in *Mythology*, a divinity who preſided over the gates of houſes.

FORD'S ISLAND, in *Geography*, a ſmall iſland in the Atlantic, near the coaſt of South Carolina. N. lat. 33° 14′. W. long. 79° 5′.

FORDEN, a town of Germany, in the biſhopric of Bamberg; 7 miles E.S.E. of Weiſchenfeld.

FORDERGERSDORF, a town of Germany, in the circle of Erzgeburg; 9 miles E.N.E. of Freyberg.

FORDICIDIA, or FORDICALIA, in *Antiquity*, a religious feaſt, among the Romans, held on the fifteenth of April; thus called from the Latin, *forda*, a cow big with calf; and *cædo*, I ſlay, or ſacrifice; becauſe ſuch cows were herein ſacrificed to the goddeſs Tellus, or the earth.

Forda, a cow with calf, is formed, according to Ovid, from *fero*, I bear; or rather, as Scaliger and Salmaſius imagine, from the Greek φοραϛ, φοραδοϛ, the ſame.

Varro writes, that there were ſeveral of theſe cows ſacrificed in the Curiæ. And Livy and Halicarnaſſeus relate, that there was one in each Curia; ſo that there were thirty in all; which is confirmed by Ovid. Faſtor. lib. i. ver. 631.

The fordicidia were firſt inſtituted by Numa, on occaſion of a general barrenneſs among the cattle. Ovid gives a particular deſcription of the ceremony, in the paſſage above quoted; he adds, that part of theſe cows were ſacrificed in the temple of Jupiter; that is, in the Capitol.

FORDINGBRIDGE, in *Geography*, a market town, which gives the name to the hundred in the diviſion of New Foreſt weſt, in the county of Hants, is pleaſantly ſituated on the banks of the river Avon, over which there is a good ſtone bridge of ſeven arches, and on the weſtern verge of the foreſt. The place is noticed as having two mills, and a *church* at the time of the Norman ſurvey. Formerly it appears to have been much larger than it now is; and its preſent diminutive ſize is attributed to frequent fires, by which at times it has ſeverely ſuffered. From the returns under the population act in 1801, the number of houſes was 461, containing 2335 inhabitants; of whom 892 are reported as occupied in trade, principally in calico-printing, and the fabrication of bed-ticking. Here is alſo a ſmall manufacture of checked linens. The town is governed by a conſtable, choſen annually at the court leet, held by the lord of the manor; and the weekly market is kept on Fridays. From its adjacency to the romantic ſcenery of the foreſt, it has to boaſt of numerous and handſome ſeats in its vicinity. See Beauties of England and Wales, and Gilpin's Obſervations on the Coaſts of Hants, &c.

FORDINGIANO, a town of the iſland of Sardinia; 22 miles S.E. of Boſa.

FORDOUN, or FORDUN, a pariſh in Kincardineſhire, forming part of the far-famed vale of Strathmore, contains the villages of Auchinblæ and Kincardine; the latter of which gives name to the county, and was long the principal town, till James VI. removed the courts of juſtice to Stonehaven; ſince whoſe reign, that has continued to be the county town. In this pariſh are the veſtiges of a large Roman encampment, and the ruins of an antiquated caſtle, ſuppoſed to have been a royal palace, and once the reſidence of Kenneth III. a prince diſtinguiſhed in Scottiſh hiſtory. By the returns made to government in 1801, Fordoun contained 465 houſes and 2225 inhabitants, 909 of whom were reported as employed in trade and agriculture.

At Auchinblæ was born the celebrated philologiſt and philoſopher, lord Monboddo, well known in the literary world by his knowledge of the Greek language, and the intimate acquaintance he poſſeſſed with the writings of the ancients.

ancients. His "Origin and Progreſs of Language," in ſix volumes, 8vo. contains a ſingular ſyſtem, which ſuppoſes all words to be derived from certain primitive *monads*, compoſed of vowel diphthongs. The "Hiſtory of ancient metaphyſics," in ſix volumes, quarto, contains opinions equally novel or eccentric. Fordoun alſo was the native place, and gave the name to

FORDOUN, JOHANNES DE, in *Biography*, a celebrated Scottiſh hiſtorian, who flouriſhed in the fourteenth century. His work, entitled "Scotichronicon," after all the attacks which have been made upon it by various writers, and the ridiculous light it was held up by Buchanan, is ſtill the moſt complete and authentic hiſtory extant of the early affairs of Scotland. Like many other excellent writers, in the early and middle ages of the annals of this iſland, Fordoun has had great injuſtice done him by continuators and tranſcribers. Bowyer, his diſciple and friend, it has now been aſcertained, was the author of ſome of the books long aſcribed to Fordoun; and many interpolations and additions totally irrelevant, or contradictory to the tenor of the original work, are attributable to the ſame prolific ſource of unfounded or unſupported narrative. An edition of his works was publiſhed in folio, by Goodal, at Edinburgh; but the beſt, collated with numerous manuſcripts, is one in ſix volumes, royal 8vo. with a preface by Hearne, printed at Oxford. See Gen. Biog. Dict. and Hearne's Prefatio.

FORDSAND, in *Geography*, a ſmall iſland of Denmark, near the coaſt of Sleſwick, in the German ocean. N. lat. 55° 1′. E. long. 8° 35′.

FORDWICH, a town of England, in the county of Kent, ſeated on the Stour; appearing to be a mean village, but governed by a mayor and jurats. It is a member of the town and port of Sandwich, and enjoys the ſame privileges as the Cinque Ports. The river is navigable for ſmall veſſels; four miles N.E. of Canterbury, and 60 E. of London.

FORDYCE, DAVID, in *Biography*, was born at Aberdeen in the year 1711, where he received his education, firſt in the grammar ſchool, and then at Mariſchal college, where he made great proficiency in the Greek language, in philoſophy, and in the mathematics. In 1728, when he was but ſeventeen years of age, he was admitted to the degree of maſter of arts. He next applied himſelf to divinity, which he cultivated with peculiar ardour, and was licenſed as a preacher, but never undertook the charge of a congregation in his native country. For ſome time he officiated as domeſtic chaplain to John Hopkins, eſq. of Britons, near Rumford, Eſſex, who had a regular ſervice every Sunday in the chapel at his own houſe. In the year 1742 he was choſen profeſſor of philoſophy in the Mariſchal college at Aberdeen. Here he read lectures on natural hiſtory, chronology, Greek and Roman antiquities, and on the ſeveral branches of natural and experimental philoſophy. In 1745 and 1748 he publiſhed his "Dialogues concerning Education;" which, though by no means a ſyſtematic treatiſe on the ſubject, contain diſcuſſions of the principal points relative to education, as alſo of various queſtions on ſubjects of taſte and polite literature. He was author of the treatiſe on moral philoſophy contained in the Preceptor, which was afterwards given to the world in a diſtinct volume, 12mo., and has ſince paſſed through ſeveral editions. In the year 1750 he made a tour on the continent, with a particular view to examine the remains of ancient art at Rome, and in the following year he meant to return to his native country, but was ſhipwrecked and loſt his life in a ſtorm on the coaſt of Holland. Thus ended the career of a man who had excited the higheſt expectations of the future benefits to be derived from his talents and learning; he had reached only his forty-firſt year. His brother James publiſhed, from a manuſcript left behind him, his "Theodorus, a dialogue concerning education." In ſpeaking of this work, a contemporary writer obſerved, "that the piety of the writer appears to have been manly and rational; his ſentiments of the divine perfections exalted and amiable; his knowledge of human nature, and of the various ways of touching the human heart, very extenſive; and his eloquence natural and affecting." This dialogue has been repeatedly reprinted, and in every edition, excepting the firſt, has been joined with Dr. Fordyce's ſermon on the eloquence, and his eſſay on the action proper for the pulpit. Another poſthumous work of Mr. Fordyce was "The Temple of Virtue, a Dream;" it was publiſhed by his brother in 1757, who added to the deſcriptive part twelve characters that had a claim to a place in it. Gen. Biog.

FORDYCE, JAMES, younger brother of the preceding, was born at Aberdeen in 1720. He received his claſſical education at the public grammar ſchool, and purſued the ſtudies neceſſary for a miniſter of the goſpel at Mariſchal college. His firſt appointment was to the place of ſecond miniſter in the collegiate church of Brechin, in the county of Angus. After continuing there ſome years, he accepted a call to Alloa, near Stirling. The people of this pariſh were prepoſſeſſed in favour of another, to the prejudice of Mr. Fordyce, yet by his impreſſive delivery, and indefatigable attention to every part of his miniſterial duty, he ſoon changed their prejudice into eſteem, and their eſteem into admiration. During his reſidence at Alloa he attracted public notice by the publication of three excellent ſermons, "On the Eloquence of the Pulpit;" "On the Method of promoting Edification by Public Inſtitutions;" and "On the deluſive and bloody Spirit of Popery." But a ſtill greater attention was excited by another ſermon, "On the Folly, Infamy, and Miſery of unlawful Pleaſure," which he preached before the general aſſembly of the church of Scotland in the year 1760. This diſcourſe contains ſuch maſterly compoſition, with reſpect to deſcription, ſpirit, and elegance, and was delivered with ſo much ſolemnity, animation, and feeling, that it is ſaid to have filled his learned fathers and brethren with aſtoniſhment, and juſtly raiſed him to unrivalled eminence among his clerical contemporaries. It was about this time that the degree of doctor of divinity was conferred upon him by the univerſity of Glaſgow; and in a ſhort time after, while he was on a viſit at London, he was invited to become copaſtor with Dr. Lawrence, to a reſpectable congregation of diſſenters at Monkwell-ſtreet. He accepted the offer, and on the death of his colleague, which happened in a few months, he was elected to the ſole paſtoral office. In this ſituation Dr. Fordyce maintained a high ſhare of popularity, generally preaching to crowded and overflowing audiences. To this he had a juſt claim, as well from the elegance of his compoſitions, as from the happy tendency that his diſcourſes had to impreſs the heart with the love of virtue and religion. He lived, however, to ſee a great declenſion in his popularity, for which many cauſes have been aſſigned, and they all had a ſhare in producing it. In the year 1772 a circumſtance took place which contributed greatly to thin the pews of his auditory. His brother, a banker of very extenſive buſineſs, was obliged to ſtop payment, and his ruin involved the fortunes and property of many of the doctor's conſtant hearers and moſt liberal ſupporters; and though no blame could attach to him on account of his brother's miſconduct,

yet the odium which it brought on his family did certainly operate unfavourably on the attachment of ſeveral other individuals to him as their miniſter. Another cauſe, which led to the decline of Dr. Fordyce's congregation, was a diſpute which took place between the doctor and Mr. Toller, his colleague: a number of perſons conceiving the latter to be much injured, withdrew with him to another place of worſhip. This was in the year 1775, but Dr. Fordyce diſcharged the duties at Monkwell-ſtreet till about Chriſtmas 1782, when he diſcontinued his public ſervices. In the following year he delivered "A Charge" at the ordination of his worthy and excellent ſucceſſor Mr., now Dr. Lindſay, which has been regarded as the fineſt ſpecimen of pulpit oratory which he had ever exhibited, and which certainly merits the attentive peruſal of every clergyman. He ſpent the remainder of his life chiefly in Hampſhire, in the vicinity of the earl of Bute, with whom he lived in great intimacy, and to whoſe valuable library he had conſtant acceſs. Towards the cloſe of life he went to Bath, where he died October 1ſt, 1796, in the 76th year of his age. The doctor's writings diſcover much genius and imagination, a correct taſte, extenſive knowledge of the world, and a happy method of engaging the attention; ardent piety, and a zeal for the intereſts of genuine virtue. His religious ſentiments were manly and rational; in private life he was highly amiable, and juſtly beloved by all who knew him. Beſides the pieces already noticed, he was the author of "Sermons to Young Women," in two volumes, which have been very generally read; "A Sermon on the Character and Conduct of the Female Sex;" "Addreſſes to Young Men;" "Addreſſes to the Deity;" a volume of "Poems;" and a "Diſcourſe on Pain." Ency. Brit. Dr. Lindſay's Funeral Sermon for Dr. Fordyce.

Fordyce, *Sir* William, knight, a phyſician of eminence, was the ſon, (and one of 20 children,) of Provoſt Fordyce of Aberdeen, where he was born in the year 1724. He received his education at the Mariſchal college of that place. At the age of eighteen he had finiſhed his academic ſtudies, and had diſtinguiſhed himſelf by his proficiency in Greek and mathematics, beſides acquiring a competent knowledge of phyſic and ſurgery, under the ableſt medical practitioner of Aberdeen. Thus prepared, he joined the army as a volunteer, and afterwards ſerved as ſurgeon to the brigade of guards on the coaſt of France, and in the German wars. The warm ſupport of his military friends co-operated with his own merit in early recommending him to extenſive practice in London; and he was ſent for to greater diſtances and received larger ſums in remuneration, than almoſt any phyſician of his time. He went to Switzerland, to Italy twice, to Scotland twice, and to other diſtant countries, to viſit ſome of his noble and wealthy patients. The wealth, which thus poured in upon him, he moſt liberally diſtributed in acts of friendſhip and bounty. Although he ſuffered ſeverely from the bankruptcy of his brother, Alexander Fordyce, a banker, he afterwards became bound for him, to the extent of ten thouſand pounds, in the project of a manufacture, which totally failed. And here we muſt not not omit a circumſtance, which equally redounds to the credit of ſir William, and of the gentlemen concerned. Sir William was called upon to pay this ſum in an hour, or go to gaol: when Mr. George Crawford, of Hertfordſhire, and Meſſrs. Drummond, generouſly diſcharged the debt, without requiring any other ſecurity than their confidence in ſir William's profeſſional merit, and in the determined integrity of his character. Yet, notwithſtanding theſe ſevere ſhocks to his fortune, he continued to maintain ſeveral poor families, and his generoſity to his relations was unbounded. His brother, the clergyman, author of the elegant and inſtructive ſermons to young women, had loſt ſeveral thouſand pounds by the banker's failure. Sir William immediately indemnified him to the full amount of his loſs. He wrote a treatiſe "on Fevers," and "on the Ulcerated Sore Throat," which contributed to extend his fame on his entering into practice: he likewiſe publiſhed "a treatiſe on the Venereal Diſeaſe." He ſuffered a long and ſevere illneſs, which terminated his life, on the fourth of December 1792, at his houſe, in Brook-ſtreet, Groſvenor-ſquare. See Gent. Mag. part ii. for 1792.

Fordyce, George, an eminent phyſician, was born at Aberdeen, on the 18th of Nov. 1736; after the death of his father, Mr. George Fordyce, who was proprietor of a ſmall landed eſtate, called Broadford, in the neighbourhood of that city. He was the only child of his parents, and, his mother having after no long time married again, he was taken from her, when about two years old, and ſent to Fouran, where he received his ſchool education. Thence he was removed to the univerſity of Aberdeen, where he took the degree of Maſter of Arts, when only fourteen years of age. Having very early formed a diſpoſition to the ſtudy of medicine, (which he uſed to attribute partly to the delight he had taken, in his childhood, in looking at the phials of coloured liquors in the windows of an apothecary's ſhop; and partly to his acquaintance with the learned Dr. Alexander Garden, then an apprentice to an apothecary in Aberdeen;) he was ſent, when about 15 years old, to his uncle, Dr. John Fordyce, who at that time practiſed medicine at Uppingham, in Northamptonſhire. With him he remained ſeveral years, and then went to the univerſity of Edinburgh, where, after a reſidence of three years, he obtained the degree of M. D. in October, 1758; having defended a theſis on catarrh. While he reſided at Edinburgh, Dr. Cullen was ſo much pleaſed with his diligence and ingenuity, that, beſides ſhewing him many other marks of regard, he frequently gave him private aſſiſtance in his ſtudies; of which kindneſs the pupil was ever grateful, and was accuſtomed to ſpeak of his preceptor in terms of the higheſt reſpect. About the end of the year 1758, he came to London; but ſoon afterwards went to Leyden, chiefly for the purpoſe of ſtudying anatomy, under Albinus. He returned to London in 1759, where he determined to fix himſelf as a teacher and practitioner of medicine; a determination, which was greatly diſapproved of by his relations, as the whole of his patrimony had been expended upon his education. Inſpired, however, with a confidence, which frequently attends the conſcious poſſeſſion of talents, he perſiſted in his purpoſe, and, before the end of 1759, commenced a courſe of lectures on chemiſtry: this was attended by nine pupils. In 1764 he began to lecture alſo upon the materia medica, and the practice of phyſic; and he continued to teach theſe three ſubjects for nearly thirty years, giving, for the moſt part, three courſes of lectures on each of them every year; a courſe which conſiſted of ſix lectures in the week of nearly an hour on each ſubject, laſting nearly four months. The time occupied by theſe lectures was from about ſeven o'clock in the morning till ten. In 1765 Dr. Fordyce was admitted a licentiate of the College of Phyſicians; and in 1770 he was choſen phyſician to St. Thomas's hoſpital, after a conſiderable conteſt with Dr., afterwards ſir William Watſon, whom he overcame by a majority of three, having 109 votes againſt 106. In 1774 he became a member of the Literary Club; in 1776 he was elected a fellow of the Royal Society; and in 1787

he was admitted, *ſpeciali gratia*, a fellow of the College of Phyſicians. This circumſtance evinces the high opinion of his abilities entertained by his profeſſional brethren: for as he had been particularly active in the diſpute, which had exiſted about twenty years before, between the fellows and licentiates, it was ſuppoſed that he had forfeited all title to be admitted into the fellowſhip through favour. But it is believed that the college, being at this time engaged in preparing a new edition of their "Pharmacopœia," wiſely ſuppreſſed their reſentment, in order to obtain the aſſiſtance of Dr. Fordyce in the proſecution of this work, there being confeſſedly none of their own number ſo well acquainted with pharmaceutical chemiſtry as himſelf. In 1793 he aſſiſted in forming a ſmall ſociety of phyſicians and ſurgeons, which has ſince publiſhed two uſeful volumes under the title of "Tranſactions of a Society for the Improvement of Medical and Chirurgical Knowledge;" and he continued to attend its meetings moſt punctually, until within a month or two of his death, which took place at his houſe in Eſſex-ſtreet, in the Strand, on the 25th of May, 1802.

His countenance was full and heavy, and not expreſſive of his powers of mind; and his manners were leſs refined, and his dreſs, in general, leſs ſtudied, than is uſually regarded, as becoming the phyſician in this country. From theſe cauſes, and from his ſpending a ſhort time with his patients, although ſufficient to enable him to form a juſt opinion of their diſorders, he had for many years but little private employment in his profeſſion; and never, even in the latter part of his life, when his reputation was at its height, enjoyed nearly ſo much as many of his cotemporaries. This may have partly reſulted too, from his fondneſs for the pleaſures of ſociety, to which he often ſacrificed the hours that ſhould have been dedicated to ſleep; he has frequently indeed been known, in his younger days, to lecture for three hours in a morning, without having undreſſed himſelf the preceding night. The vigour of his conſtitution enabled him to ſuſtain for a conſiderable time, without apparent injury, this debilitating mode of life: but at length he was attacked with the gout, which afterwards became irregular, and for many years frequently affected him with excruciating pains in his ſtomach and bowels: in the latter part of his life, alſo, his feet and ankles were almoſt conſtantly ſwollen, and a little time before his death he had ſymptoms of water in the cheſt. To the firſt mentioned diſeaſe (gout), he uniformly attributed his ſituation, which, for ſeveral weeks previous to his diſſolution, he knew to be hopeleſs.

Dr. G. Fordyce poſſeſſed a remarkably accurate and retentive memory, in which he placed ſuch great confidence, that he gave all his lectures without notes, and it is not known that he ever had any; nor did he make any memorandum in writing of the engagements, whether of buſineſs or pleaſure, which he formed; yet he was always moſt punctual in obſerving them. Even when he compoſed his works for publication, his materials were altogether drawn from ſtores in his memory, which had often been laid up there many years before. This, while it enables us to account for the extraordinary extent of his information in the ſciences, either immediately or remotely connected with medicine, alſo affords an explanation of his great deficiency in the art of literary compoſition and of the great want of arrangement, by which his writings are diſfigured. His ſtyle is commonly inelegant, and often involved, inaccurate, and obſcure: he frequently not only offends againſt the common rules of ſyntax, but errs even in reſpect to orthography; and his want of method led him to frequent repetitions. Theſe faults might, perhaps, have been avoided, had a leſs perfect memory led him, from his early years, to commit to writing the information which he wiſhed to preſerve.

Dr. Fordyce was the author of ſeveral publications, both on medical and philoſophical ſubjects. 1. "Elements of the Practice of Phyſic." This was uſed as a text-book for a part of his courſe of lectures on that ſubject, and was publiſhed in two parts, in 1768 and 1770, in 4to. 2. "Elements of Agriculture and Vegetation." He had given a courſe of lectures on this ſubject to ſome young men of rank, ſoon after the cloſe of which, one of his hearers, the late Mr. Stewart Mackenzie, preſented him with a copy of them from notes which he had taken. Dr. Fordyce corrected the copy, and afterwards publiſhed it in 1771, in 4to. 3. "A Treatiſe on the Digeſtion of Food," 8vo. 1791; which was originally read before the College of Phyſicians as the Gulſtonian lecture. 4. But the work on which he employed the moſt labour, was a ſeries of "Diſſertations on Fever," of which four were publiſhed during his life, and one left in manuſcript, which has ſince been printed. His other writings conſiſt of papers, which appeared in the Philoſophical Tranſactions of the Royal Society, and in the Tranſactions of the Society for the Improvement of Medical and Chirurgical Knowledge, upon the following ſubjects. In the former are eight papers: 1. On the Light produced by Inflammation. 2. Examination of various Ores in the Muſeum of Dr. W. Hunter. 3. A new Method of aſſaying Copper-ores. 4. An Account of ſome Experiments on the Loſs of Weight in Bodies on being melted or heated. 5. An Account of an Experiment on Heat. 6. The Croonian Lecture on Muſcular Motion. 7. On the Cauſe of the additional Weight which Metals acquire on being calcined. 8. Account of a new Pendulum, being the Bakerian Lecture. His three papers in the Tranſactions of the laſt-mentioned ſociety, are. 1. Obſervations on the Small-Pox, and on the Cauſes of Fever. 2. An attempt to improve the evidence of Medicine. 3. Some Obſervations on the Compoſition of Medicines. He was beſides the projector of the experiments in heated rooms; an account of which was given to the Royal Society by ſir Charles Blagden; and he was the author of many improvements in various arts connected with chemiſtry, on which he was frequently conſulted by manufacturers. See Gent. Mag. for June, 1802.

FORE, or Fowre, in *Geography*, a ſmall market-town, or, as Dr. Beaufort calls it, a miſerable village of the county of Weſtmeath, Ireland, near Lough Lene; formerly of ſo much importance as to give name to a barony, and return two members to parliament. The name is ſaid to ſignify "the town of books;" and it is ſuppoſed to have been formerly a ſeat of literature. It has at preſent the ruins of ſeveral religious buildings. It is 2 miles from Caſtle-Pollard, and about 71 N.W. from Dublin.

Fore, applied to a *Ship*, denotes all that part of a ſhip's frame and machinery which lies near the ſtem.

Fore *and aft*, is uſed for the whole ſhip's length, or from end to end.

Fore *Bowline* is the bowline of the fore-ſail.

Fore-*Caſtle of a Ship*, is a ſhort deck placed in the fore part of the ſhip, above the upper deck.

It is uſually terminated, both before and behind, by a breaſt-work in veſſels of war; the foremoſt end forming the top of the beak-head, and the hind-part reaching to the after-part of the fore-chains.

Fore-*Cat-harpings*, are thoſe that are uſed to brace in the upper part of the fore-ſhrouds. See Cat-*harpings*.

FORE-BAY *of a Lock*, on canals, is the breaſt or front wall. Caledonian Reports, 1806, p. 12.

FORECLOSED, in our *Ancient Law Books*, ſignifies barred, ſhut out, or excluded for ever; as, when the equity of redemption on mortgages is barred. See EQUITY *of Redemption*, and MORTGAGE.

FOREFANG, or FOREFENG, in our *Old Writers*, is the taking of proviſion from any one in fairs or markets, before the king's purveyors are ſerved with neceſſaries for him. The word is Saxon, compounded of *fore*, *ante*, and *fangen*, *prendere*.

FOREFIELD, in *Mining*, ſignifies the face or further part of the work from the mouth or drawing-ſhaft of a mine. Sometimes this is called the ſtool or bank.

FORE-FLANK, the name of a point in cattle ſtock.

FORE-FOOT, in the *Sea-Language*, is when one veſſel ſails or lies acroſs another's way.

As if two ſhips being under ſail, and in ken of one another, one of them lies in a courſe, with her ſtern ſo much weather of the other, that if both hold on, the windward ſhip will run a-head of the other: ſuch ſhip is ſaid to lie with the other's fore-foot.

Though, as ſoon as ſhe has paſſed, they ſay, ſhe is gone out a-head.

FORE-FOOT *of a Ship*, is a piece of timber that terminates the keel at the fore end. It is connected by a ſcarf to the extremity of the keel, of which it makes a part; and the other end of it, which is bent upwards into a kind of knee or crotch, is faſtened to the lower end of the ſtem, of which it makes a part, being alſo called the gripe.

FOREGAVEL, FORGABULUM, in our *Old Writers*, is uſed for a ſmall reſerved rent in money, or quit-rent.

FOREGOERS. The king's ſurveyors were thus called from their *going before*, to provide for his houſehold. 36 Edw. III 5.

FORE-HAND, a term which, in reſpect to the horſe, ſignifies that part which is before the rider. Thus a horſe is often ſaid to have a good or bad fore-hand.

FORE-HAND *Rent*, in *Rural Economy*, is ſuch as is paid before entering upon, or deriving profit from a farm, or any thing held in tenure.

FOREHEAD, a point in the horſe, which ſignifies the front part of the head. The well-ſhaped forehead ſhould be ſomewhat broad, and rather flat: if with a feather and ſtar in it, it is the more complete.

FOREHEAD, *Wounds of*. See WOUNDS.

FORE-HOOKS *of a Ship*. See BREAST-*Hooks*.

FORE-JEERS. See JEERS.

FORE-JEER-*Bits*, in a *Ship*. See BITS.

FOREIGN, ſomething extraneous, or that comes from abroad.

The word is formed from the Latin *fores*, doors; or *foris*, out of doors; or *forum*, market, &c.

Foreign miniſter, foreign prince, foreign goods, &c. are thoſe belonging to other nations. See MINISTER, &c.

Foreign to the purpoſe, ſignifies a thing remote or impertinent.

Foreign plants are particularly called exotics. Foreign foſſils, ſee FOSSIL. Foreign motion, ſee MOTION. Foreign canons, ſee CANON.

In ſome univerſities they give the appellation foreign doctors, *doctores forenſes*, to ſuch as do not reſide in the place, or the univerſity; but take degrees to go and live elſewhere, and in other countries.

In the life of St. Paul, biſhop of Verdun, written by an anonymous author, and publiſhed from a MS. about four hundred years old, by Bollandus, we meet with *forenſis presbyter*, for a prieſt who lives in another part. The ſame Bollandus notes, that St. Ambroſe uſes the word *forenſis* for exterior.

FOREIGN is uſed, in *Law*, in ſeveral ſenſes, and joined with divers ſubſtantives. Thus,

FOREIGN *Anſwer*, is ſuch an anſwer as is not triable in the county where it is made.

FOREIGN *Attachment*. See ATTACHMENT.

FOREIGN *Bill of Exchange*. See BILL.

FOREIGN *Matter*, is matter triable in another county; or matter done in another county. See INDICTMENT.

FOREIGN *Oppoſer*, or *Appoſer*, is an officer in the exchequer, to whom all ſheriffs or bailiffs do repair to be appoſed by him of their green wax, after they are appoſed of their ſums out of the pipe-office; and who from thence draws down a charge upon one of them to the clerk of the pipe.

His buſineſs is to examine the ſheriff's eſtreats with the record, to aſk the ſheriff what he ſays to every particular ſum therein.

FOREIGN *Plea*, is a refuſal of the judge as incompetent, becauſe the matter in hand was not within his precinct.

FOREIGN *Seamen*, ſerving two years on board Britiſh ſhips, whether of war, trade, or privateers, during the time of war, ſhall be deemed natural born ſubjects. But the perſons ſo naturalized are not capable of being of the privy council, or members of parliament, or of taking any place of truſt, civil or military, or to have any grant from the crown of lands. Stat. 13 Geo. II. cap. 3. ſect. 2.

FOREIGN *Service*, is ſuch ſervice whereby a meſne lord holdeth of another, without the compaſs of his own fee: or that which a tenant performeth, either to his own lord or to the lord paramount, out of his own fee. Kitch. 299. Bract. l. ii. c. 16.

FOREIGN *Service* is alſo uſed to denote military ſervice performed to foreign ſtates. The ſtat. 3 Jac. I. cap. 4. makes it felony for any perſon to go out of the realm to ſerve any foreign prince or ſtate, without having firſt taken the oath of allegiance before his departure; and it is alſo felony for any gentleman, or perſon of higher degree, or who hath borne any office in the army, to go out of the realm to ſerve ſuch foreign prince or ſtate, without previouſly entering into a bond with two ſureties, not to be reconciled to the ſee of Rome, or enter into any conſpiracy againſt his natural ſovereign. And by ſtat. 9 Geo. II. cap. 30. enforced by 29 Geo. II. cap. 17. if any ſubject of Great Britain ſhall enliſt himſelf, or any perſon ſhall procure him to be enliſted, in any foreign ſervice, or detain or embark him for that purpoſe, without licence under the king's ſign-manual, he ſhall be guilty of felony without benefit of clergy; but if the perſon ſo enliſted or enticed, diſcover his ſeducer within fifteen days, ſo that he may be apprehended and convicted of the ſame, he ſhall be indemnified. By ſtat. 29 Geo. II. cap. 17. to ſerve under the French king, as a military officer, is felony without benefit of clergy: and to enter into the Scotch brigade, in the Dutch ſervice, without previouſly taking the oaths of allegiance and abjuration, incurs a forfeiture of five hundred pounds.

FOREIGNERS are the natural born ſubjects of ſome foreign prince. (See ALIEN.) Foreigners reſiding ſeven years in the Britiſh plantations, without any longer abſence than two months at one time, and taking the oaths, are to be deemed natural born ſubjects. But, excepting Quakers and Jews, all other perſons muſt receive the ſacrament in ſome proteſtant or reformed congregation in Great Britain,

or the colonies; a certificate whereof muſt be produced at the time of taking the oaths. 13 Geo. II. cap. 7. ſect. 2. See NATURALIZATION.

FOREIRO, FRANCIS, in *Biography*, a native of Liſbon, who flouriſhed in the ſixteenth century, was patronized by John III. king of Portugal, who ſent him to ſtudy at the univerſity of Paris. Here he became a perfect maſter of the dead languages; and on his return home, in 1540, he undertook the education of Anthony, prior of Crato, and became the moſt celebrated preacher in Portugal. In the year 1561, the monarch ſent him as a divine to the council of Trent, where he acquired the admiration of the aſſembled fathers by his excellent pulpit talents. He alſo recommended himſelf to their reſpect by the capacity which he diſcovered for buſineſs; and which induced them to entruſt to his management different confidential negociations with the pope. Foreiro was afterwards one of three divines, ſelected by the council of Trent to draw up their catechiſm, which was publiſhed in the year 1566. He was likewiſe employed by them to reform the miſſal and Roman breviary. The king, however, commanded him to return to Portugal, which prevented him from accompliſhing the latter undertaking. He had not long been home before he was appointed prior of Liſbon; and in the year 1568, he was choſen provincial of his order. When the term of the laſt office was expired, he withdrew from public life to the convent of Almada, which he had built; and here he died in the year 1587. His works are a Latin verſion of the prophecy of Iſaiah, with a commentary; which was firſt printed at Venice, then at Antwerp, and afterwards inſerted in the fifth volume of the "Critici Sacri," publiſhed at London in the year 1660. He wrote commentaries, likewiſe, on the books of Job and the Pſalms, which are loſt. Moreri.

FOREJUDGED *the Court*, in *Law*, is when an officer or attorney of any court is baniſhed, or expelled the ſame, for ſome offence; or for not appearing to an action on a bill filed againſt him; in which latter caſe, he is not to be admitted to officiate, till he appear to the bill. Anno 2 Hen. IV. cap. 8.

He ſhall loſe his office, and be forejudged the court, &c. "Forejudicare, interdum eſt male judicare." Spel. See ATTORNEY.

FOREJUDGER ſignifies a judgment, whereby a man is deprived, or put by a thing in queſtion.

FORE-KNIGHT, in the *Sea-Language*, a piece of wood, carved in figure of a man's head, and faſt bolted to the beams upon the ſecond deck.

FORE-LAND, in *Embanking*, is the ſpace or land left between the embankment of a river or marſh and the ſtream or tide-way.

FORE-LAND, in *Fortification*, is a ſmall ſpace of ground between the wall of a place and the moat; called alſo *berme*, and *liziere*.

FORELAND, or *Foreneſs*, in *Geography*, a point of land jutting out into the ſea.

FORELAND, *North*, a promontory of England, on the N.E. extremity of the coaſt of Kent, on which a ſea-mark has been erected by the corporation of the Trinity-houſe, in which lights are exhibited every night; 3 miles N. of Ramſgate. N. lat. 51° 23′. E. long. 1° 17′.

FORELAND, *South*, a cape of England, on the E. coaſt of the county of Kent, between Dover and Deal, with a light-houſe. N. lat. 51° 8′. E. long. 1° 22′.

FORELAND, *Eaſt*, a cape on the W. coaſt of North America, on the eaſt ſide of Cook's inlet. N. lat. 60° 43′. E. long. 209° 19′.

FORELAND, *North*, a cape on the W. coaſt of North America, and weſt ſide of Cook's inlet, where the Ruſſians have a factory, with one large houſe, about 50 feet long and 24 wide, inhabited by about 19 Ruſſians. N. lat. 61° 4′. E. long. 209° 34′.

FORELAND, *South*, a cape on the W. coaſt of North America, in Cook's river. N. lat. 60° 50′. W. long. 151° 20′.—Alſo, a cape in Upper Canada, formerly called Point Palé, on the north ſhore of lake Erie, oppoſite to Landguard. On either ſide of the point there is good anchorage for veſſels. Near its extremity on the eaſt ſide is a pond, where boats may be ſecure from moſt winds.

FORELAND, *Weſt*, a cape on the W. coaſt of North America. on the weſt ſide of Cook's inlet. N. lat. 60° 42′. E. long. 209°.

FORE-LEGS, thoſe ſituated on the fore part of the cheſt, which ſhould be ſtraight, and well formed in the joints.

FORELLA, in *Ichthyology*, a name given by Figulus and others to the trout.

FORELOCKS, in a *Ship*, are little flat wedges, like pieces of iron, uſed at the ends of bolts, to keep them from flying out of the holes.

FORELOIN, among *Hunters*, is when a hound going before the reſt of the cry, meets chace, and goes away with it.

FORELOIN, a term denoting a point in cattle: See CATTLE, and LIVE STOCK.

FORE-MAST *of a Ship*, is a round large piece of timber, ſeated in her fore part, on which is borne the fore-ſail, and fore-top-ſail yard. See MAST.

FORE-MAST *Men*, in a *Man of War*, thoſe on board that take in the top-ſails, ſling the yards, furl the ſails, browſe, triſe, and take their turn at the helm, &c.

FORENSIC SERVICE. See SERVICE and FOREIGN.

FORENSIS TOGA. See TOGA.

FORENZA, in *Geography*, a town of Naples, in Baſilicata; 8 miles S. of Venoſa.

FORE-RAKE, in *Sea Language*. See RAKE.

FORE-REACH. The ſeamen ſay one ſhip fore-reaches upon another, when both ſailing together, ſhe ſails better, or outgoes the other.

FORE-SAIL, the ſail of the fore-maſt. See SAIL.

FORESCHOKE, DERELICTUM, anciently ſignified as much as *forſaken* in modern language.

It is eſpecially uſed in one of our ſtatutes for land or tenements ſeized by the lord, for want of ſervices due from the tenant; and ſo quietly held and poſſeſſed beyond a year and a day.

As if we ſhould ſay, that the tenant, who ſeeing his lands and tenements taken into the lord's hand, and poſſeſſed ſo long, takes not the courſe appointed by law to recover them, does, in due preſumption of law, diſavow or forſake all the right he has to them. In which caſe ſuch lands ſhall be called foreſchoke, ſays the ſtat. 10 Ed. II. cap. 1.

FORESHORTENING, in *Painting*, is the art of conveying to the mind the impreſſion of the entire length of an object, when it is repreſented as viewed in an oblique or receding poſition; in which caſe, the actual viſion of it is ſhortened in line on the receding ſide; *e. g.* a ſtick held with the end towards the obſerver appears ſhortened to the view, and that in a degree according to the angle under which its lengthened ſide is ſeen; the art of painting requires, that though thus preſented, it ſhould have in its repreſentation the appearance of poſſeſſing its utmoſt extent. Such a view

of

of an object is called a foreſhortened view; and the repreſentation, foreſhortening it.

Without a previous knowledge of the forms of bodies, no foreſhortening, however well wrought, would produce the full effect deſired. Of this, the world in general are not aware, and when a foreſhortened view of an object is given, are apt to exclaim againſt its appearance as being ſhorter than nature; not recollecting, or never having obſerved, how much they are aſſiſted in the view of the real object by ſome ſlight motion either of it or of themſelves; and thus they frequently, without mercy, criticiſe works of art in this reſpect, when their own preſumption is the only thing blameable. The writer of this article, with much difficulty, perſuaded the late lord Thurlow, the acuteneſs of whoſe judgment is every where acknowledged, of the truth of this remark. His lordſhip would not be diſſuaded from the idea, that the forms of natural objects were at all times, when viſible, completely to be underſtood. He was convinced, only by being requeſted to decide the length of a ſtick which he had not previouſly ſeen, and which was then held with the end nearly direct before him; this he was unable to do, and of courſe confirmed the opinion he had oppoſed.

Foreſhortening conſtitutes the difficulty of deſigning or drawing. The forms of bodies, wherein lines are preſented direct before the view, as in ſquare-ſided ones ſeen immediately in front, are very eaſily imitated: but when thoſe compoſed of intricate lines are thrown into oblique poſitions, where every line varies in appearance from its real ſhape, yet the whole together gives the juſt idea of the body; then is the ſkill of the great artiſt required to repreſent it faithfully; and none but the moſt cultivated talent is equal to the taſk.

In the foreſhortening of ſtraight-ſided objects, the rules of perſpective, when aided by light and ſhade, will fully produce the effect; and indeed the recollection of them is at all times uſeful when foreſhortened views are ſelected for imitation: but the variations of rounded objects, and eſpecially if compoſed of many parts, are too numerous and complicated to be ſubmitted to the regulations of that ſcience; reaſon, and the eye alone, muſt then be the guides; as in the face and limbs of the human figure, which are conſtantly preſenting themſelves under foreſhortened views.

That would be of neceſſity a very ſtiff action of the figure indeed, in which ſome part or other was not affected by this peculiarity; a leg, or an arm, the neck, or ſome feature of the face. The mere receding of the trunk and limbs in their rounding is in fact a foreſhortening, in the moſt direct front view; and it requires great delicacy of the eye and hand to adjuſt the due proportions of the parts as they retire from the view: and to give the appearance of their real quantity where a much ſmaller one is actually ſeen; that is, occupies upon the retina of the eye a much ſmaller ſpace (owing to the obliquity of the view) than they would do if ſeen directly in front.

The variations that take place in the forms of bodies, as they are more or leſs foreſhortened, are perfectly aſtoniſhing to thoſe who are not accuſtomed to obſerve them. A lengthened object becomes ſquare, or almoſt a point; a round one, oval; and irregular ones take every form in turn; ſo that the ſkilful artiſt has by its means, when judiciouſly employed, the power of introducing figures according to his neceſſities, to fill his canvas, and complete the forms of his groups in whatever ſhape he pleaſes, without diſtortion of the limbs.

But when grace or beauty is required in drawings or paintings of the human figure, theſe foreſhortenings ſhould be ſparingly employed; for even when perfectly effected, they are ſtill apt to convey the impreſſion of bad proportion, and often produce unpleaſant forms.

The actual effect which takes place in foreſhortened views of objects that have projecting parts, is, that thoſe which are moſt in advance, by their projection, hide others that are behind them, and in immediate connection with them; and it is this loſs of parts which ſhortens the view: *e. g.* a horſe ſeen directly in front, is foreſhortened to the eye. The head projecting hides the neck, and the belly the hinder parts in ſome meaſure; yet, though thoſe parts are loſt to the view, by a previous knowledge of the form of the animal, and the turns of the lines that are ſeen indicating ſome intermediate form between thoſe preſented to the eye, the mind is at no loſs for the conception of its entire ſhape.

From this it is evident that the rules of proportion are but partially uſeful in foreſhortening, and therefore in drawing objects, thus preſented to the view, their viſible proportions muſt be copied, rather than thoſe proper and natural to them. For the eye and the underſtanding, being directed by the art of perſpective, ought to be the guide and meaſure in theſe kinds of effects.

Though this peculiar part of the art of drawing be conſtantly required by the painter more or leſs in all his works, it has been moſt principally exerciſed by thoſe who have been employed in painting cielings or domes; where the intention has frequently been, to make the whole of the objects of the picture foreſhortened, or appear, as the Italians term it, *ſotto in ſu* (as ſeen from below). Such is the caſe in great meaſure in the cieling of the banquetting room, now the chapel at Whitehall, painted by Rubens.

But the great exemplar of it is the dome of the great church at Parma, painted by that divine maſter Correggio; whoſe extraordinary talents appear to have revelled with delight in ſelecting the boldeſt and moſt extraordinary foreſhortenings of the human figure; in which he has ſucceeded moſt ſurpriſingly.

Tintoretto and Paulo Veroneſe, ſkilfully employed in adorning the cielings of the halls and chapels, &c. in Venice, choſe the *ſotto in ſu*, generally, as the mode of conſtruction for their pictures, and produced numberleſs aſtoniſhing works of this kind; and after them followed in the ſame way moſt of the maſters of the Venetian ſchool. It ſuited the ſtyle of that ſchool particularly; where freedom of execution, and brilliancy of colouring, produced by ſtrong contraſts of hues, and ſtrong oppoſitions of light and ſhadows, were by means of foreſhortenings readily brought into the ſurface of the picture. Sometimes it adds greatly to the grandeur of a figure to have it appear as ſeen a little from below, lowering the horizon by that means behind the figure; but it may be doubted whether that be owing to the lines produced by the foreſhortening, or to the comparatively increaſed maſs of figure againſt the ſky.

FORE-SHROUDS. See SHROUDS.

FORESKIN. See PREPUCE.

FOREST, SYLVA, in *Geography*, a great wood; or a large extent of ground covered with trees.

The word is formed of the Latin, *foreſta*, which firſt occurs in the Capitulars of Charlemagne, and which itſelf is derived from the German, *forſt*, ſignifying the ſame thing. Spelman derives it from the Latin *foris reſtat*, by reaſon foreſts are out of towns. Others derive *foreſta a feris*, q. d. *foreſta, quod ſit tuta ſtatio ferarum*, as being a ſafe ſtation, or abode, for wild beaſts.

The Caledonian and Hercynian foreſts are famous in hiſtory. The firſt was a celebrated retreat of the ancient Picts and

and Scots: the latter anciently poſſeſſed the greateſt part of Europe; particularly Germany, Poland, Hungary, &c. In Cæſar's time it extended from the borders of Alſatia and Switzerland to Tranſylvania, and was computed ſixty days journey long, and nine broad: ſome parts or cantons thereof are ſtill remaining. The foreſt of Dean, in Glouceſterſhire, is famous for its iron works. The ancients adored foreſts, and imagined a great part of their gods to reſide in them: temples were frequently built in the thickeſt foreſts, the gloom and ſilence of which naturally inſpired ſentiments of devotion, and turned men's thoughts within themſelves.

For the like reaſon, the ancient Druids made foreſts the place of their reſidence, and performed their ſacrifices, inſtructed their youth, and gave laws in them. See DRUIDS.

FOREST, in a *Law-ſenſe*, is defined a certain territory of woody grounds and fruitful paſtures, privileged for wild beaſts, and fowls of foreſt, chace, and warren, to reſt and abide in, under the protection of the king, for his recreation and delight; bounded with unremoveable marks and meres, either known by matter of record or preſcription; repleniſhed with wild beaſts of venery, or chace, and with great coverts of vert for ſuccour of the ſaid beaſts; for preſervation and continuance whereof, with the vert and veniſon, there are certain peculiar laws, privileges, and officers.

The properties and characters of a foreſt are, firſt, that it cannot be in the hands of any but the king; becauſe none elſe had power to conſtitute ſuch commiſſions as are neceſſary to the being of a foreſt, beſide the king; as, particularly, that of juſtice in eyre of the foreſt.

And yet the abbot of Witby had a foreſt by grant of king Henry II. and king John, with all officers incident thereto.

As the king reſerved to himſelf the foreſts for his own excluſive diverſion, ſo he granted out from time to time other tracts of land to his ſubjects, under the names of *chaces* or *parks* (which ſee), or gave them licences to make ſuch in their own grounds; which, indeed, are ſmaller foreſts, in the hands of a ſubject, but not governed by the foreſt-laws: and by the common law, no perſon is at liberty to take or kill any beaſts of chace, but ſuch as hath an ancient chace or park; unleſs they be alſo beaſts of prey. (See GAME.) If, however, the king grant a foreſt to a ſubject, and granteth further, that upon requeſt made in chancery, the grantee and his heirs ſhall have juſtices of the foreſt, then the ſubject hath a foreſt in law. 4 Inſt. 314. Cro. Jac. 155.

The ſecond character of a foreſt is the courts belonging to it, which are the *juſtice-ſeat*, and the *regard*, held every third year; the *ſwanimote* or *ſwainemote*, held thrice every year; and the *attachment*, once every forty days. See each reſpectively.

But the moſt eſſential mark of a foreſt is the ſwanimote, which is no leſs incident thereto than the court of pye-powder to a fair. If that fail, it ceaſes to be a foreſt, and commences a chace.

The third characteriſtic is the officers belonging to a foreſt, for preſervation of the vert and veniſon; as the juſtices of the foreſt, the warden, warder, or keeper, ranger, verderers, foreſters, agiſtors, regarders, bailiffs, beadles, &c. See each under its proper article, JUSTICE *of the Foreſt*, KEEPER, &c.

The beaſts of the foreſt are the following five, *viz.* the hart, hind, hare, boar, and wolf; the ſeaſons for hunting of which are as follow, *viz.* that of the hart and buck begins at the feaſt of St. John Baptiſt, and ends at Holy-rood day; of the hind and doe begins at Holy-rood, and continues till Candlemas; of the boar, from Chriſtmas to Candlemas; of the fox begins at Chriſtmas, and continues till Lady-day; of the hare, at Michaelmas, and laſts till Candlemas. Dyer, 169. 4 Inſt. 316.

The way of making a foreſt is thus: certain commiſſioners, appointed under the great ſeal, view the ground intended, and fence it round; this being reported in chancery, the king cauſes it to be proclaimed throughout the county where the land lies, that it is a foreſt, and is thenceforth to be governed by the laws of the foreſt; and prohibits all perſons from hunting there without his leave.

He then appoints officers for the preſervation of the vert and veniſon, and it then becomes a foreſt on record. Manwood. c. 2. Although the king may erect a foreſt on his own ground and waſtes; yet he may not do it on the lands of a ſubject, without his conſent; and agreement with him for that purpoſe ought to be confirmed by parliament. 4 Inſt. 300. Proof of a foreſt appears by matter of record, as by the eyres of the juſtices of the foreſts, and other courts, and officers of the foreſts, &c.; and not by the name in grants. 12 Rep. 22. As parks are incloſed with wall, paling, or other appropriate fence; ſo foreſts are incloſed by meres and bounds, ſuch as rivers, high-ways, hills; which are an incloſure in law, and without which it cannot be a foreſt: and in the eye of the law, "the boundaries of a foreſt go round about it, as it were a brick wall, directly in a right line from the one to the other, and they are known either by matter of record, or preſcription." 4 Inſt. 317. Bounds of a foreſt may be aſcertained by commiſſion from the lord chancellor; and commiſſioners, ſheriffs, officers of foreſts, &c. are empowered to make inqueſts thereof. Stat. 16 & 17 Car. I. c. 16. The boundaries of a foreſt are parcel of a foreſt; ſo that if any perſon kill or hunt any of the king's deer in any high-way, river, or other incluſive limit of a foreſt, the offence is the ſame as if committed within the foreſt. 4 Inſt. 318. There are two kinds of boundary: the one incluſive as to juriſdiction, ſuch as highways, &c.; the other excluſive in that reſpect, as churches, church-yards, mills, houſes, trees, &c. which bound the foreſt, but are not within the juriſdiction. Ibid. But a manor, land, wood, &c. within the meres of a foreſt, may, by the king's charter, be exempted out of the regard of the foreſt. (Manw. 133.) Yet it ſhall not be exempted by preſcription; for meres are eſtabliſhed by the ſtat. 6 Edw. I., and there can be no preſcription ſince. Jon. 271. By the grant of a foreſt, the game of the foreſt do paſs.

Foreſts are of ſo great antiquity in England, (except the New foreſt in Hampſhire, erected by William, called the Conqueror, and Hampton-court, erected by king Henry VIII. ſee ſtat. 31 Hen. VIII. c. 5.) that, it is ſaid, there are no records in hiſtory that mention their origin; though they are noticed by ſeveral writers, and in divers laws and ſtatutes. 4 Inſt. 319. The four principal foreſts are New, Sherwood, Dean, and Windſor foreſts. New Foreſt, ſo called from its being newly added to the ſeveral foreſts previouſly poſſeſſed by the crown, was afforeſted by William I. (the Conqueror); concerning which hiſtory informs us, that it was made by laying waſte a country of above 30 miles in extent, driving out all the inhabitants, deſtroying all their dwellings, not ſparing even their churches, 22, or as ſome ſay, 36 of which he demoliſhed, much as he affected a reſpect for religion. This was one of the moſt horrible acts of wanton cruelty recorded in hiſtory, if it was done for his pleaſure only; and there is no warrant in any ancient

ancient author for the conjecture of ſome modern writers, that he did it to facilitate the landing of forces, which he might have occaſion to bring over from Normandy, by thus diſabling the Engliſh from collecting together, or maintaining any on that coaſt. If this were his motive, and not the contiguity of the New foreſt to his palace at Wincheſter, it was the policy of a barbarous tyrant, not of a wiſe or good king. M. Voltaire, in his "Abridgment of Univerſal Hiſtory," has queſtioned this fact. But lord Lyttelton has alleged various proofs from Florence of Worceſter, William of Malmſbury, and other writers of the beſt authority in the times when they lived, which atteſt and eſtabliſh it. (Hiſt. Hen. II. vol. i. p. 380.) The chief officer of this foreſt is the lord warden: and under him are two diſtinct appointments of officers; the one to preſerve the *veniſon* of the foreſt, and the other to preſerve its *vert*: the former term, in the language of foreſt-law, comprehending every ſpecies of game; and the latter ſignifying every thing that bears a green leaf within a foreſt that may cover a deer, but eſpecially great and thick coverts. The office of ſuperintending the game is now delegated to 15 keepers, who preſide over the ſame number of walks, into which the foreſt is divided. The woods are under the ſuperintendence of the woodward, under whom are 12 regarders. Beſides theſe officers, who are appointed by the lord warden, there are four others called verderers, who are commonly gentlemen of property and intereſt in the neighbourhood, and are elected, like knights of the ſhire, by the freeholders of the county. Theſe officers are the only judges of the foreſt courts. There is another officer of late conſtitution, called the purveyor, and appointed by the commiſſioner of the dock-yard at Portſmouth, whoſe buſineſs it is to aſſign timber for the uſe of the navy.

The foreſt of Sherwood, ſo renowned in ſtory as the ſcene of the exploits aſcribed to Robin Hood, is a royal demeſne, and ſince the reign of Edward I. it has been always granted by the ſovereign to ſome of the nobility and gentry, as a mark of ſpecial favour. It is governed by a warden, his lieutenant, and a ſteward, a bow-bearer, and a ranger, four verderers, twelve regarders, four agiſtors, and twelve keepers in the main foreſt, under the chief foreſter, who holds it in fee, with liberty to deſtroy and kill at pleaſure, reſerving 100 deer in the whole walk. There are alſo, as members of the foreſt, ſeveral woodwards for every townſhip within the foreſt, and one for every principal wood.

Dean foreſt is now thinned by frequency of felling, and narrowed by increaſe of cultivation, though a few ſolitary deer ſtill continue to run wild in its receſſes.

Windſor foreſt is plentifully ſtocked with deer and game of every deſcription: it was appropriated to hunting, and the preſervation of royal game, by William the Conqueror; and the laws and regulations eſtabliſhed by him for that purpoſe are, in moſt reſpects, ſtill obſerved.

In England there are 69 foreſts, 13 chaces, and upwards of 750 parks.

The whole iſland was repleniſhed with all ſorts of game in the times of the Britons; they lived in a wild and paſtoral manner, without incloſing or improving their grounds, and derived much of their ſubſiſtence from the chace, which they all enjoyed in common. But when huſbandry took place under the Saxon government, and lands began to be cultivated, improved, and incloſed, the beaſts naturally fled into the woody and deſart tracts, which were called the foreſts; and, having never been diſpoſed of in the firſt diſtribution of lands, were therefore held to belong to the crown. Theſe were filled with great plenty of game, which our royal ſportſmen reſerved for their own diverſion, on pain of a pecuniary forfeiture for ſuch as interfered with their ſovereign. But every freeholder had the full liberty of ſporting upon his own territories, provided that he abſtained from the king's foreſts; as is fully expreſſed in the laws of Canute (c. 77.) and of Edward the Confeſſor (c. 36.); and this, indeed, was the ancient law of the Scandinavian continent, from whence Canute probably derived it; but, upon the Norman conqueſt, a new doctrine took place. Accordingly our ancient Norman kings, upon the principles of the feudal law, that the king is the ultimate proprietor of all the lands in the kingdom, and that therefore he has the right of the univerſal ſoil, were the firſt who incloſed foreſts, and ſettled the juriſdiction thereof. In the courſe of a few reigns from the Conqueſt, no leſs than ſixty-eight foreſts were incloſed: the ſtricteſt laws were made to ſecure them, and the ſevereſt penalties inflicted on all treſpaſſers upon them.

William the Conqueror decreed the eyes of any perſon to be pulled out, who took either a buck or boar; William Rufus made the ſtealing of a doe a hanging matter; the taking of a hare was fined 20*s.* and a coney at 10*s.* Eadmer adds, that fifty perſons of fortune, being apprehended by that laſt prince for killing his bucks, were forced to purge themſelves by the fire of ordeal, &c.

Henry I. made no diſtinction between him who killed a man, and him who killed a buck; and puniſhed thoſe who deſtroyed the game, though not in the foreſt, either by forfeiture of their goods, or loſs of limbs; though Henry II. remitted it for a temporary impriſonment.

Richard I. revived the old diſcipline of gelding and pulling out the eyes of thoſe convicted of hunting in the foreſt: but he afterwards relaxed a little, and was contented to make ſuch convicts abjure the realm, or be committed, or pay a fine. See FOREST-*Law*, infra.

FOREST, *Aſſize of the.* See ASSIZE.

FOREST, *Charter of the.* See CHARTER *of the Foreſt.*

FOREST, *Drift of the.* See DRIFT.

FOREST, *Foot of the.* See FOOT.

FOREST, *Keeper of the.* See KEEPER.

FOREST, *Perambulation of the.* See PERAMBULATION.

FOREST, *Purlieu of a.* See PURLIEU.

FOREST, *Poſition of the.* See REPOSITION.

FOREST, *Waſte of the.* See WASTE.

FOREST is alſo uſed adjectively. The foreſt cities of the empire are four cities ſituate in the ancient Black foreſt, or Sylva Nigra, a part of the ancient Hercynian foreſt, *viz.* Rheinfield, Waldſhut, Seckingen, Lauffenbourg. But now, ſince the bounds of the Black foreſt are contracted, theſe cities are out of the limits thereof.

FOREST, *Black.* See BLACK *Foreſt.*

FOREST-*Law.* The foreſt-laws are peculiar laws, different from the common law of England.

Before the making of Charta de Foreſta, in the time of king John and his ſon Henry III., confirmed in parliament by 9 Hen. III. offences committed therein were puniſhed at the pleaſure of the king in the ſevereſt manner. By this charter many foreſts were diſafforeſted and ſtripped of their oppreſſive privileges, and regulations were made for the government of thoſe that remained; particularly, killing the king's deer was made no longer a capital offence, but only puniſhed by fine, impriſonment, or abjuration of the realm; yet even in the charter there were ſome grievous articles, which the clemency of later princes have ſince by ſtatute thought fit to alter *per aſſiſas* foreſtæ.

And to this day, in treſpaſſes relating to the foreſt, *voluntas reputabitur pro facto;* ſo that if a man be taken hunting a deer, he may be arreſted, as if he had taken a deer.

The foreſter may take and arreſt a man, if he be taken either at dog-draw, ſtable-ſtand, back-bear, or bloody-hand, notwithſtanding that three of theſe be only preſumptions. See Dog-*Draw*, Stable-*Stand*, &c. See alſo Black *Act*, Deer-*Stealing*, Game, &c.

Forest, a ſmall iſland in the Britiſh territories, at the mouth of lake Ontario, between which and Grand iſland is a narrow channel. It lies nine miles ſoutherly of fort Frontinac, and ſix N. weſterly of Roebuck iſland, in the ſame lake, and within the line of the United States.

Forests, or *Forêts, Department of*, one of the thirteen departments of the region of France, called the reunited country, and comprehending a part of the duchies of Luxembourg and of Bouillon, bounded on the eaſt by Sarre, and on the ſouth by Moſelle, in N. lat. 49° 55′. The territorial extent of this department is 7,080 kiliometres, or about 340 ſquare leagues, and it contains 225,549 inhabitants, in four diſtricts, *viz.* Neufchateau, Luxembourg, Bittbourg, and Dieckirch; 28 cantons, and 383 communes. Its contributions to general purpoſes amount to 1,340,663 francs, and the charges upon it for adminiſtration, juſtice, and public inſtruction, are 215,623 fr. 66 c. This department is hilly, wooded, indifferently fertile, and abounding in mines.

Forests, *Submerged*, in *Natural Hiſtory*, conſtitute a curious and important phenomenon, which moſt writers on the fens of the eaſtern coaſt of England have noticed: it being common in ſuch diſtricts to find proſtrate foreſts of trees under many feet of ſolid peat and ſilt, and even the tools, in ſome inſtances, which man, in the early periods of the hiſtory of this iſland, has employed in felling and converting them to his uſe; and this, in ſituations at preſent much below the high water level of every tide of the ſea, and ſcarcely elevated above low water level, in many inſtances, where no ſpecies of tree or plant of the kinds now found will grow, owing to the ſalt water, as obſerved under Encroachment *of the Sea*. In the Phil. Tranſ. 1799, part i. p. 145, Dr. Correa de Serra's ſurvey of a ſubmarine foreſt on the eaſt coaſt is given, and ſimilar ſubmerſions are obſervable on the flat ſhores of almoſt every maritime county of the Britiſh iſland: ſuch ſeem ſtrongly to point to one of two concluſions, *viz.* that the iſland has either ſubſided ſome feet into the boſom of the ocean within the laſt eight or ten centuries, or that the ſea has riſen as much within the ſame period, which latter phenomenon muſt have been obſerved on the oppoſite continent, in Denmark, France, and Spain, as well as the Netherlands, if it had occurred.

Forest *Trees*, in *Gardening*, is a common name for all ſuch trees as are grown in large woods and foreſts, either for the purpoſe of timber, or other uſes. Moſt of the deciduous trees are of this kind, and the term may be applied with propriety to many of the evergreen ſorts, as they are frequently introduced into large foreſt plantations. There are many different kinds of theſe trees; but thoſe chiefly raiſed as timber are oak, aſh, elm, beech, cheſnut, maple, birch, lime, alder, poplar, larch, fir, pine, &c.

The methods of raiſing foreſt-trees are different according to the ſeveral kinds, but principally by ſeeds, layers, and cuttings, as ſhewn under their different heads.

In the raiſing of plantations of foreſt-trees, either by ſowing the ſeeds of them, or ſetting the young plants after they have attained ſome growth, care ſhould conſtantly be taken to adapt the ſorts of the trees as much as poſſible to the ſtate and nature of the ſoil, as well as to the ſituation and expoſure of the land. In this way they ſucceed with much greater certainty and ſucceſs.

It is found by experience that the oak, elm, maple, birch, &c. ſucceed beſt on ſuch ſoils as are of the more deep and heavy kinds; while the aſh, beech, cheſnut, larch, fir, pine, &c. thrive the moſt perfectly in ſuch ſoils as are of the more light, dry, and friable deſcriptions; and the alder, poplar, willow, &c. where the moiſture is more conſiderable.

The proper management of foreſt-trees is a matter which requires much care and attention. They demand, in both thinning out and pruning their branches, the greateſt nicety and attention to the different circumſtances of the caſes. Where the climate is ſevere, and the expoſure conſiderable, much leſs thinning and pruning will be requiſite than under the contrary circumſtances. And in the latter operation, the nature and habits of growth of the trees are likewiſe to be taken into the account, and well conſidered, before the work is begun. In the buſineſs of thinning out foreſt-trees, where the ſituations are bleak and expoſed, great regard muſt alſo be had to the preſervation of ſuch ſorts of them, eſpecially near the outſides, as are the moſt ſuited to the nurſing and ſheltering of the others. Scarcely any thinning at all will be required in the more outward circles of foreſt-woods in ſuch ſituations. And in all caſes the work of thinning ſhould be performed in a gradual manner, ſo as not to cauſe too great a cold and expoſure at once to the trees.

Evergreen and reſinous trees in general ſtand in need of much leſs pruning than ſuch as are of the deciduous kind; indeed, till lately they have ſcarcely been attempted to be pruned at all; and how far the pruning ſyſtem which has recently been introduced, with reſpect to them, may be beneficial, is yet to be decided by the reſults of further trials. It has obviouſly one great diſadvantage, which is that of rendering the trees much leſs ornamental. It muſt be a very conſiderable increaſe in the growth of the timber of ſuch trees that can compenſate for ſuch a deficiency in their ornamental appearance.

The great object of pruning foreſt-trees is that of augmenting the growth of the wood or timber, by preventing their ſap-juice from being too greatly expended on the boughs or branches. But as it is neceſſary to the healthy growth and increaſe of ſuch trees that they ſhould poſſeſs a ſufficient number of ſuch branches, it is eaſy to perceive that the work of pruning may be carried too far, except this point be properly regarded in the execution of it. Proper pruning only requires that ſuch branches ſhould be removed as are ſuperfluous and unneceſſary to the perfect timber growth of the trees. Where length of bole is wanted, the lower boughs ſhould chiefly be trimmed off, thinning out at the ſame time a few in different parts of the head, which are placed in the moſt irregular or improper manner. But in caſes where the trees have been drawn up to a ſufficient length in the boles, the more irregular boughs of their heads need only be gradually thinned out, ſo as to promote their full growth and increaſe in wood. The branches ſhould in all caſes be cut off as cloſely and evenly as poſſible to the trees, and, to prevent the larger ones from ſplitting and doing injury in that way, they ſhould be cut on the under as well as upper ſide at the time they are removed or taken off from the trees.

By due attention in the pruning of trees, eſpecially when taken while they are young, their regular and ſtraight growths may be greatly directed and promoted. See Pruning *Timber Trees*.

All ſorts of foreſt-trees ſhould be well ſecured from being cropped while young by cattle, as, whenever a branch or ſhoot is taken off by them, the tree is in great danger of being wholly deſtroyed. It is the beſt method to remove ſuch injured ſhoots as ſoon as poſſible, by cutting them away cloſe to the bodies of the trees.

Beech, and ſome of the ſoft wooded trees, bear pruning

worſe than other ſorts, which ſhould be kept in mind by the workman employed in the execution of the buſineſs.

The moſt proper ſeaſon for pruning young trees of the foreſt kind is from February to the end of the following month, but they are often improperly pruned at other periods. And it ſhould be performed every ſecond or third year, according to the extent of growth, and the ſort of tree.

The growth of foreſt trees is extremely different according to the kind, ſoil, climate, expoſure, and various other circumſtances; but, in general, it may be from one inch to two inches in thickneſs in the boles, in the courſe of the year. And it is found that the large and ſmall trees increaſe in this reſpect pretty much in the ſame proportion where they are in equally thriving conditions. Mortimer long ſince, however, found that the ſtate and quality of the ſoil had much influence in this buſineſs; and after ſtating the common increaſe in the oak to be about one inch and a quarter in the body in the year, aſſerts that a large oak, which grew in one of his own ploughed fields, where the earth was tilled and manured every year, and that had often cattle lying under it, that dunged about its roots, grew annually no leſs than four inches in thickneſs. This is conſidered as a great proof of the advantage of digging about the roots of foreſt-trees and dunging them; and is ſuggeſted as a practical method of increaſing their growth in many caſes. The deſtruction of the weeds which riſe about foreſt-trees is likewiſe another method which is propoſed for increaſing their growth. The ſhrubby underwood in foreſts and coppices is, however, conſidered as highly beneficial in promoting the growth of the trees which they contain. It is probable, however, that the warmth cauſed by the cloſeneſs of ſuch woods may, in ſome meaſure, contribute to the effect. See PLANTATION, and PLANTING.

When foreſt-trees are tranſplanted, it ſhould be done while they are very young, as only of a few years growth, the ground having been previouſly well prepared for the purpoſe of receiving them. The oak, and other tap-rooted trees ſhould perhaps ſeldom, if ever, be tranſplanted where they are intended to ſtand for timber, as by ſuch means theſe roots are deſtroyed, and conſequently the natural habit of growth in them changed. See TRANSPLANTING *Timber-trees*.

FORE-STAFF, an inſtrument uſed at ſea, for taking the altitudes of heavenly bodies.

The fore-ſtaff, called alſo croſs-ſtaff, takes its denomination hence, that the obſerver, in uſing it, turns his face towards the object, in contradiſtinction to the back-ſtaff, where he turns his back to the object.

The fore, or croſs-ſtaff, repreſented in *Plate* I. *Navig. fig.* 7. conſiſts of a ſtraight ſquare ſtaff, A B, graduated like a line of tangents, and four croſſes or vanes, F F, E E, D D, C C, which ſlide thereon. The firſt and ſhorteſt of theſe vanes, F F, is called the ten-croſs, or vane, and belongs to that ſide of the inſtrument whereon the diviſions begin at three degrees and end at ten. The next longer vane, E E, is called the thirty-croſs, belonging to that ſide of the ſtaff wherein the diviſions begin at ten degrees, and end at thirty, called the thirty-ſcale. The next vane, D D, is called the ſixty-croſs, and belongs to the ſide where the diviſions begin at twenty degrees, and end at ſixty. The laſt and longeſt, C C, called the ninety-croſs, belongs to the ſide whereon the diviſions begin at thirty degrees and end at ninety.

FORE-STAFF, *uſe of the.* The great uſe of this inſtrument is to take the height of the ſun and ſtars, or the diſtance of two ſtars; and the ten, thirty, ſixty, or ninety croſſes, are to be uſed according as the altitude is greater or leſſer; that is, if the altitude be leſs than ten degrees, the ten-croſs is to be uſed; if above ten, but leſs than thirty, the thirty-croſs is to be uſed, &c.

Note, For altitudes greater than thirty degrees, this inſtrument is not ſo convenient as a quadrant or ſemi-circle.

FORE-STAFF, *to obſerve an altitude by the.* Apply the flat end of the ſtaff to your eye, and look at the upper end of the croſs for the centre of the ſun or ſtar, and at the lower end for the horizon. If you ſee the ſky, inſtead of the horizon, ſlide the croſs a little nearer the eye; and if you ſee the ſea, inſtead of the horizon, ſlide the croſs farther from the eye: and thus continue moving, till you ſee exactly the ſun or ſtar's centre by the top of the croſs, and the horizon by the bottom thereof.

Then the degrees and minutes, cut by the inner edge of the croſs upon the ſlide of the ſtaff, peculiar to the croſs you uſe, give the altitude of the ſun or ſtar.

If it be the meridian altitude you want, continue your obſervation as long as you find the altitude increaſe, ſtill moving the croſs nearer to the eye.

By ſubtracting the meridian altitude thus found, from ninety degrees, you will have the zenith diſtance.

To work accurately, an allowance muſt be made for the height of the eye above the ſurface of the ſea, *viz.* for one Engliſh foot, 1 minute; for five feet, $2\frac{1}{2}$; for ten feet, $3\frac{1}{2}$; for twenty feet, 5; for forty feet, 7, &c.

Theſe minutes, ſubtracted from the altitude obſerved, and added to the zenith diſtance obſerved, give the true altitude, and zenith diſtances.

FORE-STAFF. *To obſerve the diſtance of two ſtars, or the moon's diſtance from a ſtar, by the fore-ſtaff.* Apply the inſtrument to the eye, and looking to both ends of the croſs, move it nearer or farther from the eye, till you ſee the two ſtars; the one on the one end, and the other on the other end of the croſs; then the degrees and minutes cut by the croſs on the ſide proper to the vane in uſe, give the ſtar's diſtance.

FORESTAGE, FORESTAGIUM, in our *Ancient Cuſtoms*, an obſolete duty or ſervice, paid by the foreſter to the king. In Brittany, Lobineau obſerves, the office of foreſters was held by gentlemen of the firſt rank, who for their foreſtage were obliged to furniſh the lord, when he kept open houſe, with cups and ſpoons.

FORESTAGE alſo ſeems to have been uſed for a duty payable to the king's foreſters. "Ei ſint quieti de thelonio, et paſſagio, et de foreſtagio, &c." Chart. Edw. I.

It may likewiſe be taken for a right to uſe the foreſt, or a taking of reaſonable eſtovers.

FORESTAL, or FORSTAL, in Domeſday wrote *Foriſtel*, is an intercepting in the highway; or ſtopping, or even inſulting a paſſenger therein.

The word is formed of the Saxon *fore*, before, and *ſtal*, ſtation. In the laws of Henry I. the ſenſe of the word is thus explained: "foreſtal eſt, ſi quis ex tranſverſo incurrat, vel in viam expectet, et aſſaliet inimicum ſuum."

FORESTALLER, a perſon who buys up or foreſtalls the market of any articles of prime neceſſity; and who procures them on their way, or in the road to it.

FORESTALLING, the practice of buying up or bargaining largely for ſuch articles as are of the firſt neceſſity, as grain, fat cattle, ſheep, &c. in the way or paſſage before they reach the markets or fairs where they are to be ſold, with the view of enhancing their prices, in order to re-ſell them in the ſame places to a higher profit. Alſo the intercepting or procuring them as they come from beyond the ſeas or otherwiſe, towards any city, port, haven, or creek

of the kingdom. It has been ſtated by Fleta that it ſignifies "obſtructionem viæ vel impedimentum tranſitus, et fugæ averiorum."

It is a miſchievous practice which has long too much prevailed, and which ſeems at preſent far from being on the decline near large towns where the conſumption is great. It ſhould be guarded againſt as much as poſſible by a more full and complete enforcement of the laws againſt it.

By the 5th and 6th of Edw. VI. cap. 14. it is enacted that any buying or contracting for merchandize, victuals, or other things whatſoever, in the way, coming by land or water, to any fair or market, or to any port, &c. to be ſold, or cauſing the ſame to be bought; or diſſuading people by word, letter, or meſſage, or otherwiſe, from bringing ſuch things to market; or perſuading them to enhance the price after they are brought thither, is foreſtalling: and the party guilty of any offence of foreſtalling, &c. upon conviction at the quarter ſeſſions by two witneſſes, on bill, information, preſentment, &c. ſhall for the firſt offence loſe the goods ſo bought, or the value of them, and ſuffer two months impriſonment: for the ſecond offence, he ſhall forfeit double the value, and be impriſoned ſix months; and for the third offence, he ſhall loſe all his goods, be ſet up in the pillory, and be impriſoned at the king's pleaſure.

Several other ſtatutes have been made from time to time againſt the offences of foreſtalling, engroſſing, and regrating, all of which, from the 5 & 6 Edw. VI. c. 14. above cited, downwards, and all acts for enforcing the ſame, are repealed by ſtat. 12 Geo. III. c. 71, from the preamble of which we learn that the remedy was found worſe than the diſeaſe. But theſe offences againſt public trade are highly criminal at common law (1 Hawk. P. C. 234); and are puniſhable by diſcretionary fine and impriſonment. (Id. 235.) Indeed, ſo jealous is the common law of practices of this nature, which are a general inconvenience and prejudice to the people, and peculiarly oppreſſive to thoſe of the poorer claſs, that it will not ſuffer corn to be ſold in the ſheaf before it is thraſhed; for by ſuch ſale the market is in effect foreſtalled. 3 Inſt. 197. H. P. C. 152.

FORESTALLING is particularly uſed in Crompton, for ſtopping a deer broken out of the foreſt, and preventing its returning home again; or, a lying between him and the foreſt in the way he is to return.

FORESTEAD, in *Mining*, ſignifies a ſmall and inferior ſort of lead ore, obtained by buddling the old hillocks or refuſe of former ore-dreſſing; it is inferior to *ſmytham*, which ſee.

FORESTER, a ſworn officer of the foreſt, appointed by the king's letters patent to walk the foreſt, and watch the vert and veniſon; as alſo to attach and preſent all treſpaſſes againſt both, within his bailiwick or walk, to the foreſt-courts, to be puniſhed according to their offences. He is alſo to take care of the lawing of dogs.

Though the letters patent of a foreſter be ordinarily only granted *quamdiu bene ſe geſſerit*; yet they are granted to ſome and their heirs, who are hereby called foreſters in fee. 4. Inſt. 293. But though this office is a fee ſimple, it cannot be granted or aſſigned over without the king's licence. 4 Inſt. 316.

A "riding foreſter" is to lead the king in his hunting (1 Jones 277). Although every lord of parliament, ſent for by the king, may, both in coming and returning, kill a deer or two in the king's foreſt or chace through which he paſſes; yet it muſt not be done privily, without the view of the foreſter, if preſent; or, if abſent, by cauſing one to blow a horn; becauſe otherwiſe he may be a treſpaſſer, and ſeem to ſteal the deer. Chart. Foreſt. c. 11. 4 Inſt. 308. If any foreſter find any perſon hunting without warrant he is to arreſt his body, and carry him to priſon, from whence he ſhall not be delivered without ſpecial warrant from the king, or his juſtices of the foreſt, &c. But by ſtat. 1 Ed. III. c. 8. perſons are bailable, if not taken in *the manour*, as with a bow ready to ſhoot, carrying away deer killed, or ſmeared with blood: though if one be not thus taken, he may be attached by his goods. 4 Inſt. 289. A foreſter ſhall not be queſtioned for killing a treſpaſſer, who (after the peace cried to him) will not yield himſelf; ſo as it be not done out of ſome former malice. Stat. 21 Ed. I. ſt. 1. But if treſpaſſers in a foreſt, &c. kill a man who oppoſes them, although they bore no malice to the perſon killed, it is murder; becauſe they were upon an unlawful act, and therefore malice is implied. Rol. Abr. 548. And if murder be committed by ſuch treſpaſſers, all are principals. Kel. 87.

Sir William Temple relates, that the Franks having ſubdued all Gaul, their princes reduced Flanders into a kind of government, and gave the quality of foreſter, with part of the province, to the braveſt of their captains.

This quality of lord foreſter held till the time of Charlemagne, or, according to others, of Charles the Bald, in whoſe time Flanders being erected into a county, the title of foreſter was changed into that of count.

FORESTUS, PETRUS, or PETER VAN FOREEST, in *Biography*, was born at Alcmaer in 1522. He was ſent by his father to Louvain, in order to ſtudy with a view to the profeſſion of the law; which, however, he ſoon changed, on account of his ſtrong inclination to the profeſſion of medicine. This ſcience he cultivated in the univerſities of Bologna, Padua, and Rome; at the former of which he graduated, and afterwards proceeded to complete his ſtudies at Paris. He ſettled, at the requeſt of his friends, in his native town; but at the end of twelve years removed to Delft, in conſequence of a petition from the inhabitants of that place, which was at that time ravaged by a fatal contagious epidemic. Foreeſt obeyed the call of humanity, notwithſtanding the dangers to which he was neceſſarily expoſed. But he not only preſerved his own health, but was extremely ſucceſsful in his adminiſtration of remedies to others; inſomuch that the town of Delft regarded him as their preſerver, and retained him in the capacity of phyſician, with a conſiderable penſion, for nearly thirty years; after which he was invited to Leyden, to give the firſt lectures on medicine, at the opening of the univerſity in 1575. He afterwards returned to Delft, and reſided there about ten years more, when his attachment to his native city impelled him to viſit Alcmaer, where he terminated his life in 1597, in the ſeventy-fifth year of his age.

Foreſtus, (for by his Latin name he is beſt known,) was one of the moſt expert phyſicians of his time: he was extremely induſtrious, and his principal views were directed to the obſervation of diſeaſes, in which he manifeſted, in numerous inſtances, a conſiderable degree of penetration and judgment. Haller, indeed, has thrown out ſome ſuſpicions againſt the hiſtories of diſeaſe which he has detailed; and apprehends that he was occaſionally more anxious to prove the juſtneſs of his prognoſtics, and the felicity of his cures, than to relate a true account of the ſymptoms: but Boerhaave has praiſed him highly for the care and attention which he has evinced in the collection of ſo large a number of hiſtories of diſeaſe. The following are the titles of his works. 1. "Obſervationum et Curationum Medicinalium ſive Medicinæ Theoricæ et Practicæ, libri 28." Francofurti, 1602, two vols. in folio.

2. A third volume of the ſame work in 1604; and 3. A fourth volume, conſiſting of the 30th, 31ſt, and 32d books in 1607. 4. In 1610 a fifth volume was printed, under the title of "Obſervationum et Curationum Chirurgicarum, libri quinque. Acceſſerunt de incerto ac fallaci Urinarum judicio adverſus Uromentas et Uroſcopos, libri tres;" in which the fallacy and abſurdity of the pretenſions of the uroſcopiſts are clearly pointed out. 5. A ſixth and laſt volume of theſe treatiſes was publiſhed at Frankfort, in 1611, with the title of "Obſervationum et Curationum Chirurgicarum, libri quatuor poſterius," folio. All theſe books of obſervations were printed ſeparately at Leyden, between the years 1589 and 1610, in 8vo. The three books relative to the urine, in 1583. Complete collections of the works of Foreſtus have been ſubſequently publiſhed at various times and places.

FORE-THIGH, a term denoting the arm in the horſe and ſome other animals. It is a point not much attended to in neat cattle-ſtock.

FORE-TOP *of a Ship*. See TOP.

FORE-TOP-*Maſt* is half the length of the fore-maſt, and the fore-top-gallant-maſt half the length of the fore-top-maſt. See TOP-*maſt*, MAST, and SHIP.

FORE-TOOTH. Striking out the fore tooth is a mayhem.

FORE-YARD. See YARD.

FOREZ, in *Geography*, a country of France, ſo called before the revolution: it was a large and fertile valley interſected with ſmall rivers, which run into the Loire. The principal towns were Montbriſon and Roanne. The ſoil is fertile, but the air is not deemed wholeſome; it produces corn, hemp, excellent wine, cheſnuts, and other fruits. In ſeveral places are mines of coal and iron, and medicinal ſprings.

FORFANG. See FOREFANG.

FORFAR, in *Geography*, a royal burgh of conſiderable antiquity, and the county town of Angus, or Forfarſhire, is ſituated 13 miles N. of Dundee. At what time it was erected into a royal burgh is uncertain; a writ of *novodamus*, however, confirming its privileges as ſuch, with parliamentary ratification, dated 1669, is ſtill in poſſeſſion of the corporation. By virtue of this it is governed by a provoſt, two bailiffs, and nineteen counſellors, elected annually; and conjointly with Perth, Dundee, St. Andrew's, and Cupar-fife, ſends one member to the Britiſh ſenate. The ſtreets are irregular, though they contain many well-built and handſome houſes. The church, an elegant and commodious ſtructure, ſtands nearly in the centre of the town. The ſeſſions-houſe, lately re-built, has a neat front towards the market-place: the lower part is appropriated for priſoners, and the upper conſiſts of a ſpacious ſet of apartments for the tranſaction of municipal buſineſs, public meetings, and amuſements; and here the ſheriff holds his courts. The population of the town is about four thouſand; but it appears by the returns made to government in 1801, the number of houſes in the pariſh amounted to 726, and inhabitants to 5165; the greater part of whom are employed in manufacturing of ſail-cloth, canvas, Oſnaburghs for ſheeting, and other kinds of coarſe linen-cloth, which find a market by the neighbouring ſea-port of Dundee, on the river Tay. In the vicinity of Forfar are ſeveral lakes, or lochs, as they are here termed, *viz.* Reſtenet, Fithie, and Forfar. On the banks of the firſt are the remains of a priory, dependent formerly on the monaſtery of Jedburgh. The ſecond is about a mile in circumference, and the preſent proprietor has lately erected on its margin an elegant boudoir, or ſummer-houe. In the loch of Forfar was formerly an iſland, on which ſtood a caſtle, the reſidence of Malcolm Canmore; at which time it formed alſo a place of religious retirement for queen Margaret; but by the draining occaſioned by digging for peat, this is now united to the land. From this lake iſſues the rivulet, called Dean, which falls into the river Iſla, in its progreſs through Strathmore to the Tay.

FORFARSHIRE. See ANGUS-SHIRE.

FORFEITURE originally ſignifies a tranſgreſſion or offence againſt ſome penal law.

Forfeiture is defined by judge Blackſtone to be a puniſhment annexed by law to ſome illegal act, or negligence in the owner of lands, tenements, or hereditaments, whereby he loſes all his intereſt therein, and they go to the party injured, as a recompence for the wrong which either he alone, or the public together with himſelf, hath ſuſtained.

The word is formed of the baſe Latin *forisfactura*; whence *forfaitura*, and *forfaictura*, and the French *forfait*. *Forisfactura* comes of *forisfacere*, which, according to Iſidore, ſignifies *to hurt*, or *offend*, *facere contra rationem*; and which is not improperly derived of *foris*, *out*, and *facere*, *to do*; q. d. an action out of rule, or contrary to the rules.

But with us, it is now more frequently uſed for the effect of ſuch trangreſſion, or the loſing ſome right, privilege, eſtate, honour, office, or effects, in conſequence thereof, than for the tranſgreſſion itſelf: as forfeiture of eſcheats, forfeiture of goods, &c. A fee becomes vacant by the forfeiture or rebellion of the vaſſal.

Goods forfeited, and goods confiſcated, differ: thoſe which have a known owner, who has committed ſome offence, whereby he loſes his goods, are ſaid to be forfeited: thoſe which an offender diſavows, as not his own, and which are not claimed by any other, are ſaid to be confiſcated; ſtat. 25 Edw. III. Add, that forfeiture, or forfeit, is more general; and confiſcation more particular, being principally uſed for ſuch as forfeit only to the king's exchequer.

FORFEITURE, *full*, *plena forisfactura*, called alſo *plena vita*, is a forfeiture of life and member, and all elſe that a man has.

This obtains in criminal caſes, as where a perſon is attainted of treaſon, felony, &c. There is alſo a forfeiture of lands, &c. in civil caſes. There are various degrees and various means, whereby lands, tenements, and hereditaments, may be forfeited. 1. By crimes and miſdemeanors: of theſe, the principal offences that induce a forfeiture of lands and tenements to the crown, are treaſon, felony, miſpriſion of treaſon, præmunire, drawing a weapon on a judge, or ſtriking any one in the preſence of the king's principal courts of juſtice, and popiſh recuſancy, or non-obſervance of certain laws enacted in reſtraint of papiſts.

Forfeiture in criminal caſes is two-fold: *viz.* of real and perſonal eſtates. 1. As to real eſtates; by attainder in high treaſon a man forfeits to the king all his lands and tenements of inheritance, whether fee-ſimple, or fee-tail, and all his rights of entry to lands and tenements, which he had at the time of the offence committed, or at any time afterwards to be for ever veſted in the crown; and alſo all the profits of all lands and tenements which he had in his own right for life or years, ſo long as ſuch intereſt ſhall ſubſiſt. (Co. Litt. 392. 3 Inſt. 19. 1 Hal. P. C. 240. 2 Hawk. P. C. 448. Stat. 26 Hen. VIII. c. 13). This forfeiture relates backwards to the time of the treaſon committed;

committed; ſo as to avoid all intermediate ſales and incumbrances (3 Inſt. 211.); but not thoſe before the fact: and, therefore, a wife's jointure is not forfeitable for the treaſon of her huſband, becauſe it was ſettled upon her previous to the treaſon committed. But her dower is forfeited by the expreſs proviſion of ſtatute 5 and 6 Edw. VI. c. 11. And yet the huſband ſhall be tenant by the curteſy of the wife's lands, if the wife be attainted of treſon (1 Hal. P. C. 359.): for that is not prohibited by the ſtatute. But, though after attainder, the forfeiture relates back to the time of the treaſon committed, yet it does not take effect unleſs an attainder be had, of which it is one of the fruits; and, therefore, if a traitor dies before judgment pronounced, or is killed in open rebellion, or is hanged by martial law; it works no forfeiture of his lands, for he never was attainted of treaſon (Co. Litt. 13.) But if the chief juſtice of the king's bench (the ſupreme coroner of all England) in perſon upon the view of the body of one killed in open rebellion, records it, and returns the record into his own court, both lands and goods ſhall be forfeited. (4 Rep. 57.)

Forfeiture of lands and tenements to the crown for treaſon is by no means derived from the feodal policy, but was antecedent to the eſtabliſhment of that ſyſtem in this iſland; being tranſmitted from our Saxon anceſtors, (Ll. Aelfr. c. 4. Canut. c. 54.); and forming a part of the ancient Scandinavian conſtitution, (Stiernh. de jure Goth. l. ii. c. 6. l. iii. c. 3.) But in certain treaſons relating to the coin, it is provided by ſome of the modern ſtatutes (5 Eliz. c. 11. 18 Eliz. c. 1.) which conſtitute the offence, that it ſhall work no forfeiture of lands, ſave only for the life of the offender; and by all, that it ſhall not deprive the wife of her dower, (ſtat. 8 and 9 W. III. c. 26. 15 and 16 Geo. II. c. 28.) And in order to aboliſh ſuch hereditary puniſhment entirely, it was enacted by ſtatute 7 Ann. c. 21. that, after the deceaſe of the late pretender, no attainder for treaſon ſhould extend to the diſinheriting of any heir, or to the prejudice of any perſon, other than the traitor himſelf. By this act, the law of forfeiture for high treaſon would by this time have been at an end, if a ſubſequent ſtatute had not intervened to give them a longer duration. In order to explain this part of hiſtory, it ſhould be conſidered, that at the time of the union, the crime of treaſon in Scotland was, by the Scotch laws, in many reſpects different from that of treaſon in England; and particularly in its conſequence of forfeiture of entailed eſtates, which was more peculiarly Engliſh; yet it ſeemed neceſſary, that a crime, ſo nearly affecting government, ſhould, both in its eſſence and conſequences, be put upon the ſame footing in both parts of the united kingdoms. In new-modelling theſe laws, the Scotch nation and the Engliſh houſe of commons ſtruggled hard, partly to maintain, and partly to acquire, a total immunity from forfeiture and corruption of blood; which the houſe of lords as firmly reſiſted. At length a compromiſe was agreed to, which is eſtabliſhed by this ſtatute, *viz.* that the ſame crimes, and no other, ſhould be treaſon in Scotland, that are ſo in England; and that the Engliſh forfeitures and corruption of blood ſhould take place in Scotland, till the death of the then pretender; and then ceaſe through the whole of Great Britain; (Burnet's Hiſt. A. D. 1709): the lords artfully propoſing this temporary clauſe, in hopes, as it is ſaid, that the prudence of ſucceeding parliaments would make it perpetual. (Foſt. 250.) This has partly been done by the ſtatute 17 Geo. II. c. 39, (made in the year preceding the late rebellion,) the operation of theſe indemnifying clauſes being thereby ſtill farther ſuſpended, till the death of the ſons of the pretender.

In petit treaſon, miſpriſion of treaſon, and felony, the offender alſo forfeits his chattel intereſts abſolutely, and the profits of all eſtates of freehold during life; and, after his death, all his lands and tenements in fee-ſimple, (but not thoſe in tail,) to the crown, for a very ſhort period of time; for the king ſhall have them for a year and a day, and may commit therein what waſte he pleaſes; which is called the king's "year, day, and waſte." (2 Inſt. 37.) Formerly the king had only a liberty of committing waſte on the lands of felons, by pulling down their houſes, extirpating their gardens, ploughing their meadows, and cutting down their woods. And a puniſhment of a ſimilar ſpirit appears to have obtained in the oriental countries, from the decrees of Nebuchadnezzar and Cyrus, in the books of Daniel (ch. iii. v. 29.) and Ezra (ch. vi. v. 11.); which, beſides the pain of death inflicted on the delinquents there ſpecified, ordain, "that their houſes ſhall be made a dung-hill." But as this tended greatly to the prejudice of the public, it was agreed, in the reign of Henry I. in this kingdom, that the king ſhould have the profits of the land for one year and a day, in lieu of the deſtruction he was otherwiſe at liberty to commit; (Mirr. c. 4. § 16. Flet. l. i. c. 28.); and therefore Magna Carta provides, (9 Hen. III. c. 22.), that the king ſhall only hold ſuch lands for a year and a day, and then reſtore them to the lord of the fee; without any mention made of waſte. But the ſtatute 17 Edw. II. "de prærogativâ regis," ſeems to ſuppoſe, that the king ſhall have his year, day, and waſte; and not the year and day *inſtead* of waſte; which ſir Edward Coke, (and the author of the "Mirror" before him,) very juſtly look upon as an encroachment, though a very ancient one, of the royal prerogative, (Mirr. c. 5. § 2. 2 Inſt. 37.) This year, day, and waſte, are now uſually compounded for; but otherwiſe they regularly belong to the crown; and, after their expiration, the land would naturally have deſcended to the heir, (as in gavel-kind tenure it ſtill does,) if its feodal quality did not intercept ſuch deſcent, and give it by way of eſcheat to the lord. Theſe forfeitures for felony do alſo ariſe only upon attainder; and therefore a "felo de ſe" forfeits no lands of inheritance or freehold, for he never is attainted as a felon, (3 Inſt. 55.) They likewiſe relate back to the time of the offence committed, as well as forfeitures for treaſon; ſo as to avoid all intermediate charges and conveyances. As a part of the forfeiture of real eſtates, we might here mention the forfeiture of the profits of lands during life; which extends to two other inſtances beſides thoſe already ſpoken of, the ſtriking in Weſtminſter hall, or drawing a weapon upon a judge then ſitting in the king's courts of juſtice, (3 Inſt. 141.) And it ſeems that the ſame forfeiture is incurred by reſcuing a priſoner in or before any of the courts there, committed by the judges. (Cro. Jac. 567.)

2. The forfeiture of "goods and chattels" accrues in every one of the higher kinds of offence; in high treaſon and miſpriſion thereof, petit treaſon, felonies of all ſorts, whether they be clergyable or not, ſelf-murder or felony *de ſe*, petty larciny, ſtanding mute, and the above-mentioned offences of ſtriking, &c. in Weſtminſter hall. In *flight* alſo, on an accuſation of treaſon, felony, or even petit larciny, whether the party be found guilty or acquitted, if the jury find the flight, the party ſhall forfeit his goods and chattels. But the jury very ſeldom find the flight (Staundf. P. C. 183 *b.*) forfeiture being looked upon, ſince the vaſt increaſe of perſonal property of late years,

as

as too large a penalty for an offence, to which a man is prompted by the natural love of liberty.

Between the forfeiture of lands, and that of goods and chattels, there are ſome remarkable differences. 1. Lands are forfeited upon *attainder*, and not before; goods and chattels are forfeited by *conviction*. 2. In outlawries for treaſon or felony, lands are forfeited only by the judgment; but the goods and chattels are forfeited by a man's being firſt put in the *exigent*, without ſtaying till he is *quinto exactus*, or finally outlawed; for the ſecreting himſelf ſo long from juſtice, is conſtrued a flight in law. (3 Inſt. 232.) 3. The forfeiture of lands has relation to the time of the fact committed, ſo as to avoid all ſubſequent ſales and incumbrances; but the forfeiture of goods and chattels has no relation backwards; ſo that thoſe only which a man has at the time of conviction ſhall be forfeited. Therefore a traitor or felon may *bonâ fide* ſell any of his chattels, real or perſonal, for the ſuſtenance of himſelf and family between the fact and conviction (2 Hawk. P. C. 454.); for perſonal property is of ſo fluctuating a nature, that it paſſes through many hands in a ſhort time; and no longer could be ſafe, if he were liable to return the goods which he had fairly bought, provided any of the prior vendors had committed a treaſon or felony. Yet if they be colluſively, and not *bonâ fide*, parted with, merely to defraud the crown, the law (and particularly the ſtatute 13 Eliz. c. 5.) will reach them; for they are all the while truly and ſubſtantially the goods of the offender; and as he, if acquitted, might recover them himſelf, as not parted with for a good conſideration; ſo in caſe he happens to be convicted, the law will recover them for the king.

Lands which a perſon hath in truſt, or goods and chattels in right of another, or to another's uſe, &c. will not be liable to forfeiture. Though leaſes for years, in a man's own, or his wife's right, eſtates in jointenancy, &c. and all ſtatutes, bonds, and debts due thereby, and upon contracts, &c. ſhall be forfeited. (Co. Litt. 42. 151. Staundf. 188.)

3. There is a forfeiture by *alienation*, (which ſee,) contrary to law, which may be in *mortmain* (ſee MORTMAIN); to an alien, not only on account of his incapacity to hold the lands ſo alienated; which occaſions him to be paſſed by in deſcents of land, but likewiſe on account of his preſumption in attempting, by an act of his own, to acquire any real property, (ſee ALIEN); and by particular tenants, when the alienations are greater than the law entitles them to make, and diveſt the remainder or reverſion; in which caſe they become forfeitures to him whoſe right is hereby injured; there is alſo an alienation by *diſclaimer*, which ſee. 4. By non-preſentation to a benefice, when the forfeiture is denominated a *lapſe*, which ſee. 5. By *ſimony*, which ſee. 6. By breach or non-performance of *conditions*, annexed to eſtates, either expreſſed or legally implied. (See CONDITION.) 7. By *waſte*, which ſee. 8. By breach of copyhold cuſtoms. (See COPYHOLD.) 9. By *bankruptcy*, which ſee. There are alſo various other forfeitures, beſides thoſe already recited, that are inflicted, by ſpecial ſtatutes, for particular crimes and miſdemeanors; ſome of which are *mala in ſe*, or offences againſt the divine law, either natural or revealed; but by far the greateſt part are *mala prohibita*, or ſuch as derive their guilt merely from their prohibition by the laws of the land; ſuch as the forfeiture of 20*s.* per month by the ſtat. 5 Eliz. cap. 4. for exerciſing a trade without having ſerved ſeven years apprenticeſhip to it; and the forfeiture of 1*l.* by 9 Ann. cap. 23. for printing an almanack without a ſtamp. Thus alſo artificers, going out of the kingdom and teaching their trade to foreigners, are liable to forfeit their lands, &c. by ſtat. 5 Geo. I. c. 27. (See MANUFACTURES.) In all caſes where a penalty or forfeiture is given by ſtatute, without ſaying to whom it ſhall be, or a limitation for a recompence for the wrong to the party, it belongs to the king. (Stra. 50. 828. 2 Vent. 267.) And ſuch forfeitures ſhall be conſtrued favourably. (Cowp. 585. 8.) Blackſt. Com. vol. ii. p. 267, &c. 420, &c. vol. iv. p. 370, &c. 416. &c.

Goods or lands of one arreſted for felony ſhall not be ſeized before he is convict or attaint of the felony, on pain of forfeiting double value. (Stat. 1 R. III. c. 3.) Goods of a felon, &c. cannot be ſeized before they are forfeited; though they may be inventoried, and a charge made thereof before indictment. (Wood's Inſt. 659.) When goods of a felon are pawned before he is attainted, the king ſhall not have the forfeiture of the goods till the money is paid to him to whom they were pawned. 3 Inſt. 17. 2 Nelſ. Abr. 874. 5.

The true reaſon of any forfeiture, for crimes, ſays judge Blackſtone, is this: that all property is derived from ſociety, being one of thoſe civil rights which are conferred upon individuals, in exchange for that degree of natural freedom, which every man muſt ſacrifice when he enters into ſocial communities; if, therefore, a member of any national community violates the fundamental contract of his aſſociation, by tranſgreſſing the municipal law, he forfeits his right to ſuch privileges as he claims by that contract; and the ſtate may very juſtly reſume that portion of property, or any part of it, which the laws have before aſſigned him. Hence, in every offence of an atrocious kind, the laws of England have exacted a total confiſcation of the moveable or perſonal eſtate; and in many caſes a perpetual, in others only a temporary loſs of the offender's immoveables or landed property; and have veſted them both in the king, who is the perſon ſuppoſed to be offended, being the one viſible magiſtrate in whom the majeſty of the public reſides. Blackſt. Com. vol. i. p. 299.

FORFEITURE *of marriage*, *foriſfactura maritagii*, a writ which formerly lay againſt him, who, holding by knight's ſervice, and being under age, and unmarried, refuſed her whom the lord offered him, without his diſparagement, and married another. F. N. B. 141. Reg. Orig. 163.

FORFEX, in *Surgery*, a pair of ſciſſars wherewith things may be cut.

The word is ſometimes alſo uſed for pincers, nippers, or pliers; and is often confounded with forceps. Blanchard, and after him Quincy, deſcribes a forfex as an inſtrument for drawing teeth.

FORFICULA, in *Entomology*, a genus of the coleoptera order, in the Linnæan ſyſtem, diſtinguiſhed by the following eſſential characters: antennæ ſetaceous; feelers unequal and filiform; wing-caſes about half the length of the abdomen; wings folded up under the wing-caſes; tail armed with forceps. This is the earwig of Engliſh writers.

The forficulæ can ſcarcely be conſidered with propriety as appertaining to the coleopterous tribes of inſects; and later writers ſeem ſo well aſſured of this, that few continue in this reſpect to follow the example of Linnæus. Fabricius, with more conſiſtency, has placed them in his claſs *ulonata*, together with the blattæ, the mantes, phaſmæ, and other analogous families; and hence we may conceive, had Fabricius been himſelf diſpoſed to adopt the ſyſtem propoſed by Linnæus, he would have placed the forficulæ in the hemiptera inſtead of coleoptera order. There are ſtill objections to this, and we cannot avoid approving, in preference to either, the ſuggeſtion of Latreille, that they conſtitute

conſtitute an intermediate order between the coleoptera and hemiptera. La Marck had previouſly conſtituted a new order for the reception of the forficulæ, blattæ, and other inſects of the ſame natural tribe, to which he gave the name orthoptera; yet he does not place it between the two orders before mentioned: it ſtands in his arrangement between the coleoptera and neuroptera.

The two ſexes of the forficulæ differ a little in general form, and alſo in the ſhape and bulk of the abdomen, as well as the forceps at the extremity of the abdomen. The female is diſtinguiſhed by the ſuperior ſize of the abdomen. The eggs are large, white, and gloſſy; and the larvæ, when hatched, conſiderable in proportion to the magnitude of the egg from whence they are excluded. Few of the inſect tribe evince more attention to their young than the females of the forficulæ. In the firſt inſtance, they are particularly careful to depoſit their eggs in places of ſecurity, and are often ſeen ſitting on them for hours together; and they are alſo known to regard the infant brood with tenderneſs, the young remaining in ſociety with the parent ſome time after being produced from the egg. The forficulæ live in moiſt places, among plants, or under rotten wood and ſtones; and are injurious in particular to the kitchen and flower gardens, as the ravages of the more frequent ſpecies, the common earwig, ſufficiently atteſt.

Species.

Herculeana. Forceps elongated, in the middle beſet with a ſingle tooth, black; legs rufous. Fabr. Suppl.

The largeſt of this genus. The head is black; antennæ ferruginous; thorax flat, ſmooth, and black; wing caſes ſhort, deep black, and without ſpots; body deep black; forceps nearly the length of the body. This ſpecies inhabits the iſland of St. Helena.

Ruficollis. Black; thorax and wing-caſes in the diſc, with the legs ferruginous. Fabr.

A ſpecies of large ſize, found in Africa. The head is black; antennæ teſtaceous, and conſiſting of eleven joints; abdomen black; forceps curved, black, and armed with a ſingle tooth at the baſe.

Gigantea. Pale, variegated above with black; tail bidentated; forceps advanced and armed with a ſingle tooth. Fabr. *Forficula bilineata*, Herbſt. *Gigantic earwig*, Donov. Brit. Inſ.

Inhabits the ſouth of Europe, and is rare in Britain; its magnitude double that of the common kind.

Auricularia. Wing-caſes white at the tip; forceps curved, and denticulated at the baſe; antennæ of fourteen joints. Linn. Fn. Suec., &c. *Forficula major*, Degeer. *Scarabæus ſubrufus, cauda furcata*, Liſter. *Vermis auricularius*, Friſch. *Earwig*, Donov. Brit. Inſ.

Very common in wet places throughout Europe; infeſts fruit-trees and flowers, and is ſaid to creep into the ears of ſuch as ſleep in the open air; whence the name of earwig, or ear-piercer.

Annulata. Black; extreme joint but one of the antennæ, with the legs white. Fabr.

A ſmall ſpecies. The antennæ contain thirteen joints, and are black, except the firſt joint, and the laſt joint but one; legs pale; thighs with a brown annulation. It inhabits South American iſlands.

Bipunctata. Black; hind part of the head, with the legs rufous; wing-caſes with a white ſpot. Fabr.

Native of Italy. The antennæ contain only eleven joints.

Biguttata. Black; wing-caſes with a yellow ſpot; forceps incurved, denticulated in the middle. Fabr.

A ſpecies of moderate ſize, found in Hungary.

Fulvipes. Black; mouth, ſides of the abdomen, and legs white. Fabr.

Large; the antennæ pale, and containing eleven joints; the forceps large, and denticulated within. This ſpecies inhabits Cayenne.

Albipes. Black; thorax behind; baſe of the wing-caſes, wings, and legs white. Fabr.

About the middle ſize, and inhabits the South American iſlands.

Minor. Wing-caſes teſtaceous, and immaculate; antennæ of ten joints. Linn.

A native of Europe, and is eſteemed a rare ſpecies. The antennæ are whitiſh at the tip.

Pygmæa. Black; thorax ſquare, with pale margin; antennæ and legs teſtaceous. Fabr.

Infeſts plants in Guinea. A ſmall ſpecies.

Flexuosa. Forceps flexuous; wing-caſes with yellow dots. Fabr.

Native of Cayenne. The body is brown, and the forceps ferruginous at the baſe.

Dentata. Antennæ of ten joints; body brown; edges of the thorax and legs pale; forceps toothed at the baſe. Fabr.

Inhabits Madeira. The abdomen is brown, extremity of the abdomen armed with four teeth; forceps large, curved, and black.

Erythrocephala. Black; head and tail ferruginous; ſpots on the abdomen, and legs yellowiſh. Fabr.

A ſpecies of moderate ſize, and inhabits South American iſlands.

Elongata. Duſky; margin of the thorax, wing-caſes, and legs pale; forceps with a ſingle tooth at the baſe. Fabr.

Inhabits ſame iſlands as the laſt, and reſembles it in ſize.

Morio. Deep black; antennæ with a white band. Fabr.

A large ſpecies, found in Otaheite. The antennæ conſiſt of eighteen joints of a black colour, except the firſt, fourth, and fifteenth articulations, which are white; the wings are hyaline, with the tip black; and the legs ferruginous at the end.

Parallella. Black; edges of the thorax, wing-caſes, and legs pale; forceps ſtraight and unarmed. Fabr.

Native of Madeira.

Flavipennis. Black; wing-caſes yellowiſh, with a black future. Fabr.

About the middle ſize, and inhabits Senegal. The head is obſcure rufous, with a black frontal ſpot; thorax margined and blackiſh; body black; legs yellow.

Pallipes. Forceps long, with a ſingle tooth; body black; legs white. Fabr.

A large ſpecies. The antennæ pale; wings white, with a brown line at the tip; forceps nearly as long as the abdomen, ferruginous, and tipped with black.

Livida. Livid; very minute; forceps very minutely denticulated. Linn.

Native of Europe.

Forficula *Marina*, the *ſea earwig*, a name given by authors to an inſect frequently found about the ſea-ſhores, and having ſome ſort of external reſemblance to the common earwig. It is of the ſize of the common earwig, and is of a mixed colour, of a deep black and a ſilvery white. The ſhoulders are ſomewhat gibboſe, the eyes ſtanding cloſe to one another on the ſummit of the head; the antennæ are long and very ſlender. It has eight pair of legs on the anterior part of the body, and eight pair more at the hin-

der part, and there are three or four briſtles at the tail. It moves about very ſwiftly, and lives on rocks and among ſtones.

FORGAVEL, Forgabulum, in *Antiquity*, a ſmall reſerved rent in money, or quit-rents.

FORGE, properly ſpeaking, is any kind of furnace, the heat of which is afforded by the action of bellows. The term, however, is now more particularly applied to the common ſmith's forge, and to the forge uſed for the manufacture of bar iron. For a deſcription of the latter, ſee Iron.

A peculiar ſpecies of forge is alſo uſed for the manufacture of ſhear ſteel; for an account of which, ſee Steel. The common ſmith's forge requires bellows of different kinds and ſizes, agreeable to the nature of the work.

The double bellows are chiefly uſed for the working of iron, and ſingle ones for ſteel. The double bellows are apt to blow ſome time after the workman takes out one of his irons; and as in working ſteel, the heat is leſs than that employed for iron, the rod of ſteel, if left in the fire, would be often liable to be burned, as the workmen term it. The ſingle bellows are, therefore, better adapted for this work, becauſe the blaſt does not continue after the workman leaves the bellows.

The fire-place is generally a flat hearth, nearly on a level with the blaſt, on which the fuel is placed, which moſtly conſiſts of the coaks of pit-coal. In ſmithery, however, and more particularly for the working of ſteel, the coal ſhould be carefully ſelected, as free from pyrites as poſſible, as the ſulphur of that ſubſtance is found to be very injurious to the metal. In all caſes where welding is required, the ſulphur totally prevents the adheſion. If pyrites ſhould by accident get into the fire, the beſt means to get rid of it is to throw a quantity of iron-filings into the fire, which immediately takes up the ſulphur.

After the coaks have been uſed for ſome time, the pieces become exceedingly ſmall, and are ſo light as to be blown away by the bellows, ſeparating the fuel from the iron. This inconvenience is removed by taking away theſe ſmall particles from time to time. It, however, may be much eaſier removed by a contrivance which is not in general uſe. This is effected by making the bed of the hearth a grate, about four inches below the level of the blaſt. The ſmall duſt, paſſing through the grate upon an inclined plane, is carried away, leaving nothing on the hearth but the proper fuel.

In moſt of theſe forges, particularly where great heat is required, the nozel of the bellows is not preſented to the fire. A thick iron tube is placed between the bellows and the fire, called the tuiron. It is funnel-ſhaped at the end next the bellows, for the reception of the nozel of the bellows; and has a cylindric hole, from about the middle to the oppoſite end, a little leſs than the aperture at the nozel of the bellows.

Before means were contrived of preventing the tuiron from being raiſed above a certain temperature, it was very ſpeedily worn out by the heat and the oxydation of the iron. This evil has been removed by the invention of what is now called the water-tuiron. It conſiſts of ſomething like the common tuiron, having a crooked tube paſſing through the body of it. One end of the tube, at ſome diſtance from the tuiron, is inſerted into the bottom of a tub, filled with water; the other end coming from the tuiron paſſes over the top of the tub: ſo that the cold water has conſtant acceſs to the body of the tuiron, which the heat of the fire raiſes into vapour. This vapour paſſes up the other tube, which condenſing, is diſcharged into the tub. By this means, it is evident that the tuiron can never much exceed the heat of boiling water. This contrivance prevents a much greater evil than the deſtruction of the tuiron. The oxyd of iron, which is conſtantly formed from the heated iron, combining with the earthy matter of the coal, forms a very fuſible ſcoria, which, if the tuiron were not kept cool, would be apt to adhere to it, and ſtop up its aperture. This ſcoria may be eaſily diſcharged through the grate of the hearth, which would at any rate be an interruption to the blaſt.

The large quantity of oxygen conſtantly blown into the fire, upon the iron, at ſo high a temperature, cauſes a very rapid oxydation of the metal. This oxyd has ſome tendency to vitrification, and conſequently to prevent the iron, in ſome meaſure, from the future attacks of oxygen. Since, however, ſilex forms a very fuſible vitreous compound with the oxyd of iron, the ſmith is in the habit of uſing the powder of any ſtone of a ſandy nature. When the iron becomes nearly of a welding heat, he takes it out to immerſe it in the powdered ſand. A thin fluid ſubſtance is immediately ſeen to flow over the heated ſurface, which defends the metal from the oxygen. In the welding of one piece of iron to another, the uſe of ſand is highly important, and more particularly in welding ſteel to iron. When the two ſurfaces are brought together, the oxyd of iron, with the flint, is removed by reaſon of its great fluidity. If, however, the oxyd were not rendered thus fluid, it would remain and prevent the adheſion of the ſurfaces.

Lead is found to be very injurious to the ſmith's fire; it combines with ſomething on the ſurface of the iron, which makes it unfit for welding. Its preſence is eaſily known, as the iron affected with it makes a brown mark upon the anvil. The ſtrongeſt heat of a forge is at about two inches from, and a little above the aperture of the tuiron.

A forge is alſo uſed by braziers, copper-ſmiths, and in the plated manufactories. This conſiſts of a hearth like the ſmith's forge, and a pair of bellows. The fuel is moſtly coak, but ſometimes for particular purpoſes charcoal. It is uſed for annealing their metal previous to working it, and alſo for ſoldering.

The forge fire is not well calculated for the fuſion of metals, ſince the ſide of the crucible next the blaſt is liable to be cooled, which generally cauſes it to break. The portable blaſt furnace is however better adapted than the common forge, as the air is introduced at bottom, like the common air furnace. See Furnace.

Forging conſiſts in changing the form of ſuch malleable metals as may have been heated for that purpoſe in the fire of the forge, by means of the hammer and other inſtruments uſed in ſmithery.

Several of theſe proceſſes are carried on by machinery worked by water or ſteam. In the manufacture of bar iron, very large maſſes of this metal, called blooms, are drawn into bars by an immenſe hammer, worked by a water wheel, or the ſteam-engine. See Iron.

The forging of ſcythes is alſo performed by ſimilar power, which by the workmen is called ſkelping. See Scythe.

Forging, however, more properly belongs to the forming of various utenſils from iron, and other malleable metals.

The anvil, on which the metal is laid, conſiſts of a large maſs of wrought iron, faced with hardened ſteel, and ground ſmooth on the ſurface. The hammers are of the ſame materials, and are of different ſizes, agreeable to the nature of the work. If the work is heavy, beſides the perſon who holds the ſubſtance to be hammered, a ſecond, and ſometimes a third and fourth perſon ſtrike in turns at the heated body. If the body requires to be made round, in-

ſtruments called *ſwages* are employed. They conſiſt of two maſſes of iron faced with ſteel, and hardened, one lying upon the anvil, or faſtened into a groove in the anvil, and the other held in the hand, by means of a piece of hazel ſtick twiſted round it. In the faces of each of theſe ſwages a proper ſized groove is made, which, for ſwaging round bodies, is a ſegment of a cylinder. The body to be ſwaged being laid upon the lower one, the upper ſwage is placed upon it, on which a perſon ſtrikes with a large hammer, while the body to be made cylindrical is turned round. A variety of other inſtruments are uſed according to the nature of the work to be done. Iron admits of being forged with greater facility than ſteel, as it is much ſofter, and can be heated to a much greater heat, which ſtill makes it ſofter. Indeed iron is generally heated to a welding heat, in order that its parts, which are frequently looſe and unconnected, may be made ſound.

Copper may be forged into any ſhape, but will not bear more than a red heat, and of courſe requires to be heated often. The bottoms of large boilers are frequently made by a large forge hammer worked by machinery. The bolts of copper uſed for ſhips, and other purpoſes, are moſtly made by the hammer. Silver, gold, and platina will alſo admit of forging into any form. Of the former metal, ſilver knives are made very neatly by the hammer. The heat at which it is worked ſhould be barely that of ignition.

It is remarkable that alloys of the malleable metals, although very malleable when cold, will not bear the hammer when heated.

Forge is alſo uſed for a large furnace, wherein iron ore, taken out of the mine, is melted down.

But this is not ſo properly called a forge as a *furnace*; which ſee.

Forge is more properly uſed for another kind of furnace wherein the iron ore, melted down and ſeparated in a former furnace, and there caſt into ſows and pigs, is heated; and fuſed over again, and beaten afterwards with large hammers, and thus rendered more ſoft, pure, ductile, and fit for uſe.

Of theſe forges there are two kinds, which the iron ſucceſſively paſſes through, before it comes to the ſmith.

The firſt is called the *finery*, where the pigs are worked into groſs iron, and prepared for the ſecond, which is called the *chafery*, where it is farther wrought into bars fit for uſe.

Forge-*mills*. See Mill.

Forge-*volant*, or *Flying-forge*, means ſuch an arrangement of the ſeveral implements and materials, neceſſary for the eſtabliſhment of a ſmith's forge, within a cart or waggon, as may qualify it to accompany an army during a campaign, with the ſame facility as the ſeveral carriages appertaining to the train of artillery.

It will be immediately underſtood, that much contrivance, and great attention to regularity, are needful to accompliſh and preſerve ſo eſſential a purpoſe; the more ſo, as the whole weight of the forge and its ſupplies of fuel, &c., ſhould not exceed half a ton when conveyed in a cart; nor a whole ton when carried in a waggon. The beſt mode is to place the anvils and their blocks in ſuch a poſition as to balance well, but to be eaſily lifted in and out. For minor purpoſes two or three ſmall anvils may be attached temporarily to the hinder tranſom of the cart-body. There ſhould be a water trough, a furnace, and a pair of bellows, all within a frame of iron plate, properly rivetted and cloſed with hard ſolder, ſo as to be firm, and to prevent latent ſparks from ſetting fire to the machine, or to its contents. The tail-board ſhould let down to a level with the bottom of the cart, and be ſuſpended in that direction by ſtrong ſegments of iron; ſo as to be well fixed, and to reſiſt preſſure either upwards or downwards; the ſides around the furnace and bellows ought to be divided into compartments for the reception of fuel, (generally charcoal,) ſufficient for immediate ſervice, and for the aſſortment of nails, ſcrews, clouts, ſwivels, pins, nuts, horſe ſhoes and nails, bridle chains, buckles, &c., in ſmall quantities, ſo that any thing wanting immediate repair may be fitted without the ſmalleſt delay.

Every forge ſhould carry implements ſufficient to employ forty men; of whom two ſhould be fire-men, ſix ſledge-men, ten light hammer-men, two ſcrew and nut-men, and the reſidue, file-men, or workers on cold metal. If the apparatus be carried in a waggon that can contain two double forges, or furnaces, double the number of men may be employed; ſmall anvils, in either caſe, as alſo vices, being made to ſcrew, or to hook, on to the ends of the ſeveral projecting tranſoms, and even to the naves of the wheels, of which the iron tires become uſeful for light hammer work. The total weight of a forge-waggon, excluſive of its contents, ſhould never exceed 15 cwt. In our arſenals they are made even lighter, their average being 13 cwt. 2 qrs. 14 lbs. Being rated with what are called "Park carriages," it is neceſſary they ſhould conform as nearly as may be practicable with others of their claſs, and be drawn by the number of horſes, &c. uſually employed for light machines.

Forge *for red-hot balls*, is a place where the balls are made red-hot before they are fired off: it is conſtructed about five or ſix feet below the ſurface of the ground, of ſtrong brick-work, and an iron grate, upon which the balls are laid with a large fire under them.

FORGER *of falſe deeds*, ſignifies either him that fraudulently makes and publiſhes falſe writings, to the prejudice of any man's right, or elſe the writ that lies againſt him who commits this offence.

Fitz. Nat. Br. fol. 69. B. ſays, that a writ of deceit lies againſt him who commits this offence; and the penalty of it is declared in the ſtat. 5 Eliz. cap. 14.

FORGERY, in *Law*, may be defined (at common law) the fraudulent making or alteration of a writing to the prejudice of another man's right; and it is an offence which was puniſhed by the civil law with deportation or baniſhment, and ſometimes with death: and by the common law the offender may ſuffer fine, impriſonment, and pillory. Alſo, by a variety of ſtatutes, a more ſevere puniſhment is inflicted on the offender in many particular caſes, which are ſo multiplied of late as almoſt to become general. The principal inſtances are as follow:

By ſtatute 5 Eliz. c. 14. to forge or make, or knowingly to publiſh or give in evidence, any forged deed, court roll, or will, with intent to affect the right of real property, either freehold or copyhold, is puniſhed by a forfeiture to the party grieved of double coſts and damages; by ſtanding in the pillory, and having both his ears cut off, and his noſtrils ſlit, and ſeared; by forfeiture to the crown of his lands, and by perpetual impriſonment. For any forgery relating to a term of years, or annuity, bond, obligation, acquittal, releaſe, or diſcharge of any debt or demand of any perſonal chattels, the ſame forfeiture is given to the party grieved; and on the offender is inflicted the pillory, loſs of one of his ears, and a year's impriſonment; the ſecond offence in both caſes being felony without benefit of clergy.

Beſides this general act, a multitude of others, ſince the revolution (when paper credit was firſt eſtabliſhed) have inflicted

flicted capital punishment on the forging, altering, or uttering as true, when forged, of any bank bills or notes, or other securities (stat. 8 and 9 W. III. c. 20. § 36. 11 Geo. I. c. 9. 12 Geo. I. c. 32. 25 Geo. II. c. 13. 13 Geo. III. c. 79.); of bills of credit issued from the exchequer, according to the several acts for issuing them; of South-sea bonds, &c. (stat 9 Ann. c. 21. 6 Geo. I. c. 4. and 11. 12 Geo. I. c. 32.); of lottery tickets or orders, by the several lottery acts; of army or navy debentures (stat. 5 Geo. I. c. 14. 9 Geo. I. c. 5.); of East India bonds (stat. 12 Geo. I. c. 32.); of writings under seal of the London, or Royal Exchange assurance (stat. 6 Geo. I. c. 18.); of the hand of the receiver of the pre-fines (32 Geo. II. c. 14.); or of the accountant-general and certain other officers of the court of chancery (12 Geo. I. c. 32); of a letter of attorney, or other power to receive or transfer stock or annuities; and on the personating a proprietor thereof, to receive or transfer such annuities, stock, or dividends (8 Geo. I. c. 22. 9 Geo. I. c. 12. 31 Geo. II. c. 22. § 77.); also on the personating, or procuring to be personated, any seaman, or other person, entitled to wages or other naval emoluments, or any of his personal representatives; and the taking, or procuring to be taken, any false oath in order to obtain a probate, or letters of administration, in order to receive such payments; and the forging, or procuring to be forged, and likewise the uttering or publishing, as true, of any counterfeited seaman's will or power (stat. 31 Geo. II. c. 10. 9 Geo. III. c. 30.); to which may be added, though not strictly reducible to this head, the counterfeiting of Mediterranean passes, under the hands of the lords of the admiralty, to protect one from the piratical states of Barbary (4 Geo. II. c. 18.); the forging or imitating of any stamps to defraud the public revenue (according to the several stamp acts); and the forging of any marriage register or licence (26 Geo. II. c. 33.); all which are by distinct acts of parliament made felonies without benefit of clergy. By statutes 13 Geo. III. c. 52. and 59. forging or counterfeiting any stamp or mark to denote the standard of gold and silver plate, and certain other offences of the like tendency, are punished with transportation for fourteen years. By statute 12 Geo. III. c. 48. certain frauds on the stamp duties, therein described, principally by using the stamps more than once, are made single felony, and liable to transportation for seven years; and the same punishment is inflicted by stat. 13 Geo. III. c. 38. on such as counterfeit the common seal of the corporation for manufacturing plate glass (thereby erected), or knowingly demand money of the company by virtue of any writing under such counterfeit seal.

There are also certain other general laws with regard to forgery; of which the first is 2 Geo. II. c. 25. whereby the first offence in forging or procuring to be forged, acting or assisting therein, or uttering or publishing as true, any forged deed, will, bond, writing obligatory, bill of exchange, promissory note, indorsement or assignment thereof, or any acquittance or receipt for money or goods, with intent to defraud any person (or corporation) is made felony without benefit of clergy. And by statutes 7 Geo. II. c. 22. and 18 Geo. III. c. 18. it is equally penal to forge or cause to be forged, or utter as true, a counterfeit acceptance of a bill of exchange, or the number or principal sum of any accountable receipt for any note, bill, or any other security for money; or any warrant or order for the payment of money, or delivery of goods. There is now hardly a case to be conceived, wherein forgery, that tends to defraud, whether in the name of a real or fictitious person, is not made a capital crime. (Foft. 116, &c.) Blackft. Com. B. iv.

FORGES, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton in the district of Neufchatel, famous for its mineral waters of a ferruginous quality; near the source of the Epte, nine leagues N.E. of Rouen, and 25 N.N.W. of Paris. The place contains 1,201, and the canton 11,757 inhabitants, on a territory of 242½ kiliometres, in 31 communes.

FORGESIA, in *Botany*, so named by Commerson the French botanist and traveller, in honour of his friend and patron, M. Desforges, governor of the isle de Bourbon, at the time when he investigated the vegetable productions of that country with so much success. Juss. 164. (Defforgia; Lamarck. Illustr. t. 125.) Class and order, *Pentandria Digynia*. Nat. Ord. *Campanulaceæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, in five deep, ovate, acute, equal, spreading, permanent segments. *Cor.* of five equal, oblong, upright petals, twice the length of the calyx, cohering by their broad bases, reflexed at the tip, clothed with short hairs on their inner side, especially upwards. *Stam.* Filaments five, equal, the length of the corolla, cylindrical, firm, erect, roughish; anthers fixed, incumbent, heart-shaped, two-lobed. *Pist.* Germen inferior, turbinate, convex at the top, of two cells; styles two, cohering in a columnar form, erect, the length of the stamens, permanent, roughish; stigmas divaricated, globose, undivided. *Peric.* Capsule encircled with the calyx, opening at the top by two valves, crowned with the styles, of two cells. *Seeds* numerous, small.

Ess. Ch. Petals five, rough on their inside. Capsule inferior, of two cells and two valves, crowned by the styles.

Obs. Commerson observed that the styles are sometimes, though very rarely, three, the cells and valves of the fruit agreeing with them in number. Jussieu suggests that this genus is akin to his order of *Onagræ*, as well as to *Heucheræ* amongst his *Saxifragæ*. We follow him in referring it to the *Campanulaceæ* for the present, though it ill accords with the characters of that order, having two styles. It has indeed somewhat of the habit of *Campanula aureæ*, but little else in common. To *Escallonia*, one of Jussieu's *Onagræ*, it has a very great affinity in every part, except the two styles, which last mark seems of the less moment, as their germens accord in having two cells. Wherever *Escallonia* is to remain, *Forgesia* must certainly, as we find Lamarck has observed, go along with it. In the artificial system, the latter should follow *Heuchera*; in the natural, or rather *conjectural* one (if we may be allowed the term), it is related to *Ribes*, *Heuchera*, *Escallonia*, *Fœtidia*, *Philadelphus*; scarcely, if at all, to *Campanula*.

1. F. *borbonica*. (Defforgia borbonica; Lamarck. Illustr. v. 2. 71.) Native of the isle de Bourbon. A *tree*, smooth in every part, except the flower. *Leaves* numerous, scattered, three or four inches long, obovate, acute, serrated, with one rib and numerous transverse veins; paler beneath; on stalks an inch long. *Panicles* about the ends of the branches, axillary and terminal, spreading, with small, oblong, scattered bracteas. *Flowers* the size of *Campanula aurea*; of their colour we have no information. The whole plant dries of a dull brown. The young shoots are resinous, somewhat astringent, scarcely aromatic.—In this case we tolerate a specific name derived from that of a country, though against sound principle, for the sake of the connection between that country and the person to whom the genus is dedicated. S.

FORGING, in the *Mechanic Arts*, the act of beating or hammering iron on an anvil, after having first made it red-hot in the forge, in order to extend it into various forms, and fashion it into works.

Iron is hammered and forged two ways; either by the force of the hand, in which there are uſually ſeveral perſons employed, one of them turning the iron, and hammering likewiſe, and the reſt only hammering.

Or, it is done by the force of a water-mill, which raiſes and works ſeveral huge hammers, beyond the force of man, under the ſtrokes whereof the workmen preſent large lumps or pieces of iron, which are ſuſtained, at one end, by the anvils, and, at the other, by iron chains faſtened to the cieling of the forge.

This laſt way of forging is only uſed in the largeſt works, as anchors for ſhips, &c. which uſually weigh ſeveral thouſand pounds. For the lighter works, a ſingle man ſuffices to hold, heat, and turn, with one hand, while he ſtrikes with the other. Each purpoſe for which the work is deſigned requires its proper heat. If it be too cold, it will not feel the weight of the hammer, as the ſmiths call it, *i. e.* it will not ſtretch or give way; and if it be too hot, it will red-ſear, *i. e.* it will break or crackle under the hammer.

The ſeveral heats the ſmiths give to their irons, are, 1. A blood-red heat. 2. A white-flame heat. 3. A ſparkling or welding heat. See Forge.

Forging *Over*, in *Sea Language*, denotes the art of forcing a ſhip violently over a ſhoal, by the effort of a great quantity of ſail.

FORHAD, in *Geography*, a town of Perſia, in Choraſan; 40 miles E.S.E. of Niſabour.

FORI, a town of Japan, in the iſland of Niphon; 10 miles E. of Scoda.

FORIANI, a town of the department of Golo, in the iſland of Corſica; four miles S. of Baſtia.

FORK-Tail, among the *Fiſhermen of England*, a name given to the ſalmon, while in the fourth year's growth, and not yet come to what they call a ſalmon.

Forked *Head*, in *Geography*, a cape on the S. coaſt of the iſland of Cape Breton. N. lat. 45° 42′. W. long. 60° 4′.

Forked *Deer river*, a river of America, which runs into the Miſſiſſippi. N. lat. 35° 22′. W. long. 90° 4′. It is about 76 yards wide, 7 miles from its mouth.

Forked *Beard, great*, in *Ichthyology*, a name given on the coaſt of Cornwall to the *blennius phycis* of Linnæus.

Forked *Heads*, among *Hunters*, thoſe horns of deer which bear two croches on the top, or which have their croches doubled.

FORKEN, in *Geography*, a town of Pruſſia, in the province of Samland; 4 miles N.E. of Fiſchauſen.

FORKS, a townſhip of America, in Northampton county, Pennſylvania, having 884 inhabitants.

FORLANA, Ital. in *Muſic*, the air of a dance of the ſame name, very common at Venice, eſpecially among the Gondolieri. Its time is $\frac{6}{8}$ played with ſpirit; and the dance is very gay. It is called *Forlana* from being invented and common in Friuli, where the inhabitants are called *Forlani*.

FORLAZZO, in *Geography*, a town of Naples, in the province of Bari; 11 miles S.E. of Teramo.

FORLET-Land, a term applied to ſuch land, in the biſhopric of Hereford, as was formerly granted or leaſed out, "dum epiſcopus in epiſcopam ſteteris," in order that the ſucceſſor might have it for his preſent income. This cuſtom is now however in diſuſe, and ſuch lands let or granted, as in other caſes, by leaſe, but they ſtill retain the name.

FORLI, in *Geography*, a town of Italy, in the department of the Amona, the ſee of a biſhop, ſuffragan of Ravenna; containing ten churches and many convents. It was anciently called "Forum Julii." Having been for ſeveral ages under the dominion of the Romans, Forli recovered its liberty under the exarchs, and became powerful enough to gain conſiderable advantages in a war with its neighbours. In 1248 it was taken by the Bologneſe, but found means to emancipate itſelf from their yoke in the year 1296. After a civil war Forli was ſo reduced as to be obliged to ſubmit to the popes. The town is ſurrounded with ſtrong walls and ſolid towers; the ditches are large, and defended with low works; 33 miles S.E. of Ravenna. N. lat. 44° 13′. E. long. 12° 1′.

FORLIMPOPOLI, a town of Italy, in the department of the Amona; formerly called "Forum Populi," and one of the "fora" on the Via Emilia, where the Roman magiſtrates kept their courts. In the year 700 it was ruined by the Lombards, but afterwards rebuilt by the people of Forli. Pope Gregory XI. who reſided at Avignon, having been offended by its inhabitants, it was razed by order of cardinal d'Avila, his legate-general in Italy. Such was the furious reſentment of this prelate, that in the year 1370 he cauſed it to be ſown with ſalt, and a harrow to paſs over its ruins; the pope alſo transferred the epiſcopal ſee to Bertinero, about $1\frac{1}{2}$ mile diſtant from it. About twenty years after this deſolation Ordeloffi, prince of Forli, re-eſtabliſhed the town and fortified it with a good citadel. But being afterwards ſubjected to the dominion of the popes, it ſunk into a ſtate of irrecoverable deſolation.

FORLORN Hope, a deſignation applied, in the *Military Profeſſion*, to that party which is to take the lead on any duty ſuppoſed to be ſo pregnant with danger as to leave but little hope of ſurviving the enterpriſe. It, however, generally happens, that the forlorn-hope ſuffer far leſs than circumſtances ſhould warrant us to expect: many inſtances have occurred in which they have ſuſtained but little loſs, and an examination of the ſeveral details of caſualties after a breach has been ſtormed, a wall ſcaled, or a deſperate attack made on ſome entrenchment, will be found to throw the ſevereſt part of the carnage upon thoſe troops which follow immediately after the forlorn-hope.

This may appear curious, and contrary to reaſon, but examination of the events ordinarily attendant on ſuch arduous duties will ſolve the problem. In advancing towards a breach, &c. it is uſual to keep up a heavy fire, eſpecially of grape and caſe-ſhot, upon thoſe parts towards which the detachment is proceeding; whereby there uſually appears but little oppoſition in that direction; the forlorn-hope thus advance with at leaſt as much ſafety as their immediate ſupporters, and when they are on the creſt of the breach often preſent an equal front with the defenders, againſt whom they contend nearly on equal terms. But as this conteſt ſometimes laſts for a long time, thoſe who may be detained at the foot of the breach, muſt remain expoſed to whatever fire the garriſon may be able to direct towards that quarter; for which purpoſe every exertion, though temporary only, is ever made. Hence every gun that can be brought to bear, even though openly expoſed to the fire of the beſiegers' batteries, or even to their muſketry, will open upon the foot of the breach, which is ever the ſcite of dreadful havock.

Few ſtorming-parties are exempt from volunteers: it is, indeed, in ſuch "hair-breadth eſcapes in the deadly breach" that the crown of military glory is to be found; conſequently, the forlorn-hope is ſeldom taken in the ordinary routine of duty, but is completed by the aſſociation of men who aim at celebrity, and conſequently at promotion;

and who ſtake their whole *hope* upon what is generally conſidered a moſt *forlorn* ſpeculation.

The party whoſe claim to the deſignation is genuine, rarely exceeds twenty or thirty firelocks, uſually commanded by a ſubaltern, or at the utmoſt by a captain. The reſidue of the volunteers, of all claſſes, are formed into what is called the "ſtorming-party," to which any neceſſary augmentation is ſupplied from choice corps, and eſpecially by the grenadiers of the army; it being a poſt of honour.

FORM, Forma, in *Phyſics*, denotes the manner of being peculiar to each body; or that which conſtitutes it ſuch a particular body, and diſtinguiſhes it from every other. Mr. Harris uſes the term form likewiſe in another ſenſe, as an efficient animating principle; to which he ſuppoſes Ovid to refer in the firſt lines of his Metamorphoſis.

"In nova fert animus mutatas dicere formas
Corpora——"

Theſe animating forms are of themſelves no objects either of the ear, or of the eye; but their nature or character is underſtood in this, that were they never to exert their proper energies on their proper ſubjects, the marble on which the ſculptor exerciſes his art would remain for ever ſhapeleſs, and the harp from which the harper calls forth ſounds would remain for ever ſilent.

Thus, alſo, the animating form of a natural body is neither its organization, nor its figure, nor any other of thoſe inferior forms, which make up the ſyſtem of its viſible qualities; but it is the power, which is yet able to produce, preſerve, and employ theſe. It is the power, which firſt moves, and then conducts that latent proceſs, by which the acorn becomes an oak, and the embryo becomes a man; by which digeſtion is performed in plants and animals, and, which departing, the body ceaſes to live, and its members putrify; and by which every being produces another like itſelf, and every ſpe ies is continued. In animals, it is that higher faculty, which, by employing the organs of ſenſe peculiar to them as animals, diſtinguiſhes them as ſenſitive beings from vegetables; and it is alſo that more noble faculty, which by its own divine vigour, unaſſiſted perhaps with organs, makes and denominates him a being intellective and rational. So that Mr. Harris reckons two ſorts of forms, thoſe which are paſſive elements, and thoſe which are efficient cauſes. And all of them agree in this, that they give to every being its peculiar and diſtinctive character; and on the whole he concludes, that form appears in part to be an element, and in part an efficient cauſe, *i. e.* a cauſe which aſſociates the conſtituent elements of natural ſubſtance, and which employs them, when aſſociated, according to their various and peculiar characters. Harris's Phil. Arrangements, chap. vi.

The philoſophers generally allow two principles of bodies: matter, as the common baſis, or ſubſtratum of all; and form, as that which ſpecifies and diſtinguiſhes each; and which, added to a quantity of common matter, determines or denominates it this, or that; wood, or fire, or aſhes, &c.

Subſtantial forms ſeem to have been firſt broached by the followers of Ariſtotle, who thought matter, under different modes or modifications, not ſufficient to conſtitute different bodies; but that ſomething ſubſtantial was neceſſary to ſet them at a greater diſtance: and thus introduced ſubſtantial forms, on the footing of ſouls, which ſpecify and diſtinguiſh animals.

The conſiderations which the Peripatetics principally inſiſt on, in confirmation of this doctrine, are, 1. That, without ſubſtantial forms, all natural things would be of the ſame ſpecies, nature, and eſſence; which is ſuppoſed to be an abſurdity.

2. That every thing has its peculiar power, motion, and operation: as the magnet, *e. gr.* has that of attracting iron; but that this power does not flow from the matter of the body, which is only paſſive; nor from the accidents: and therefore that it muſt ariſe from a ſubſtantial form.

3. That without ſubſtantial forms, there would be no generation: for a production of accidents is only an alteration.

4. That without ſuch form, the nature of a man and of a lion would not differ.

What contributed much to their error, was the circumſtances of life and death: for obſerving, that, as ſoon as the ſoul was departed out of a man, all motion, reſpiration, nutrition, &c. immediately ceaſed, they concluded that all thoſe functions depended on the ſoul, and conſequently that the ſoul was the form of the animal body, or that which conſtituted it ſuch: that the ſoul was a ſubſtance, independent of matter, nobody doubted; and hence the forms of other bodies were concluded equally ſubſtantial.

But to this it is anſwered, that though the ſoul be that by which a man is man, and conſequently is the form of the human body, as human; yet it does not follow, that it is properly the form of this body of our's, as it is a body; nor of the ſeveral parts thereof, conſidered as diſtinct from each other. For thoſe ſeveral parts have their proper forms ſo cloſely connected with their matter, that it remains inſeparable therefrom, long after the ſoul has quitted the body: thus fleſh has the form of fleſh; bone of bone, &c. long after the ſoul is removed, as well as before.

The truth is, the body does not become incapable of performing its accuſtomed functions, becauſe the ſoul has deſerted it; but the ſoul takes its leave, becauſe the body is not in a condition to perform its functions.

The ancient and modern corpuſcular philoſophers, therefore, with the Carteſians, exclude the notion of ſubſtantial forms; and ſhew, by many arguments, that the form is only the modus or manner of the body it is inherent in.

And as there are only three primary modes of matter, *viz.* figure, reſt, and motion, with two others ariſing therefrom, *viz.* magnitude and ſituation, the forms of all bodies they hold to conſiſt therein; and ſuppoſe the variations theſe modes are capable of, ſufficient to preſent all the variety obſervable in bodies. See Mode.

Many varieties we actually ſee reſult from changes in theſe modes, which may very well paſs for differences of form: thus, an awl only differs from a needle in magnitude; a globe from a cube in figure; and tranſparent glaſs, being pulverized, will reflect the light, and appear white; and yet all the alteration conſiſts in the order and arrangement of the parts; when wheat is ground into flour, all the change conſiſts in a ſeparation of the contiguous parts; and when the flour is baked into bread, what is it but the ſame particles aſſociated again in another manner? By agitating water, a froth is formed; if the agitations be increaſed, the particles will exhale, and form clouds; which being congregated again, return in dew, ſnow, hail or rain; and the ſame water, by the acceſſion of cold, might have been formed into ice. So many different bodies, endued with different qualities, and which the Peripatetics themſelves allow ſpecifically different, ariſe from one and the ſame body, by mere motion and reſt!

The

The philoſophy of ſubſtantial forms, its riſe, uſe, and extent, are ſet in an excellent light by F. Malebranche. But it is needleſs now to enlarge on this ſubject. Forms are uſually diſtinguiſhed into *eſſential* and *accidental*. Though the five modes above mentioned, generally taken, be adventitious; yet, to this or that body, *e. gr.* to fire, or water, they are eſſential: thus, it is accidental to iron to have this or that magnitude, figure, or ſituation, ſince it might exiſt in different ones; yet, to a knife, or hammer, the figure, magnitude, and poſition of parts, which conſtitute it a hammer, or knife, are eſſential, and they cannot exiſt, or be conceived without them. Hence it is inferred, that, though there be no ſubſtantial, there are eſſential forms, whereby the ſeveral ſpecies of bodies become what they are, and are diſtinguiſhed from all others. *Accidental* forms are thoſe really inherent in bodies, but in ſuch manner as that the body may exiſt in all its perfection without them. Such as whiteneſs in a wall; heat in water; a figure of a man in wax, &c.

Forms, again, are diſtinguiſhed into *ſimple* and *compound*: the former are thoſe of ſimple bodies; *i. e.* of ſuch as have but few properties: and the latter are thoſe of more compound bodies; or of ſuch as have more properties.

Thus, *e. gr.* if the form of a hard body be compared with the form of wood, the former may be accounted *ſimple*, and the latter *complex*: inaſmuch as a hard body, conſidered only as hard, has fewer properties than wood. Abſolutely ſpeaking, however, ſimple forms are thoſe of the elements; and compound, thoſe of the mixt bodies.

Some diſtinguiſh forms into *natural* and *artificial*. *Natural* forms are thoſe inherent in bodies, without any thing contributed thereto on the part of man. Such is the form of marble. Whereas *artificial* forms are thoſe ariſing from human induſtry. Such is that of a ſtatue. But this diſtinction is uſeleſs, and does not imply any intrinſic difference in the forms themſelves.

Others, again, diſtinguiſh forms into *primary* and *ſecondary*. *Primary*, or *univerſal* forms are thoſe which originally belong to phyſical and natural bodies; and theſe, they ſay, are extenſion, figure, and organization; figure having reſpect to its external, organization to its internal, and extenſion being common to both. *Secondary* forms are the ſame ſenſible qualities, and ariſe, for the moſt part, from the primary forms. Harris's Philoſ. Arrangements. p. 88.

FORM is alſo uſed in the ſame ſenſe with claſs.

FORM alſo denotes the external appearance or ſurface of a body; or the diſpoſition of its parts, as to length, breadth, and thickneſs. In which ſenſe it coincides with figure.

FORM is alſo uſed for a manner of being, or doing a thing according to rules; *e. g.* this republic has frequently changed its form of government; that is, its conſtitution. Pardons generally expreſs a remiſſion or abolition of a crime, in what form or manner ſoever it be committed. He was admitted doctor in form. Put your argument in form.

FORM, in *Hunting*, denotes the ſeat of a hare; or the place and time when and where ſhe ſquats.

FORM, in *Joinery*, &c. is applied to the long ſeats or benches in the choir of churches, for the prieſts, canons, prebendaries, religious, &c. to ſit on.

Du-Cange takes the name to be derived from hence, that the backs of the ſeats were anciently enriched with figures of painting and ſculpture, called in Latin *formæ & typi*. In the life of St. William of Roſchild, we meet with forms as ſignifying a ſeat for an eccleſiaſtic, or religious, in a choir; and in that of St. Lupicin, we have *formula* in the ſame ſenſe. In the rule of the monaſtery of St. Cæſaria, the nun who preſides over the choir is called *primiceria, vel formari*.

FORM, in *Law*, is applied to certain eſtabliſhed rules to be obſerved in proceſſes or judiciary proceedings. In which ſenſe the word ſtands oppoſed to the ground or matter in diſpute, or the merits of a cauſe. Under this head we may obſerve, that not only the ſubſtantial part, or judicial deciſions of the law, but alſo the formal part, or method of proceeding, cannot be altered but by parliament; for, if once thoſe outworks were demoliſhed, there would be an inlet to all manner of innovation in the body of the law itſelf. The king, it is true, may erect new courts of juſtice; but then they muſt proceed according to the old eſtabliſhed forms of the common law.

Contra FORMAM *collationis, feoffumenti, et ſtatuti*. See CONTRA.

FORM is alſo uſed, in the *Mechanic Arts*, for a kind of mould whereon a thing is faſhioned or wrought.

Such are the hatter's form, the paper-maker's form, &c.

The hatters' form is a large block or piece of wood, of a cylindrical figure; the top whereof being rounded, and the bottom quite flat. Its uſe is, to mould or faſhion the crown of the hat, after the matter thereof has been beaten and fulled. To form a hat, it is neceſſary the wool, hair, &c. be very hot, juſt reeking out of the copper. The paper-makers' form is the frame or mould wherein the ſheets are faſhioned. See PAPER.

FORM, in *Mineralogy*. Mr. Wm. Martin, one of the lateſt and beſt writers on the extraneous foſſils, organic remains or relics of the former race of animated beings and vegetables, of which we can now only find the veſtiges in the ſtrata of the earth, is of opinion, that it is the form only of ſuch relics which can be taken into account in claſſing them into genera and ſpecies. See RELIQUIA.

FORM, in *Theology*, denotes one of the eſſential parts of the ſacraments, being that which gives them their ſacramental nature and efficacy.

The form conſiſts in certain words, which the prieſt pronounces in adminiſtering them. In ſome of the Romiſh ſacraments, the form is deprecative; in our's it is abſolute, or indicative.

The fathers and ancient divines held, that the ſacraments conſiſted of things and words, *rebus & verbis*. William of Auxerre was the firſt who, about the beginning of the 13th century, introduced the terms *matter* and *form* in lieu thereof.

FORM *of Concord*, in *Eccleſiaſtical Hiſtory*. See CONCORD.

FORM *of a Series*, in *Algebra*. See SERIES.

FORM, *Syllogiſtic*, in *Logic*, is a juſt diſpoſition, both of the terms, in reſpect of predicate and ſubject; and of the propoſitions, in reſpect of quantity and quality.

By juſt diſpoſition, we mean ſuch an one, wherein the concluſion follows duly and legitimately from the two premiſes, there being no form where there is no concluſion. See SYLLOGISM.

The diſpoſition of the ſeveral terms, being, as it were, ſo many ſteps or degrees of a ſyllogiſtic form, is called the *figure* of the ſyllogiſm.

The diſpoſition of the premiſes alone, being, as it were another degree, is called the *mode* of the ſyllogiſm. See FIGURE and MODE.

FORM, in *Printing*, or *Printers' form*, is an aſſemblage of letters, words, and lines, arranged in order, and diſpoſed into pages, by the compoſitor; from which, by means of ink and a preſs, the printed ſheets are drawn.

Every

Every form is incloſed in an iron chaſe, wherein it is firmly locked by a number of pieces of wood, ſome long and narrow, and others in form of wedges.

There are two forms required for every ſheet; one for each ſide; and each form conſiſts of more or fewer pages, according to the volume of the book. See PRESS, and PRINTING.

FORM *of Corporeity*, according to Avicenna, and the Scotiſts, is that which conſtitutes body in the generical eſſe of body. That there is ſuch a thing, they prove thus: the human body is a natural body, which cannot be placed in the eſſe of body, but by the form of corporeity: for it is either ſo placed by this, or by the rational ſoul; not by the ſoul, ſince that is ſpiritual; therefore, by the form of corporeity. And the ſame may be underſtood of other bodies: but the later philoſophers ſet this aſide as a chimera.

FORMA, MODO ET, in *Law*. See MODO.

FORMA *Pauperis*, or *in Forma Pauperis*, is when any perſon has a cauſe or ſuit, but is ſo poor that he cannot diſpend the uſual charges of ſuing at law, or in equity.

In this caſe, upon his making oath that he is not worth 5*l*. his debts being paid, and bringing his certificates from ſome lawyer, that he has juſt cauſe of ſuit, the judge admits him to ſue *in forma pauperis*; that is, without paying fees to the counſellor, attorney, or clerk. This cuſtom has its beginning from ſtat. 11 Hen. VII. cap. 12. See COSTS and DISPAUPER.

FORMAL, ſomething that regards the form; or that gives the manner, or form.

The formal cauſe joining itſelf to the material, produces the body or compound.

The ſchoolmen alſo apply the word to any thing which has a kind of form, either eſſential or accidental, at leaſt, in our conception. Thus we frequently hear the philoſophers talk of the formal object of knowledge; and of the formal reaſon of any thing; formal unity, &c.

FORMAL *Cauſe* is defined, by certain philoſophers, to be ſomething implanted in one parcel of matter, whereby it is diſtinguiſhed from all other matter.

For matter is ſuppoſed common to all bodies: conſequently, that they are diſtinguiſhable from one another, does not ariſe from their matter, but from the form which is peculiar to each: hence, what is produced by ſuch cauſe, is ſaid to be formal.

FORMAL *Circle*. See CIRCLE.

FORMAL *Notion*. See NOTION.

FORMAL is alſo uſed in a moral ſenſe, importing poſitive, expreſs, and preciſe.

Thus we ſay, a formal agreement, a formal text, formal anſwer, &c. Formal evidence, ſee EVIDENCE.

FORMALITER, FORMALLY, is variouſly uſed in the ſchools.

Sometimes it is underſtood of the ſubject, when a predicate is therein on account of ſome form: thus, white, formally taken, diffuſes light; *q. d.* the form inherent in this ſubject, *viz.* whiteneſs, is the cauſe why the ſubject diſperſes the light.

FORMALLY has alſo place in ſuppoſitions; a word being formally ſuppoſed, when it is taken for the thing it was intended to ſignify: as, *man is an animal*.

FORMALLY is alſo uſed in the ſame ſenſe with adequately and totally; thus, a ſyllogiſm formally, *i. e.* adequately taken, requires three propoſitions.

FORMALLY is alſo uſed for really, in oppoſition to objectively; thus, a thing is ſaid to be formally ſuch, when it is ſuch in the proper notion of the thing ſpoken of.

FORMALLY, again, is uſed in ſpeaking of the manner where in a thing is contained in another, in oppoſition to virtually and eminently.

FORMALITY, the quality of a form or formula; or that which conſtitutes and denominates them ſuch.

FORMALITY, as defined in the *Schools*, is any manner, wherein a thing is conceived; or, a manner in any object, importing a relation to the underſtanding, whereby it may be diſtinguiſhed from another object.

Thus, animality and rationality are formalities. The Scotiſts make great uſe of formalities, in oppoſition to the virtualities of the Thomiſts.

The Scotiſts hold, that the metaphyſical degrees in man are ſo many formalities, really diſtinct from each other; as *man*, *living*, *animal*, &c. And the ſame they hold of the attributes of God. The Thomiſts, on the contrary, contend that they are really and intrinſically the ſame.

FORMALITIES, in *Matters of Law*, are frequently uſed for the formulas themſelves, or the rules preſcribed for judiciary proceedings. In contracts of ſtrict law, all the formalities muſt be ſtrictly obſerved; and omiſſion of the leaſt formality may ruin the whole convention.

The term is alſo uſed for a certain order, or decorum to be obſerved.

FORMARTEN, in *Geography*, one of the four diſtricts into which Aberdeenſhire in Scotland was formerly divided; the other three being Mar, Buchan, and Gariock. Formarten extends along the coaſt from the river Don to the Ythan, and on the weſt is bounded by a ridge of low hills near Old Meldrum, which ſeparate it from Gariock. It conſiſts partly of a ſtony ſoil, interſected with bogs, and partly of an excellent clay, capable of a high degree of improvement.

FORMATION, in *Geology*, is a term much in uſe with the diſciples of Werner, and other German geognoſtics, and ſignifies ſtrata or maſſes of ſtone, following each other in an uninterrupted order or ſeries, and ſuch as may have been formed by the ſame agent, and under a ſucceſſion of ſimilar circumſtances. This term ſeems generally uſed ſynonymouſly with ſtrata, or depoſitions of matter, but ſometimes ſignifies the particular ſtructure of mountains or large maſſes of particular kinds of minerals. See GEOGNOSY.

FORMATION, in *Philoſophy*, &c. the act of forming, faſhioning, or producing a thing.

FORMATION *of Stones*. See STONES.

FORMATION *of the Tails of Comets*. See COMETS.

FORMATUM PUNCTUM. See PUNCTUM.

FORME', or FORMY, in *Heraldry*. A croſs formé, or formy, is a croſs narrower in the centre, and broad at the extremes: ſo called by Leigh and Morgan, though moſt other authors call it *patée*.

FORMED, or FIGURED *Stones*, among *Naturaliſts*, are ſuch bodies as, being either pure ſtone, flint, or ſpar, are found in the earth, ſo formed, as that they bear a near reſemblance to the external figure of muſcles, cockles, oyſters, or other ſhells, or to plants, or animals.

Authors have been greatly divided as to their origin: the ſeveral opinions ſee under the articles FOSSIL, SHELL, &c.

FORMED *Bachelor*. See BACHELOR.

FORMED, in *Heraldry*, the ſame as ſeated.

FORMEDON, *Secundum Formam Doni*, in *Law*, a writ which lies for him who has a right to lands or tenements by virtue of an entail ariſing from the ſtatute "de donis" of Weſtm. 2. 13 Edw. I. cap. 1. This is in the nature of a writ of right, which is confined only to ſuch as claim in fee-

ſimple;

ſimple; and it is the higheſt action the tenant in tail can have. Finch. L. 267. Co. Litt. 316.

The time of limitation in a formedon, by ſtat. 21 Jac. I. cap. 16. is twenty years; within which ſpace of time, after his title accrues, the demandant muſt bring his action, or elſe is for ever barred.

There are three kinds, *viz. forma donationis*, or *formedon in the deſcender; formedon in the remainder;* and *formedon in the reverter*.

FORMEDON *in the deſcender* lieth, where a gift in tail is made, and the tenant in tail alienes the lands entailed, or is diſſeiſed of them, and dies; in this caſe, the heir in tail ſhall have this writ, to recover thoſe lands ſo given in tail againſt him who is then the actual tenant of the freehold. F. N. B. 211, 212.

FORMEDON *in the remainder*, lies where a man gives land to another for life or in tail, with the remainder to a third perſon in tail or in fee; and afterwards the former tenant dies without iſſue inheritable, and a ſtranger intrudes upon him in remainder, and keeps him out of poſſeſſion. F. N. B. 217. In this caſe, he in remainder ſhall have this writ, in which the whole form of the gift is ſtated, and the happening of the event upon which the remainder depended. This writ is not given in expreſs words by the ſtatute "de donis;" but is founded upon the equity of the ſtatute, and upon this maxim in law, that if any one hath a right to the land, he ought alſo to have an action for the recovery of it.

FORMEDON *in the reverter* lies where there is a gift in tail, and afterwards by the death of the donee or his heirs without iſſue of his body the reverſion falls in upon the donor, his heirs or aſſigns; in ſuch caſe the reverſioner ſhall have this writ to recover the lands, wherein he ſhall ſuggeſt the gift, his own title to the reverſion minutely derived from the donor, and the failure of iſſue upon which his reverſion takes place. F. N. B. 219. 8 Rep. 88. This lay at common law before the ſtatute "de donis," if the donee aliened before he had performed the condition of the gift, by having iſſue, and afterwards died without any. Finch. L. 268.

FORMELLA, a certain weight of about ſeventy pounds, mentioned in the ſtatute of weights and meaſures, 51 Hen. III.

FORMELLO, in *Geography*, a town of Italy; 10 miles N.W. of Rome.

FORMENTARA. See FROMENTERA.

FORMENTOR, CAPE, the N.E. point of Majorca. N. lat. 39° 57′. E. long. 3° 13′.

FORMER, in *Gunnery*, for cartridges, conſiſts of a piece of wood, either cylindrical or flat, according to the ſize of the cannon, &c. for which it is to be employed, or for the material whereof the cartridge is to be made. For making ſmall cartridges of paper, ſuch as are ſuited to muſkets, carabines, piſtols, &c. a cylindrical former of a proper diameter, and about a foot in length is neceſſary; this ought to be made of lignum vitæ, or heart of crab-tree, or ſome ſuch very ſolid wood, turned perfectly ſmooth, and armed at its ſummit or upper extremity with a ſtout braſs or copper ferril. The other extremity is either flat or concave, according as the cartridges are to be made either *blank* (*i. e.* light) or *heavy* (*i. e.* with a ball in each). When blank cartridges are to be made, the flat-ended former is to be uſed, the paper being wrapped round, under the guidance of a turned ring or groove, to keep it to a proper height; when the end being properly lapped over in regular folds, is placed downward on a board, and the former, ſtanding perpendicularly, is ſtruck ſeveral times forcibly with a mallet; ſo that the laps of the paper may be fixed in their ſituations, and not be liable to open when the cartridge caſe may be taken off the former to be handed over to thoſe whoſe duty it may be to pour into each the allotted quantity of gunpowder.

Heavy, that is, ball-cartridges, are made with a former, of which the lower extremity is nearly ſemi-ſpherically concave, ſo as to allow the ball to fit in while the paper is paſſed round. That being done, a piece of fine, but tough twine is paſſed in a double hitch over the paper, cloſe to the ball, and drawn very tight; thus ſecuring the ball from falling out, and enabling it to retain the gun-powder. When properly managed, the end of the paper will form an inverted cup, of which all but about the third of an inch ſhould be cut away with a pair of ſciſſars; when the former, being as before placed perpendicular on the board, and ſtruck with the mallet, the cup will be flattened, at the ſame time that the ball is ſettled cloſe down to the ligature; the former may then be withdrawn.

The former for a cartridge of any ſize, when made with paper, may be on the ſame principle, the ſize being ſuited to the nature of the piece for which the cartridges may be preparing.

When woollen cartridge-caſes are to be made, a flat former, not unlike a taylor's ſleeve board, is needful; the width of the former being proportioned to the calibre of the cannon, and its length according to the uſe to which it is to be put: thoſe for ſalutes, &c. wherein ſmall charges of powder are required, being leſs capacious than ſuch as are intended for ſervice, but eſpecially for battering in breach. The following lengths of cartridges will ſerve to ſhew the requiſite lengths of the ſeveral formers; obſerving that one end is at right angles with the two ſides, which of courſe are parallel, and, that the other is ſemi-circular: the edges are every where duly rounded off.

TABLE for the lengths of formers for the cartridges uſed in cannon.

Nature of the piece of Ordnance.		Paper. Feet.	Paper. Inches.	Flannel. Feet.	Flannel. Inches.
Pounders	42	2	4	2	3
	32	2	4	2	3
	24 heavy	2	4	1	10
	— med.	2	4	1	5
	— light	2	4	1	0
	18	2	4	2	3
	12 heavy	2	4	1	6
	— med.	2	4	1	2
	— light	2	4	0	10
	9	2	4	1	4
	6 heavy	2	0	1	1
	— med.	2	0	0	11
	— light	2	0	0	$9\frac{1}{2}$
	4	1	7	0	5
	3	1	7	0	4
Mortars	13 Inch		—	1	6
	10		—	1	1
	8		—	1	0
	$5\frac{1}{2}$		—	0	9
	$4\frac{2}{5}$		—	0	7
Howitzer	8		—	1	$1\frac{1}{2}$
	$5\frac{1}{2}$		—	0	$9\frac{1}{2}$
	$4\frac{2}{5}$		—	0	$9\frac{1}{2}$

FORMERY, in *Geography*, a town of France, in the depart nent of the Oiſe, and chief place of a canton in the diſtrict of Beauvais; 9 miles N.W. of Gerberoy. The place

place contains 1,433, and the canton 10,050 inhabitants, on a territory of 220 kiliometres, in 24 communes.

FORMEY, John Henry Samuel, in *Biography*, was born at Berlin in 1711. His family was originally of Champagne, and his father was a refugee on account of his religious principles, at the revocation of the edict of Nantes. He was educated at the royal French college for the church, and was ordained miniſter before he had completed his twentieth year. He was choſen one of the officiating miniſters of the French congregation in Berlin; in 1737 he was appointed profeſſor of eloquence in the French college, and in 1739 ſucceeded to the philoſophical chair of the ſame college. On the reſtoration of the Royal Academy of Sciences and Belles Lettres at Berlin in 1744, M. Formey was made ſecretary to the philoſophical claſs, and four years afterwards, at the inſtance of the preſident Maupertuis, he was created ſole and perpetual ſecretary of the academy, which poſt he held nearly fifty years. He was admirably qualified for the office, and ſo was regarded by foreigners as well as by his own countrymen. He was accordingly aſſociated to a number of foreign learned bodies, as thoſe of London, Peterſburg, Haarlem, Mantua, Bologna, and many others in Germany, and he was perſonally acquainted with ſeveral of the moſt eminent and illuſtrious characters throughout Europe. Beſides his academical employments, he had the management of various other concerns. He was agent or ſecretary to the dowager princeſs of Wirtemberg: he filled ſeveral offices in the French colony at Berlin, and at length became a privy counſellor in its ſuperior directory. He was twice married, and by his ſecond wife had many children, ſeven of whom ſurvived him. He died in the month of March 1797, at the great age of eighty-five years and eight months. The printed works of M. Formey were ſo numerous, that he is ſaid to have been in connection with fifty bookſellers. There is ſcarcely a department in the fields of ſcience and literature which he had not cultivated; and his early occupation as a journaliſt, which he began in 1733 with Beauſobre in the Bibliotheque Germanique, had given him a very extenſive acquaintance with books on all ſubjects. In theology, he wrote "Le Philoſophe Chretien:" he defended the cauſe of revelation againſt Diderot and Rouſſeau. He took an active part in the Encyclopædia of Yverdun, and wrote various popular pieces on morality, and elementary works for young people. As a member of, and contributor to the academy, he read a number of memoirs, as well on popular as on high philoſophical ſubjects, ſuch as the doctrines of liberty and neceſſity: the demonſtration of the exiſtence of a God, &c. In all theſe there are a clearneſs and preciſion, an eaſy and flowing ſtyle, and a freedom from that dogmatiſm which is very diſguſting when aſſumed upon ſubjects of ſo much doubt and difficulty. Gen. Biog.

FORMIÆ, in *Ancient Geography*, a town of Italy, in Latium, N. of Capua, and W. of Minturna. Mola di Gæta was built on its ruins. Some have ſuggeſted that it was founded by the ſavage people called Leſtrigones; however this be, it was very conſiderable in the time of the Romans. Horace calls it "Mamurrarum Urbs," from the name of a diſtinguiſhed family which dwelled in or near it. Near this town was the country-houſe of Cicero, called his "Formianum," and not far from hence he was aſſaſſinated by the emiſſaries of Antony. (See Cicero.) The place in which this atrocious deed was perpetrated was diſcovered by the Abbé Chaupy by means of a monument which he found on a private road that led to the ſea, whence Cicero meditated his eſcape. Horace compares the wine made from the grapes of the Formian hills with the Falernian.

FORMIATE. See Formic *Acid*.

FORMIC Acid, in *Chemiſtry*, ſo denominated from the inſect from which it is obtained. Chemiſts are not unanimous in their opinion reſpecting this acid; ſome of them contend that it is no other than the acetic or malic acid, and others maintain that its properties are diſtinct from thoſe of all other acids, and therefore that it is an acid *ſui generis*. It was noticed nearly a century and half ago in the Philoſophical Tranſactions by Mr. Ray, who gave an account of the experiments of Mr. Fiſher on the acid juice which is given out ſpontaneouſly by ants, and which they yield when diſtilled. Since that period many experiments have been made by Margraff, Richter, Deyeux, Fourcroy, Vauquelin, and others; of whom the laſt two concluded that the formic acid was a mixture of the acetic and malic acids. Suerſen was induced to examine the ſubject with much attention, and from his experiments in 1804, he inferred that formic acid contains no malic acid, and that its properties are very different from the acetic. This chemiſt had recourſe to the method propoſed by Margraff, and corrected by Richter to obtain the formic acid pure. He infuſed a quantity of red ants, *formicæ rufæ*, in thrice their weight of water, and put the mixture in a ſilver ſtill; drew off the water by diſtillation, till a burnt ſmell began to be perceived; he then ſaturated the water in the receiver with pot-aſh, and evaporated to dryneſs. The maſs thus obtained was mixed with as much diluted ſulphuric acid as was ſufficient to ſaturate the potaſh, and diſtilled to dryneſs in a retort. The liquid, which came over, was again rectified by moderate heat to get rid of any remaining portion of ſulphuric acid; and the reſult was ſuppoſed to be pure formic acid. It is colourleſs like water; its ſmell is peculiar to itſelf, and different from that of acetic acid; its taſte is acid; it reddens vegetable blues; and ſo alſo will the juice which is given out ſpontaneouſly by the inſect in paſſing over the corollæ of blue flowers. The ſpecific gravity of formic acid is 1.11, whereas the moſt concentrated acetic acid is only 1.08. It is not ſuſceptible of being brought to a ſtate of cryſtals, and it will not neutralize ſo large a quantity of alkali as the acetic acid. This acid flies off in the form of vapour; ſmelling ſomething like muſk; deſtroys animal life under the gaſeous form; is capable of ſerving economical purpoſes like vinegar; is decompoſed by great heat, and forms ſalts with earth in alkalies and metallic oxyds, which are cryſtallizable and not deliqueſcent. Theſe have been denominated formiates by thoſe who admit the formic as a diſtinct acid, but by thoſe who oppoſe this theory the formiates are ſuppoſed to be compounds of the acetates and malates together, with a portion of animal matter, the nature of which is not perfectly known. The quantity of acid contained in ants exceeds what is found in any other known part of the animal creation. Theſe inſects exhale the acid whether irritated or not, ſo that the ſame changes, produced on flowers by known acids, take place when they are laid in the tract of ants, and it has been conjectured that part of the irritation cauſed by their bite is produced by the inſertion of a portion of their native acid.

FORMICA, in *Entomology*, a genus of the hymenopterous order, poſſeſſing, according to Linnæus, the following eſſential character: a little upright ſcale between the thorax and the abdomen; males and females furniſhed with wings, and the neuters apterous, or wingleſs.

Geoffroy propoſes in addition to the above character, to

diſtinguiſh the inſects of this genus from the ſtructure of the antennæ, theſe, as he obſerves, being in the true formicæ, elbowed or broken into an angle in the middle, and having the firſt joint longer in proportion than the others; the ſtemmata or falſe eyes three in number, and the abdomen joined to the thorax by means of a ſhort pedicle, or ſtalk.

This character is further improved by Schæffer, who deſcribes the formicæ as having the mouth armed with jaws, the wings incumbent, and the tarſi compoſed of five articulations.

Fabricius defines the genus with ſtill more preciſion, from the ſtructure of the organs, or parts which compoſe the mouth; according to this author, the feelers are four in number, unequal, with cylindrical joints placed at the tip of the lip, which is cylindrical, and almoſt membranaceous, and the antennæ filiform.

In the Gmelinian edition of the Syſtema Naturæ, the Fabrician definition is united with that before aſſigned to the genus formica by Linnæus.

La Marck explains the genus ſomewhat differently, and by the adoption of his character, ſeveral of the Linnæan and Fabrician formicæ are excluded. This writer lays down the eſſential character as follows; antennæ filiform and broken, the firſt joint very long; feelers unequal, the anterior pair longer; mandibles ſtrong; tongue ſhort, concave and truncated. To this is added, as a ſecondary character, that the abdomen is attached to the corſelet by a pedicle, bearing a ſmall ſcale, or vertical knob; and that of each ſpecies there are three kinds, males, females, and neuters, which latter are without wings. The larva deſtitute of feet.

It will not be amiſs in this place to remark that the ſpecies of formicæ known to Linnæus, or at leaſt deſcribed by that naturaliſt, do not amount to twenty, a number nearly doubled by Fabricius in his "Species Inſectorum," as he there deſcribes altogether thirty-ſeven; and this number has been again progreſſively augmented in his later publications to about ninety ſpecies. Thus it will be perceived that Fabricius and not Linnæus is the firſt deſcriber of the far greater number of thoſe ſpecies which are inſerted in the laſt edition of the Syſtema Naturæ, and it muſt be at the ſame time obſerved that it is principally to his labours we ſtand indebted for our knowledge of thoſe kinds which are peculiar to extra-European climates.

Since the time of the above writers, the hiſtory of this curious tribe of inſects has engaged the attention of other continental entomologiſts, among the principal of whom we ſhould mention Latreille. This author deſcribes only a few new ſpecies, yet he enters more minutely on the ſubject of claſſification in this family than either of his predeceſſors. From the reſult of his obſervations it appears neceſſary to divide the formicæ of Linnæus and Fabricius into two, if not a greater number of genera, and beſides that to form ſeveral ſubdiviſions of thoſe which ought to be retained under the original deſignation of formica. The moſt obvious diſtinction conſiſts in the diſſimilar ſtructure of the antennæ, theſe in one tribe terminating in a maſs or club, and being in the other nearly ſetaceous; in the latter the firſt joint is very long, the ſecond almoſt conic, and the laſt of the ſame bulk as the foregoing, or rather leſs. The inſects which compoſe this ſection are further diſtinguiſhed by other characters, which ſeem to concur in forming a natural line of ſeparation between the two genera, the moſt material of which appears however to conſiſt in the ſtructure of the antennæ.

Latreille at one time propoſed to comprehend the firſt mentioned tribe as a diſtinct genus under the name of cryptocerus, allowing the others to remain under the original appellation of formica. In an arrangement ſubſequently publiſhed by the ſame author, he retains the whole as one family, which he calls formicariæ, and under this is included no leſs than eight genera. The ſpecies of formicæ, herculanea, rufeſcens, hæmatoda, clavata, hamata, and cephalotes are conſidered generically diſtinct from each other, and are referable to the ſeveral newly inſtituted genera of Latreille in the following order; herculanea, with 4-punctata, and rufa, belong to the genus formica; rufeſcens to polyergus; hæmatoda to odontomachus; clavata to ponera; hamata and guloſa to eciton; and cephalotes with rubra to myrmica; the two remaining genera of this family are cryptocerus and dorylus. Several of theſe genera are ſubdivided into two or more ſections, which altogether render the arrangement rather more diffuſe than will be deemed perhaps in any manner requiſite by other naturaliſts.

The formicæ are called among us piſmires, ants, or emmits. They live, for the moſt part, in large ſocieties; are proverbially an induſtrious race of creatures; and, like the bees, their ſpecies are invariably compoſed of three kinds, the males, females, and neuters. The different ſpecies are diſperſed throughout every part of the known world: many inhabit woods, where they eſtabliſh themſelves in immenſe colonies, in the trunks of decayed trees, or in deep ſubterranean cavities, which they either conſtruct for themſelves, or ſeize from others; for colonies of ants are frequently met with in cavities of the ground, which are known to be the burrows of rats, rabbits, and other quadrupeds, whoſe habitations theſe troubleſome intruders have probably rendered untenable to the original occupiers. Some form their neſts in the earth, beneath the ſhelter of a heap of ſtones, or under a tree, among the ramifications and branches of the root; while others occupy the more open places, in the fields or plains, and ſo contrive their habitations that the ſummit riſes in a cone or hillock, which we call an ant-hill, to the height of one, two, or three feet; and in hot climates, even more above the ſurface of the ground. There are ſpecies which in a ſimilar manner form neſts in the ſands; but theſe are not numerous. The interior of theſe neſts is generally ſpacious, and adapted for the reception of thoſe myriads of creatures which compoſe each diſtinct ſociety. Thoſe which reſide in trees provide themſelves with an habitation, by ſelecting ſuch as are already rotten, and excavating the interior to the dimenſion required. Others, and thoſe in particular which live in the hillocks, conſtruct the walls of their cones with dry vegetable ſubſtances, ſuch as the leaves of fir trees, and other evergreens, dried tendrils, twigs, and ſtalks, or other ſimilar materials, intermixed with earth and clay. The interior exhibits a number of apartments or paſſages, the middle one of which may be conſidered the principal, as being the nurſery for the larvæ or young; other parts are allotted to the males and females; and the more open ſpaces to the neuters.

The conſtruction of theſe neſts, in common with every other laborious occupation, is the buſineſs of the neuters, as among the bee-tribe. While the latter are employed in drudgery, in providing the ſociety with a ſufficient ſtock of proviſion, and in the various toil incidental to the feeding and rearing the young, the females ſit in inactivity, and never quit the neſt, except to indulge in the ſofter paſſions with the males. Linnæus believed their amours were conducted within the neſt, an idea contradicted by the more recent

recent obſervations of other naturaliſts. On this occaſion they leave the neſt, and under favour of the darkneſs which a ſummer evening affords, retire to a ſhort diſtance, whither the males follow; and in ſuch ſituations the ants are frequently ſeen covering the ground in pairs for a pretty conſiderable ſpace. The ſeaſon of coupling varies in different ſpecies from the beginning of ſummer to the end of autumn.

After this union of the ſexes, the males die, or at leaſt never return to the neſt; the females, on the contrary, either return of their own accord, or are carried thither by the working ants, and are attended with the utmoſt care and tenderneſs. The eggs they depoſit are conveyed to their proper receptacle, and, when hatched, become the objects of their deepeſt ſolicitude. The eggs are ſmall, roundiſh, and of a yellowiſh-white colour. The larvæ are white, thick, and ſhort, and their body compoſed of twelve rings. In the nymph or pupa ſtate, thoſe ants, which when produced will be deſtitute of a ſting, are entirely naked; while the others are enveloped in a ſilken cone. The females are much larger than the males.

The working ants wander about all day in ſearch of food, or materials for the neſt; and aſſiſt each other, when the load is too heavy for one or more that have attempted to move it. The eggs and larvæ are daily brought out of the neſt by them, and expoſed to the warmth of the ſun; and the larvæ fed till they aſſume the pupa form. When in ſearch of proviſion, they will not ſcruple to attack any inſect, however conſiderable in ſize, and, by their united ſtrength, have little difficulty to overcome their victim. They alſo attack and devour ſmall quadrupeds, birds, and reptiles, when they find them in a helpleſs ſtate, incapable of defending themſelves; and which, in the end, muſt be conſidered as the fate of many. In ſhort, they prey on food of every kind, whether animal or vegetable. Some ſpecies are, however, moſt injurious to the former, and others to the latter; though, when preſſed with hunger, they devour either indiſcriminately.

In the evening, when their labour is over, the ants are ſaid to make their repaſt of whatever proviſion they have collected in the courſe of the day; for their care and foreſight, in laying up a ſtore of proviſion againſt the winter, are no other than pleaſing fictions, which, however they amuſe the fancy, have no exiſtence in reality. During the winter, they either become torpid or die. The ants are particularly fond of the aphides, or lice which infeſt plants; and are, in their turn, the favourite food of birds and various other animals.

Ants ſwarm in every region of the globe. In northern countries, and more eſpecially thoſe which abound in woods, theſe inſects are exceedingly troubleſome. The ravages of theſe creatures are not, however, to be compared with thoſe of the ant-tribe which inhabit warmer climates. The latter are oftentimes the ſcourge of thoſe countries which they inhabit. In Africa it is well known that proviſion of every deſcription, and even clothes and various articles of furniture, are oftentimes deſtroyed by theſe creatures. The American iſlands ſwarm with them, as well as Africa, and South America. The damage occaſioned by the ants, in the ſugar plantations of Grenada, about the year 1777, affords a memorable proof of the tremendous powers which theſe apparently inſignificant creatures poſſeſs to do miſchief: it was ſo exceſſive, that it was deemed expedient to burn down the whole of the ſtanding crops of canes, and turn up the earth throughout the plantations, in order to deſtroy thoſe ants which had fixed their habitations in the canes, and at their roots. Theſe were to be replaced by new crops: and if that remedy proved ineffectual, it was determined to abandon the culture of the canes altogether. After ſuſtaining conſiderable loſs, and having in vain endeavoured by every means to exterminate the legions of ants with which the country was infeſted, without reſorting to this final remedy, the inhabitants were, however, at length very fortunately relieved by the ſetting in of very heavy rains, which checked the ants in their career of devaſtation, and deſtroyed immenſe numbers of them. The ants in thoſe parts are always numerous; but, on this occaſion, they appeared ſuddenly in ſuch bodies, that nothing could reſiſt them. The country, in many parts, was literally covered for the ſpace of miles with them. They deſcended the hills in torrents; the plantations were every where filled with them, as well as every road and avenue leading to them. Numbers of the domeſticated quadrupeds periſhed. Rats, mice, and reptiles of every kind, became an eaſy prey to them; and even the birds, which they attacked wherever they alighted, till they were ſo haraſſed as to fall at laſt within their power. Streams of water retarded their progreſs only for a ſhort time: the foremoſt columns puſhing boldly into the water to certain death, and there periſhing, formed at length an embankment, which dividing the waters, afforded means for the reſt to paſs over in ſecurity. Even fire itſelf, which will oftentimes deter the moſt ferocious beaſts of prey in their attacks, was in vain employed on this occaſion. Fires were lighted in the routes which, from their courſe along the hills, it was obvious they would purſue; nor did this divert their track: they precipitated themſelves into the fires in ſuch bodies as to extinguiſh them; and though many by this means periſhed, the reſt were enabled to continue their march unhurt.

The appearance of the ants in leſs formidable bodies is indeed eſteemed rather a benefit than diſadvantage, in thoſe countries; becauſe they aſſiſt, and in a very material degree, in the deſtruction of ſnakes, and other venomous reptiles, when they can ſeize on them by ſurpriſe. We are aſſured by Mad. Merian, that the ſpecies cephalotes is called in Surinam the ants of *viſitation*, as they appear only at certain ſeaſons, or about once in two or three years. Its multitudes receive a cheerful welcome from the natives, who throw open the doors of their houſes to admit them: the ants enter, traverſe every part of their dwellings, and, after deſtroying the rats, mice, ſcorpions, kakerlacs, or cockroaches, and other vermin ſecreted therein, again take their departure.

Ants may be eaſily killed by means of arſenic, kneaded with proviſion of any kind, and which being thrown into the neſt, will be greedily conſumed by them. The ſting of the ant is very ſharp and painful, the ſevere ſenſation of which may be abated by the application of a mixture of oil and honey. Such ants as poſſeſs no ſting are, nevertheleſs, capable of exciting a painful puſtule, by means of an acrid juice which they diſcharge upon the ſkin: this juice proceeds from the mouth, contrary to the vulgar ſuppoſition that it is emitted from the vent; and the pain occaſioned by which may be abated by an application of oil and honey, as before mentioned.

A very grateful acid is procured from ants by diſtillation. See FORMIC *Acid*.

The ants are probably more numerous, in reſpect to ſpecies, than we are at preſent aware: the following appear to be the moſt material of thoſe already deſcribed.

Species.

HERCULANEA. Black; abdomen ovate; legs ferru-

 ginous.

ginous. Linn. Fn. Suec. *Formica magna*, ib. *Formica magna hyppomyrmex*, It. Goth. *Formica maxima*, Ray.

Large; lives in the trunks of decayed trees in Europe.

Compressa. Black; thorax compreſſed; tip of the antennæ and thighs rufous; head very large. Fabr.

Native of Tranquebar. The abdomen is ovate; the ſcale entire; thorax immaculate.

Smaragdina. Green; thorax lineated with yellow. Fabr.

Inhabits India, and is of a large ſize; the antennæ reddiſh at the tip; wings large and white, with ferruginous nerves.

Rufipes. Hairy, black; legs rufous. Fabr.

Deſcribed from the Bankſian cabinet. The head is large, ovate, rough with ferruginous hairs; antennæ brown at the tip; ſcale of the petiole ovate-obtuſe.

Bicolor. Black; ſcutel, abdomen, and legs ferruginous. Fabr.

Large; inhabits Barbary.

Erythrocephala. Deep black; head rufous; ſcale of the petiole double. Fabr.

Native of New Holland. The head large and oblong; antennæ rufous; thorax filiform; legs black, at the ends rufous.

Barbara. Deep black; head, antennæ, and ends of the legs ferruginous; petiole with two tubercles. Fabr.

Inhabits Africa; ſize that of herculanea; head large; firſt joint of the antennæ large, and black.

Didyma. Black; abdomen greyiſh; ſcale of the petiole double. Fabr.

An European ſpecies found chiefly in Italy. The ſize is moderate; antennæ pitchy; thorax gibbous; abdomen covered with cinereous down; ſcale double, or widely emarginate; legs black.

Viatica. Ferruginous, abdomen ovate and black. Fabr.

The mandibles are blackiſh at the tip; thorax compreſſed, ferruginous with a ſingle tubercle; hind legs very long with brown ſhanks. This ſpecies inhabits Spain, and is the ſame ſize as the laſt.

Pallipes. Deep black and gloſſy, antennæ and legs whitiſh. Fabr.

Small; head ſmall and roundiſh; thorax gibbous; ſcales of the petiole truncated, and nearly emarginated; wings white. Native of Cayenne.

Ægyptiaca. Black; thorax rufous, two-toothed behind; petiole with two tubercles. Fabr.

Head large, and brown; antennæ ferruginous; thorax compreſſed; legs ferruginous with ſub-clavated thighs; a ſmall ſpecies found in Egypt.

Binodis. Black; head very large and rufous; petiole of the abdomen bituberculated. Fabr.

Native of Egypt; legs rufous; thighs ferruginous.

Rufa. Black; thorax compreſſed, and with the legs ferruginous. Fabr. Thorax compreſſed, entirely ferruginous, head and abdomen black. Linn.

Inhabits Europe.

Pubescens. Black; abdomen pubeſcent. Fabr.

Native of Calabria and Hungary. In ſize reſembles the laſt.

Nigra. Gloſſy-black; tail piceous. Degeer.

An European inſect.

Fusca. Greyiſh-brown and poliſhed; antennæ and legs ferruginous; wings white. Degeer.

Inhabits Europe.

Flavescens. Yellowiſh; abdomen darker, with a black dorſal line. Fabr.

Native of Cayenne. In this ſpecies the ſcale of the petiole is entire.

Melanocephala. Pale; head and back of the thorax black. Fabr.

Like the laſt this inſect inhabits Cayenne; it occurs in immenſe numbers at certain ſeaſons, and commits vaſt depredations, conſuming and deſtroying every kind of proviſion.

Rubra. Teſtaceous; eyes and dot under the abdomen black. Degeer.

An European ſpecies.

Cinerascens. Black; head rufous; abdomen greyiſh. Fabr.

A large ſpecies found in Tranquebar; the head is rufous, mandibles and antennæ black; abdomen ovate, greeniſh-grey, with a black angle behind the middle; wings duſky.

Foetens. Oblong, black; tail rufous; ſcale of the petiole ſomewhat cylindrical and obtuſe. Fabr.

Named fœtens, from its offenſive ſmell; the ſpecies is of a large ſize, preys on other ants, and inhabits Guinea.

Elongata. Oblong, rufous; abdomen and legs paler. Fabr.

A ferocious ſpecies found in Tranquebar; the head is large, mandibles black; thorax elongated and compreſſed; ſcale forming an ovate tubercle in the middle of the petiole.

6-Guttata. Oblong, black; abdomen with three dots each ſide; antennæ and legs rufous. Fabr.

Inhabits Santa Cruz; the mouth is rufous; ſcale ovate, obtuſe and entire; wings whitiſh, with a marginal black ſpot.

Albipennis. Oblong, pale; thorax black behind; abdomen reddiſh. Fabr.

Inhabits ſame country as the former; the ſcutel is white; ſcale of the petiole ovate, gibbous; wings white with a black marginal dot.

Rufibarbis. Oblong, black; mouth and thorax rufous. Fabr.

Native of France.

Obsoleta. Above black; beneath red, teſtaceous; abdomen ſub globular. Fabr.

Leſs than Formica rufa, and inhabits Europe.

4-Punctata. Thorax compreſſed and ferruginous; abdomen black, with four ſnowy dots. Fabr.

Inhabits Alſace. The head is black; antennæ ferruginous; ſcale of the petiole ſhort, obtuſe; legs ferruginous, thighs black.

Virescens. Pale; head and abdomen greeniſh. Fabr.

Deſcribed from the Bankſian cabinet. The petiole is long, with a ſmall raiſed tubercle. This inſect inhabits New Holland.

Saccharivora. Black; antennæ, mandibles, and legs rufous. Brown Jam.

A native of the American iſlands; and is very deſtructive to the ſugar-cane, in which it forms its neſt.

Maculata. Black; poſterior part of the thorax and thighs ferruginous; abdomen with pale ſpots at the ſides. Fabr.

Inhabits Africa; the head is large; mandibles with many teeth; antennæ piceous at the tip; abdomen ovate and hairy.

Antiguensis. Teſtaceous; abdomen black at the tip, the petiole with two tubercles. Fabr.

Native of Antigua.

Guineensis. Ferruginous; abdomen black; legs yellowiſh. Fabr.

A ſmall

A ſmall ſpecies found in Guinea.

Omnivora. Thorax rough, with raiſed dots; petiole with two tubercles; body teſtaceous; abdomen very minute. Degeer.

Native of Surinam.

Flava. Yellow; abdomen ovate and pubeſcent. Degeer.

An European ſpecies.

Caespitum. Black; petiole of the abdomen with two tubercles; ſcutel bidentated. Linn.

In dry meadows under moſs in Europe; the winged ants of this ſpecies fly abroad in ſwarms like the day-fly, when the weather is ſerene.

Tuberum. Rufous; head black; abdomen with a black band, the petiole with two tubercles. Fabr.

Inhabits Sweden; leſs than the former; the antennæ black at the tip, and the thorax bidentated behind.

Vagans. Rufous; head, and back of the abdomen brown; thorax two-ſpined behind; petiole with two tubercles. Fabr.

Twice the ſize of the former; the head globular; antennæ ferruginous. This ſpecies inhabits Saxony.

Acervorum. Rufous; head and abdomen black; thorax two-ſpined behind; petiole with two protuberances. Fabr.

Reſembles the laſt; the antennæ and mandibles rufous; legs ferruginous.

Native of Denmark.

Unispinosa. Black; antennæ and legs rufous; ſcale of the petiole, with a ſingle ſpine; mandibles projecting, and parallel. Fabr.

Inhabits Gaudaloupe. The body is elongated; head large, grooved in the front; abdomen ovate and black; legs red.

Grossa. Blackiſh; thorax bidentated under the ſcutel; abdomen large and globular. Fabr.

Native of Cayenne.

This ſpecies is large; the antennæ are pitchy, with the tip grey; head pitchy, ſub-ſpinous each ſide; wings ferruginous.

Australis. Black; thorax unarmed; ſcale of the petiole with two ſpines. Fabr.

Native of New Holland. The body entirely covered with cinereous down.

Bidens. Thorax with two-toothed tubercle; head ovate; antennæ ferruginous; the firſt joint black. Degeer.

Inhabits Surinam.

Biscutata. Thorax bidentated; ſcale of the petiole double. Fabr.

Head pointed each ſide behind; abdomen globular, with a black dorſal line; wings ſub-ferruginous. Native of Cayenne.

Clavata. Black; thorax two-toothed; petiole one-toothed beneath. Fabr.

A large ſpecies found in India; the thorax is gibbous; the petiole with a large tubercle, and ſpine beneath; abdomen ovate, the firſt ſegment globular.

Arenaria. Thorax impreſſed behind, and bidentated; body black; ends of the legs pitchy. Fabr.

Inhabits the moveable ſands of Barbary. The head is large and ovate; thorax compreſſed; the petiole with two tubercles; abdomen ſomewhat globular and downy.

Attelaboides. Black; thorax two-ſpined; head tapering behind; legs ferruginous. Fabr.

A Braſilian ſpecies in the Bankſian cabinet; the head is rough and black; thorax ſlender, black; abdomen brown and downy.

Megacephala. Thorax two-ſpined behind; ferruginous; abdomen black; head very large. Fabr.

Inhabits the iſle of France. The ſpecies is ſmall; head ovate, and larger than the whole body; antennæ and legs ferruginous; petiole with two tubercles.

Ammon. Thorax armed with two ſpines; petiole of the abdomen with two incurvated ſpines. Fabr.

Native of New Holland. The head is ſmall and ovate; thorax and abdomen black, with gold down on the back; legs black.

Bihamata. Thorax four-ſpined; petiole of the abdomen with two curved ſpines. Drury.

The head is ſmall and round; the antennæ long; abdomen ſub-globular, black at the baſe, ferruginous; legs long and black; thighs ferruginous. Inhabits India.

Militaris. Thorax bi-ſpinous before; ſcale of the petiole armed with four ſpines. Fabr.

An African ſpecies. The head is large; gibbous, black, and carinated each ſide between the antennæ; antennæ globular, black, and downy; wings brown.

4-Dens. Thorax quadridentated; body black; head with a double carinated ridge. Fabr.

Native of Cayenne. The ſpines on the thorax placed two before, and two behind.

Sex-dens. Thorax armed with ſix ſpines; head very large, double, and armed with a ſpine each ſide behind. Linn.

Inhabits America.

Cephalotes. Thorax four-ſpined; head large, double, and armed with a ſpine each ſide behind. Linn.

Native of South America, which it inhabits in prodigious number, and is extremely deſtructive in the plantations.

Atrata. Thorax four-ſpined; body black; head depreſſed, margined and armed behind with two ſpines. Linn.

Inhabits ſame country as the former, and is like that ſpecies exceedingly injurious.

Gulosa. Rufous; abdomen black at the tip, the firſt ſegment contracted; mandibles projecting. Fabr.

An Auſtralaſian ſpecies.

Forficata. Brown; abdomen pubeſcent, and black, the firſt ſegment contracted; mandibles projecting. Fabr.

Head large and flat; mandibles forked and toothed within; thorax compreſſed in the middle; petiole with a globular tubercle; legs dull ferruginous. Inhabits New Holland.

Maxillosa. Thorax ſix-toothed; head yelloviſh, the mandibles as long as the head. Fabr.

Native of India; the head is large, and abdomen brown.

Rostrata. Thorax compreſſed, three-toothed before; mandibles projecting and incurved. Fabr.

A ſmall ſpecies found in Cayenne.

Hamata. Ferruginous; head very large and pale; mandibles projecting and hooked. Fabr.

Head with a ſmall conic ſpine each ſide at the baſe; mandibles longer than the head, black and hooked at the tip, the baſe ferruginous; petiole with two tubercles.

Hæmatoda. Scale of the petiole conic, and very acute; head nearly double, the mandible projecting. Linn.

The mandibles are toothleſs, and of a rufous colour; the head reddiſh; thorax unarmed and black; wings hyaline. This ſpecies inhabits America.

Pharonis. Rufous; abdomen browniſh. Linn.

A very minute ſpecies found in Egypt.

Salomonis. Red; abdomen black and ſomewhat villous. Linn.

Native of Egypt and Arabia.

Foetida. Petiole with tranſverſely compreſſed tubercles; firſt ſegment of the abdomen contracted; mandibles projecting. Linn.

The head is black with three raiſed dots, the abdomen and legs hairy. This inhabits America.

Vaga. Black; abdomen ovate and hairy. Scop.

Native of Europe, and lives in decayed trees under the bark.

Venosa. Head and thorax black; abdomen cylindrical and brown; ſcale of the petiole thick and entire; legs teſtaceous; wings white with teſtaceous veins, and a brown marginal ſpot. Linn.

Country unknown.

Melanopis. Rufous; eyes black; abdomen brown on the back; ſcale of the petiole entire. Linn.

This and the four following ſpecies are natives of Europe.

Glabra. Black; glabrous; ſcale of the petiole bidentated; inciſures of the abdomen whitiſh; legs rufous. Linn.

Testacea. Teſtaceous-brown, and ſomewhat downy; antennæ and legs brown; wings white with a ferruginous baſe. Linn.

Fuscescens. Black; head as wide as the abdomen; ſcale of the petiole very ſhort; mouth, antennæ, and legs reddiſh-brown. Linn.

Ruficornis. Head and thorax black; abdomen brown; jaws, antennæ, and legs teſtaceous; wings hyaline.

Formica-*leo*, the *ant-lion*, the name given by authors to a very remarkable ſpecies of inſect, which is, in its perfect ſtate, a winged creature, approaching to the nature of the *libellulæ*, or dragon-flies; but in its prior ſtate of a creeping animal, has a wonderful art and addreſs in catching its prey. It is in this ſtate that it is known by the name of formica-leo, as it chiefly feeds upon ants. See Myrmeleon.

Formica, literally *an ant*, has been applied by the old medical writers to a ſpecies of wart, of a black colour, and with a broad ſeſſile baſe, which Foreſtus obſerves, when it is removed by exciſion, undergoes much pain, reſembling that ariſing from the ſtinging of ants, whence it has received its name. This ſpecies of ſenſation is alſo denominated *formication*, *formicatio*, and by the Greeks μυρμηκιασις, *myrmeciaſis*, from μυρμηξ, *an ant*. The term *formicatio* is likewiſe applied to a ſenſation occaſionally occurring in the ſkin, as if ants or other ſmall inſects were creeping upon its ſurface. See Foreſti Opera, lib. xxiii. obſ. 9.

Formica, among *Sportſmen*, the name of a diſeaſe incident to ſpaniels. See Spaniel.

FORMICATIO. See Formica.

FORMICATION, a term uſed among *Builders* for arching or vaulting.

FORMICHI, in *Geography*, a cluſter of ſmall iſlands and rocks in the Mediterranean, near the coaſt of Italy, between Monte Chriſtio and Pianoſa. N. lat. 42° 40′. E. long. 10° 25′.

FORMICOLA, a town of Naples, in Lavora; ſix miles E. of Capua.

FORMIGALES, a town of Spain, in the province of Aragon; 10 miles S.E. of Ainſa.

FORMIGI, a town of Italy, in the department of the Panaro; four miles S. of Modena.

FORMIGNANO, a town of the duchy of Urbino; ſeven miles from Foſſombrone.

FORMIGUE, a ſmall rocky iſland, near the French coaſt, in the Mediterranean. N. lat. 43° 8′. E. long. 6° 18′.—Alſo, a ſmall iſland in the Mediterranean, near the S. coaſt of the Morea. N. lat. 36° 46′. E. long. 21° 49′.

FORMING is uſed for the act of giving being or birth to any thing.

The word is alſo ſimply uſed for giving the figure to any thing. The potter forms his veſſels as he pleaſes. Geometry teaches how to form all kinds of figures.

It is alſo uſed for the producing of a thing: thus, the lineaments of the face began to be formed.

Forming *of a Siege*, in *Military Language*, is the making lines of circumvallation, to fortify the camp, and diſpoſing things for the attack of a place in form.

They alſo ſay, to form a ſquadron or battalion; meaning, to range the ſoldiers in form of a ſquadron, &c.

The term is alſo uſed in ſpeaking of a body of forces, which being out of any order of ſquadrons, battalions, &c. do halt, range themſelves in order, and put themſelves in a condition for the attack.

Forming the line, is drawing up infantry, cavalry, and artillery into line of battle. See Line.

Forming *the flank*, *Angle*. See Angle.

Forming, in *Grammar*, is uſed in ſpeaking of certain tenſes of verbs, which are made from others, by a change of certain letters.

The preſent tenſe is formed from the infinitive. Compound and derivative words alſo, and even all that have any etymology, are ſaid to be formed.

FORMOCHE, in *Geography*, a ſmall iſland in the Grecian Archipelago; nine miles N. of Patmos.

FORMOSA, or Tai-ouan, an iſland in the Chineſe ſea, ſeparated from the province of Fo-kien in China by a ſtrait, about 60 miles in its narroweſt part. This iſland, ſituated between 22° 8′, and 25° 20′ N. lat., and 120° to 122° E. long., is about 240 miles in length from north to ſouth, and about 60 miles in its greateſt breadth from eaſt to weſt, but much contracted at each extremity. Formoſa, though lying ſo near to the coaſt of China, was not known to the Chineſe until the year 1430. The Dutch formed an eſtabliſhment in the weſtern part of it in 1634, and built the fort of Zealand, by which they ſecured to themſelves the principal port of the iſland; but they were driven from thence in 1659, or 1661, by a Chineſe pirate, who made himſelf maſter of the whole weſtern part, which afterwards, *viz.* in 1682, ſubmitted to the authority of Kang-hi, emperor of China. This iſland is divided by a long chain of mountains, running from north to ſouth, into two parts, the eaſtern and weſtern. The former part is little known, but the latter is divided into three diſtinct governments, ſubordinate to the governor of Taï-ouan, the capital of the iſland, who is himſelf ſubject to the viceroy of the province of Fo-kien. This part, which is poſſeſſed by the Chineſe, preſents extenſive and fertile plains, watered by a great number of rivulets that fall from the eaſtern mountains. Its air is pure and wholeſome, and the ſoil produces, in abundance, corn, rice, and moſt other grains. Moſt of the Indian fruits are alſo found here; ſuch as oranges, bananas, pine-apples, guavas. papaws, and cocoa-nuts; and ſome of thoſe of Europe, particularly peaches, apricots, figs, raiſins, cheſnuts, pomegranates, water melons, &c. Tobacco, ſugar, pepper, camphor, and cinnamon are alſo common. Horſes, ſheep, and goats are very rare in this iſland; of hogs, which abound in China, here are few; domeſtic poultry, ſuch as fowls, geeſe, and ducks,

are very plentiful: pheaſants alſo are ſometimes ſeen, and monkies and ſtags have multiplied ſo much, that they wander through the country in large flocks. The inhabitants of Formoſa rear a great number of oxen, which they train for riding, from a deficiency of horſes and mules, and which they accuſtom to go as expeditiouſly as the beſt horſes, furniſhing them with a bridle, ſaddle, and crupper. The only important article that ſeems to be wanting in Formoſa is wholeſome water, that which it ſupplies being of a deleterious quality. In this iſland there are few mulberry trees, and conſequently little ſilk is produced: but if the Chineſe were permitted to form eſtabliſhments here, various profitable manufactures might be introduced. Thoſe who come hither muſt be protected by paſſports from the Chineſe mandarins, who grant them at a very dear rate, and accompany them with intolerable exactions and oppreſſions. The Chineſe connive at this conduct on the part of the mandarins, becauſe it ſerves to prevent numerous emigrations to this iſland, which is rendered a place of great importance by its proximity to China. Ever ſince Tartar conquerors have been on the throne, they are afraid leſt any revolt ſhould happen in Formoſa, and diſturb the ſecurity and tranquillity of the empire: and in order to prevent any diſturbance, the Tartars keep a garriſon here of 10,000 men, changing it every three years, or more frequently, if they find ſuch a meaſure to be neceſſary.

The capital of this iſland, called Taï-ouan, is large and populous, and a place of great trade. It furniſhes every neceſſary of life; not only the natural productions of the iſland, ſuch as rice, ſugar, tobacco, ſalt, ſtag's fleſh dried, fruits of all kinds, medicinal herbs, cotton cloth, hemp, and various ſorts of bark, but ſuch foreign commodities as are imported hither, ſuch as Chineſe and Indian cloths, ſilk ſtuffs, varniſh, porcelain, various kinds of European goods, &c. The ſtreets are for the moſt part ſtraight, and covered with awning during ſeven or eight months in the year, for the purpoſe of moderating the exceſſive heat of the ſun. Theſe ſtreets are 30 or 40 feet broad, and ſome of them about a league in length; almoſt all of them are bordered with houſes belonging to the merchants, or with ſhops, in which are diſplayed ſilk ſtuffs, porcelain, lacquer-ware, and other kinds of merchandize, arranged in great order, ſo as to appear like ſo many ornamented galleries. The houſes are generally conſtructed of clay and bamboo-reeds, and are thatched with ſtraw. This capital of the iſland has neither mills nor any kind of works; its harbour is good, and ſhelters veſſels from every wind; but the entrance of it becomes every day more difficult, on account of the accumulation of ſand. Beſides this capital, the Chineſe have two other cities, and ſome villages, in which they reſide by themſelves, as they do not permit the Indians, who are their ſubjects, to live among them; ſlaves and domeſtics excepted. Theſe Indians are united into 45 villages, 36 lying towards the north, and nine towards the ſouth. The northern villages are very populous, and the houſes are built after the Chineſe manner. The habitations of the ſouthern iſlanders are only heaps of huts, or cottages of earth, in which they have no kind of furniture; but the middle part is occupied by a ſort of hearth or chimney, elevated to the height of two feet, and conſtructed of earth, upon which they dreſs their victuals. Their ordinary food is rice, or other ſmall grain, and the game they take by courſing, or kill with their arms. Theſe iſlanders poſſeſs a wonderful degree of agility, and run with ſuch ſwiftneſs, that they can almoſt outſtrip the fleeteſt grey-hound. Their favourite arms are lances, which they dart to the diſtance of 60 or 80 feet, with the greateſt dexterity and preciſion. They uſe bows and arrows, and can kill a pheaſant on wing with as much certainty as an European ſportſman could do with a fuſee. As they have neither plates, diſhes, nor ſpoons, they uſe their fingers in feeding themſelves, and eat their fleſh half raw. Their beds are formed of freſh-gathered leaves. Their bodies are naked, excepting a piece of cloth, which hangs from their girdle to their knees. Thoſe among them who, according to the judgment of their chiefs, have excelled by agility in running, or by dexterity in the chace, obtain the privilege of marking on their ſkin, by a very painful operation, ſeveral fantaſtical figures of flowers, trees, and animals; all have the right of blackening their teeth, and of wearing ornaments of bracelets, and crowns made of ſhells and cryſtal. The iſlanders of the northern parts, where the climate is colder, clothe themſelves with the ſkins of ſtags, which they kill in hunting; on their heads they wear a cap in the form of a cylinder, made of palm-leaves, and ornamented with ſeveral crowns placed one above another, on the top of which they fix plumes compoſed of the feathers of a cock or a pheaſant. The marriage ceremonies of the Formoſans approach very nearly to the ſimple laws of nature; parents are ſcarcely ever conſulted, but young perſons ſettle their matrimonial union according to their own diſcretion.

Although theſe iſlanders are entirely ſubjected to the Chineſe, they ſtill preſerve ſome ſmall remains of their ancient government. Each village chooſes two or three old men of the greateſt reputation for probity; and in conſequence of this choice, they become the rulers or judges of the hamlet, and have the power of finally determining all differences: and if any one ſhould refuſe to abide by their judgment, he would be immediately baniſhed from the village, nor could any of the inhabitants afterwards dare to receive him.

The tribute impoſed by the Chineſe is paid in grain, and the mode of laying and collecting this impoſt is ſettled by a perſon ſpecially appointed for this purpoſe. But theſe perſons are very arbitrary and oppreſſive; inſomuch that they have by their tyranny cauſed the deſertion of three villages in the ſouthern part of the iſland, where were formerly twelve. They expelled the tax-gatherers, refuſed to pay tribute to the Chineſe, and joined themſelves to the independent nation in the eaſtern part of the iſland.

In 1782 a dreadful diſaſter befel Formoſa, occaſioned by a violent hurricane, which cauſed ſuch a ſwell of the ſea, that it overwhelmed a great part of the iſland, and deſtroyed many buildings on the land, with ſtores of various kinds contained in them, ſeveral ſhips and their cargoes in the harbour, a quantity of proviſions and growing crops. This grievous calamity, however, was redreſſed by the paternal attention and care of the Chineſe emperor.

Between Formoſa and the continent are ſeveral ſmall iſlands called "Pong-hou" by the Chineſe, and "Piſcadores" by the Europeans, which form a kind of Archipelago; of theſe iſlands, the principal only is inhabited by a Chineſe garriſon under the command of a mandarin. Duhalde. Groſiere.

Formosa, an iſland of the Atlantic, near the coaſt of Africa, about ſix miles long and one wide. The ſoil is fertile, and well covered with trees, but wants ſprings of good water. N. lat. 11° 29'. W. long. 14° 20'.

Formosa, *Benin*, or *Argon*, a river of Africa, which riſes in the interior part of Benin, and runs into the Atlantic. N. lat. 5° 40'. W. long. 4° 20'. For ſeveral leagues along the river upwards the land is low and marſhy, but the banks are adorned with lofty trees, and divided by branches of the river into a number of iſlands, which afford a pleaſant proſpect: however, the air is inſalubrious, and the muſquitoes innumerable.—Alſo, a river of Africa, which

runs

runs into the Indian ſea, S. lat. 34° 18'.—Alſo, a river of Brazil, which runs into the Atlantic, S. lat. 22° 25'.

Formosa *Bay*, a bay of the Indian ſea, on the coaſt of Africa. S. lat 2° 45'.

Formosa, *Cape*, a cape on the coaſt of Guinea, ſo called from its beautiful appearance; it is low, flat, and woody. N. lat. 5° 45'. E. long. 4° 52'.—Alſo, a cape on the coaſt of Malacca; 30 miles S.E. of Malacca.

FORMOSUS, Pope, in *Biography*, ſucceeded to the high dignity on the death of Stephen VI. He had poſſeſſed, previouſly to his election to the papal chair, high church honours, and had been biſhop of Porto, and ſent legate from the Roman ſee into Bulgaria, to ſolve ſome doubts relating to religious matters which were entertained by the people of that country, who had lately become converts to the Chriſtian faith. Under the pontificate of John VIII. he was accuſed of conſpiring againſt the lives of the emperor and pope, and not appearing to anſwer the heavy charge, he was excommuncicated and anathematized. To make his peace he was obliged to ſwear that he would never return to Rome, nor reſume the epiſcopal dignity, but content himſelf, during the remainder of his life, with lay communion. In 883 he was abſolved from his oaths by pope Marinus, who declared him innocent of the crimes alleged, and reſtored him to his epiſcopal functions: and in 891 he was elected pope in the room of Stephen. Formoſus was the firſt pope who was tranſlated from another ſee to that of Rome; for, till his time the biſhops of Rome had all been raiſed to that office from among the preſbyters and deacons of the church. Formoſus was ſcarcely ſettled in his chair when legates arrived at Rome from Conſtantinople to ſettle the diſpute reſpecting the perſons who had been ordained by the patriarch Photius, who had been anathematized by the preceding popes. Being unable to accompliſh the object of their miſſion, they returned, and the conference which was intended to heal ſubſiſting diviſions, widened ſtill farther the breach between the eaſtern and weſtern churches. Formoſus, in the following year, ſent legates to preſide at the council of Vienna, to redreſs abuſes that prevailed in the kingdom of Arles: he eſpouſed the cauſe of Charles the "Simple" of France againſt Odo, who, upon the death of that prince's father, had ſeized on the kingdom of Aquitaine, and had even been crowned king of France. His letters, however, to Odo were unavailing, and it was not till his death that the family of Charlemagne regained poſſeſſion of the whole of France. In the year 894 Formoſus crowned Lambert emperor in the room of his deceaſed father Wido: but Berengarius laid claim to the kingdom of Italy, which cauſed a bloody war between the contending parties. The pope invited Arnulph, king of Germany, to Rome, promiſing to crown him emperor, provided he reſtored peace to the country by vanquiſhing the preſent emperor and his rival. Arnulph complied, entered Italy with a powerful army, made himſelf maſter of Lombardy, marched to Rome, obtained poſſeſſion of the city, and was crowned emperor by the pope. After this, to ſettle matters more completely, the kingdom of Lombardy was divided between Lambert and Berengarius, and Arnulph returned to Germany. Formoſus died in the year 896, after a reign of about four years and a half. In the "Collectio Conciliorum" there are two letters extant which bear the name of Formoſus, one reſpecting the affairs of the Eaſt, and the other addreſſed to the biſhops of England; the latter is not generally regarded as genuine. The ſucceſſor of Formoſus, Stephen VII., was his bitter enemy, and determined to diſgrace him after his death, whom he durſt not openly oppoſe while alive. He accordingly, as one of his firſt acts, ſummoned a council to meet at Rome, and placed the body of the dead pontiff, taken from his tomb, on the pontifical throne; and having aſſigned him a deacon to plead his cauſe, he uttered a furious philippic againſt him, and pronounced him guilty of the charge of illegally intruding himſelf into the apoſtolic ſee. He was next ſtripped of his ornaments; three of the fingers, with which it was cuſtomary to beſtow the papal benediction, were cut off, and the body, with a large ſtone ſuſpended about its neck, was thrown into the Tyber, and all ordinations which Formoſus had conferred were declared invalid. In the next pontificate, under Theodore II. the body of Formoſus was reſtored with great pomp to its ſepulchre in the Vatican; and by John IX. the acts of Stephen's council were condemned to the flames. See John, Stephen, and Theodore.

FORMULA, a rule, or model, or certain terms preſcribed and decreed by authority, for the form and manner of an act, inſtrument, proceeding, or the like. The Roman law was full of formulas. The formulas of Marculphus, with M. Bignon's Comment, are in great eſteem.

Formula, in *Church Hiſtory* and *Theology*, denotes a formulary or profeſſion of faith.

Formula, in *Mathematics*, a general expreſſion for reſolving certain caſes or problems. E. G. $\sqrt{dx - x^2}$ is the formula that expreſſes the ordinate of a circle, having d for its diameter and x for its, abſciſſa.

Formula, in *Medicine*, denotes a little form or preſcription, ſuch as phyſicians direct in extemporaneous practice, in diſtinction from the greater forms, which are the officinal medicines. See Prescription.

FORMULARY, a writing, containing the form or formula of an oath, declaration, atteſtation, or abjuration, &c. to be made on certain occaſions. There are alſo formularies of devotion, of prayers, &c. Liturgies are formularies of the public ſervice in moſt churches.

FORNA, in *Ichthyology*, a name given by Hildegard, and others, to the trout.

FORNACALIA, or Fornicalia, in *Antiquity*, a feaſt held among the ancient Romans, in honour of the goddeſs Fornax, or Fornix. It was ſolemnized with ſacrifices, performed before the mouth of an oven, wherein they dried their corn, baked their bread, &c. The fornacalia were moveable: the grand curio proclaimed the time of celebration every year on the twelfth of the calends of March. They were firſt inſtituted by Numa; and the quirinalia were inſtituted for the ſake of ſuch as had not kept the fornacalia.

FORNAGE, Fornagium, in our *Old Writers*, ſignifies the fee taken by a lord from his tenants, bound to bake in the lord's oven, or for a permiſſion to uſe their own; this was uſual in the northern parts of England. Plac. Parl. 18 Ed. I. See Assisa *panis et cereviſiæ*. (51 Hen. III.)

The word comes from the French *fournage*, which ſignifies the ſame.

FORNAZZANO, in *Geography*, a town of Italy, in the departmen of the Amona; 15 miles S.S.W of Faenza.

FORNELLA, a port and bay in the iſland of Minorca. The port is ſituated about ſix miles from mount Toro, and deſcribes a circle, the entrance of which is very narrow and facing the north. The bay is capable of containing the largeſt fleet, and perfectly ſheltered. The port is defended at the entrance by a ſmall ſquare fort, conſtructed of hewn ſtone, with baſtions and foſſes. This rampart is covered with magazines and lodgments, which are vaulted; on the oppoſite ſide is a tower, and at the further end of the port, upon a rock or iſle, is a fort, built of wood. The eſtabliſhment is capable of ſupporting a conſtant garriſon

riſon of 300 men. Near this is a ſmall village of the ſame name, inhabited only by fiſhermen.

FORNELLO, a town of Naples, in the Moliſe; 17 miles W. of Moliſe.—Alſo, a river which runs through the city of Naples into the ſea.

FORNICATION, Whoredom, the act or crime of incontinency between ſingle perſons; for, if either of the parties be married, it becomes adultery. The term is derived from the *fornices* in Rome, where lewd women proſtituted themſelves for money.

By the ancient law of England, the firſt offence herein was puniſhed with three months impriſonment: the ſecond was made felony by an act paſſed A.D. 1650, in the time of the uſurpation. The ſpiritual court hath cognizance of this offence; and doing public penance is the chief puniſhment. But by ſtat 27 Geo. III. c. 44 the ſuit muſt be inſtituted within eight months, and not at all after the intermarriage of the offending parties. Formerly courts-leet had power to inquire of and puniſh fornication and adultery: in which courts the king had a fine aſſeſſed on the offenders, as appears by the book of Domeſday. 2 Inſt. 488. See Bastard.

Fornication is ſometimes uſed as a generical term, including all kinds of offences againſt chaſtity.

Its ſpecies are, 1. *Simple fornication*, which is that committed with a proſtitute. 2. *Stuprum*, that committed with perſons of reputation and ſobriety. 3. That committed with relations, called *inceſt*. 4. That committed with married perſons, *adultery*. 5. That committed with perſons conſecrated to God, *ſacrilege*. 6. That committed between perſons of the ſame ſex, *ſodomy*. 7. That committed by perſons on themſelves, *manuſtupration*. And, 8. That committed with beaſts, *beſtiality*.

FORNIX, in *Anatomy*, a medullary body contained in the lateral ventricles of the brain. See Brain.

FORNULUS, in *Geography*, a town of Italy, in Venetia, N. E. of Aquileia.

FOROMAN, a town of the iſland of Sumatra, near the weſt coaſt; 150 miles S. of Acheen.

FORONOVO, a town of Italy, in the duchy of Parma; 8 miles W. S. W. of Parma.

FORPRISE, in *Law*, an exception, or reſervation; in which ſenſe the word is uſed in the ſtatute of Exon. 14 Edw. I.

We ſtill uſe it in conveyances and leaſes, wherein excepted and forpriſed are ſynonymous terms.

Forprise is alſo uſed for an exaction; in which ſenſe it amounts to the ſame with forecapium.

"Totum pratum, &c. ſine quacunque forpriſa in excambium pro placca dedit."

FORQUERAG, Anthony, and John Baptist Anthony, in *Biography*, father and ſon, both French muſicians, who were patronized by Louis XIV. during their infancy. Anthony, the eldeſt, was born at Paris in 1671; his father, a profeſſor on the violin, gave him leſſons in early infancy, of which he profited ſo much, that at five years old he played many times to the king, who uſed to call him his "petit prodige." At 20, the young Forquerag was the beſt performer on the violin of his time; he had alſo a genius for compoſition, and produced pieces equally harmonious and melodious. His talents, and ſtill more the ſweetneſs of his temper, introduced him into the beſt company, which he regaled with his performance whenever deſired. The regent duke of Orleans choſe him for his maſter in muſic, and conſtantly honoured him with his patronage. This muſician died at Mantes in 1745, and left a ſon born in 1700. This was John Baptiſt Anthony, of the king's chamber and chapel band, who equalled his father in talents. He, as well as his father, performed before Louis XIV. at the age of five or ſix, and aſtoniſhed the whole court by the prodigious execution which he had acquired at ſo tender an age. The prince of Conti had a great affection for this muſician, and engaged him in his ſervice. On the death of that prince, Forquerag quitted the profeſſion, and finiſhed his days in tranquillity in the boſom of his family, by whom he was much beloved and reſpected. Madam Forquerag, his wife, excelled on the harpſichord, and till 1780 played with ſo much grace and facility, that ſhe may be regarded at the head of female dilettanti. Laborde.

FORRAGE, or Forage, proviſion for cattle, of hay, oats, and ſtraw; particularly in war.

Skinner derives the word from *foras agere*, by reaſon they go abroad to ſeek forrage; others from *far*, which anciently ſignified any kind of corn or grain. Menage, from *foderagium*, of *foderum*, or *fodrum*, which the Romans uſed in the ſame ſenſe. Cujas and Du-Cange derive it from the German *futter*, horſe meat; Voſſius, from the German *foden*, or *voeden*, to feed; Nicod, from *farrago*, which literally ſignifies what we call forrage, and figuratively, a mixture of divers kinds of things; Hicks derives it from the Saxon *fodra*, or the Engliſh *fodder*, or the baſe Latin *fodrum*. See Fodder.

This term relates to the acquiſition and diſtribution of ſuch ſupplies as are immediately neceſſary for the ſubſiſtance of troops, or for the formation or maintenance of any poſt or ſtation; being for the moſt part an arbitrary demand, ſuch as we underſtand by the affectedly delicate term "requiſition" uſed by the French, but which is in effect only a contributory ſpecies of pillage: it is to be ſuppoſed that foraging takes place chiefly in an enemy's country. Such is, indeed, the caſe; whence it is found expedient to ſtrengthen the covering parties ſent out with foragers, ſo far as may be ſafely done without weakening the main body, or creating too much fatigue.

The cavalry form a very prominent feature on all forages; each trooper being furniſhed with a ſack, ſuch as may lie conveniently over the ſaddle-bows, and another over the loins of his ſteed, on the cloak-pad, or eventually to ſtand upright on it, and to faſten by means of a ſtrap paſſing round his own waiſt. Whatever means may be employed it is highly neceſſary that no faſtenings ſhould be uſed, except ſuch as may be undone in an inſtant: nor ought any horſe to be laden ſo as to prevent his keeping up a moderate trot on emergency. Further attention ſhould be paid to keeping every trooper's arms clean for action.

When troops are detached on this important duty, the whole of the country muſt be well ſearched, leſt the enemy, having intelligence of the intention, ſhould take means, by ambuſcade or otherwiſe, for cutting off the foragers. For this purpoſe ſmall parties of cavalry, each having a trumpeter, ſhould proceed beyond the places to be foraged, and poſt lines of *videttes*, or centries, ſo as to obtain a full command of the whole country; they being ſituate on ſuch eminences, ſteeples, &c. as might beſt favour the precaution. In the mean while the ſeveral foragers collect the ſeveral articles they may find, or ſtand in need of; taking care to pack them into the ſmalleſt compaſs, and ſecuring every bundle with proper bands, &c.

So ſoon as an alarm is given, the troops muſt concentrate, in ſuch manner as may have been previouſly directed, but without loſing ſight of the object of their miſſion. Here ariſes a very delicate and critical caſe; for, on the judgment of the ſuperior officers all will depend. If a large

force ſhould appear, ſuch as could not ſafely be oppoſed, the forage muſt be abandoned; unleſs, indeed, reinforcements may be obtainable within a reaſonable time; ſuch being the caſe, the moſt obſtinate defence muſt be made; eſpecially if the army be in diſtreſs for proviſions, &c.

The enemy, though unable perhaps to make any efficient attack, will endeavour to excite alarm among foragers, ſo as either to cauſe their remaining within narrow limits, or to retire with a ſcanty ſupply. Such ſhould always be diſtinguiſhed, and though vigilantly watched, leſt a larger body ſhould be at hand, ought never to prevent the completion of the duty. When the whole are ready for retreat, the carts, waggons, &c. if any are employed, are firſt ſent on towards the camp, together with the infantry as an eſcort; the laden cavalry then cloſe in, and, in their turn, are protected by the eſcorts of horſe.

Where great reſiſtance is expected, it is ſometimes neceſſary for a few guns, eſpecially horſe-artillery, to proceed with the foragers; but the utmoſt endeavours ſhould be uſed to avoid coming to action. In ſome inſtances the whole army move to the ſcene of plunder, for the purpoſe of carrying off whatever may be procurable, and for which conveyance can be provided; the camp being left under charge of a few ſmall detachments, or piquets; but ſuch can happen only on great emergency, or when the enemy are ſo near as to render it inexpedient to detach any portion.

A ration of forage, for the daily conſumption of one horſe, conſiſts of 10lb. of oats, 20lb. of hay, and 5lb. of ſtraw. When hay may not be obtainable more oats are allowed, or *vice verſâ*. When on foreign ſervice ſubſtitutes are of courſe adopted, and diſtributed *ad valorem*.

FORRAGE-*guard*, in *Military Affairs*, a detachment ſent out to ſecure the foragers. The forrage-guard is poſted at all places, where the enemy's parties may come to diſturb the foragers. This guard is likewiſe called the *covering party*, and marches generally that night before the foraging, that they may be poſted in the morning before the foragers come. The guard conſiſts both of horſe and foot, and muſt ſtay at their poſt till the foragers be all come off the ground. See the preceding article.

FORRENBACH, in *Geography*, a town of Germany, in the territory of Nuremberg; five miles E. S. E. of Herſbach.

FORRES, a town ſituated near the mouth of the river Findhorn, on a riſing ground three miles diſtant from the bay of the ſame name, is a royal burgh, in the county of Moray; and though it is uncertain when it received this privileged diſtinction, yet it is noticed in records as a conſiderable place in the thirteenth century. The corporation conſiſts of a provoſt, two bailiffs, and a dean of guild, elected annually; and the town, conjointly with Fortroſe, Nairn, and Inverneſs, ſends one member to the Britiſh parliament: it is the ſeat of a preſbytery. The houſes, which are in general neatly built, amounted, according to the returns made to government in 1801, to 663, containing 3114 inhabitants; of whom 380 were employed in trade and manufactures. The river is navigable up to the village of Killos, within two miles of the town, where is the port belonging to this place. The Findhorn abounds with ſalmon and other fiſh, and the fiſheries on it are very productive. To the ſouth of the town, on an eminence, ſtands the houſe of Burdsyards, commanding a fine proſpect, and ſurrounded by extenſive plantations; on an eminence at the weſt end of the town ſtood a caſtle, built by ſome of the early kings, and burnt at the reformation. Near Forres, in the pariſh of Rafford, is a very ſingular remain of antiquity; it is an upright pillar, known under the denomination of "Sweno's ſtone." This, which exceeds all other obeliſks to be ſeen in Scotland, is perhaps the fineſt monument of the Gothic kind to be found in Europe. It is thus deſcribed by Mr. Pennant in his Tour in Scotland. "It is three feet ten inches broad, and one foot three inches thick; the height above ground is 23 feet; below, as it is ſaid, 12 or 15. On one ſide are numbers of rude figures of animals and armed men, with colours flying; ſome of them ſeem bound like captives. On the oppoſite ſide was a croſs included in a circle, and raiſed above the ſurface of the ſtone. At the foot of the croſs are two gigantic figures, and on one of the ſides is ſome elegant fret-work." The column appearing likely to fall, a few years ſince was ſet upright, and guarded by the addition of ſeveral free-ſtone ſteps erected round the baſe. Various have been the conjectures reſpecting the age and purport of this monument. That of the late reverend Mr. Cordiner appears the moſt probable. In his remarks, which accompanied a drawing of the pillar ſent to Mr. Pennant, he ſuppoſes it to have been ſet up in commemoration of the peace concluded between Malcolm, king of Scotland, and Canute, the Daniſh king of England, in the year 1002; when the Danes, who had long been in poſſeſſion of Moray, finally relinquiſhed that province by ſtipulation.

In a moor not far from Forres, Shakſpeare places Macbeth's rencounter with the witches. Below the ſtone, at the head of an inlet of the ſea, are ſome remains of Kinloſs abbey, founded in 1150 by David I. for Ciſtercian monks, and amply endowed. The ruins were ſold, in 1651, to build the citadel of Inverneſs. On the oppoſite ſide of that inlet was Conebin eſtate, overwhelmed with ſand about a century ago. The country, for ſeveral miles weſt of Forres, is level, well cultivated, and adorned with fine plantations, ſeats, old caſtles, &c. In a hollow of that tract there was diſcovered, in the laſt century, a ſhip's anchor four feet below ground, whence, and from other circumſtances, it would appear that the whole of the low-lands along the coaſt of the Frith was anciently covered with the ſea. To the ſouth of Forres lies the foreſt and caſtle of Tarnaway, formerly the reſidence of the earls of Moray. This caſtle is noted for its ſpacious hall, named from earl Randolph, one of the ſupporters of Robert Bruce. In the church-yard of Dyke, weſt of Forres, is part of a ſtone-croſs ornamented with rude reliefs. N. lat. 57° 36'. W. long. 3° 42'.

FORRESTER'S ISLAND, a ſmall iſland in the North Pacific ocean, about 14 miles N. W. from the S. W. coaſt of the Prince of Wales's Archipelago, ſo called by Mr. Dixon. N. lat. 54° 50'. E. long. 126° 38'.

FORS, a town of Sweden, in Weſt Gothland; 17 miles S. S. E. of Uddevalla.—Alſo, a town of Sweden, in Jamtland; 44 miles N. of Sundſwall.

FORSE, a river of Scotland, in Caithneſs; which runs into the North ſea; ſix miles W. of Thurſo.

FORSES, CATADUPÆ, a term uſed in Weſtmoreland for water-falls.

FORSKALEA, in *Botany*, named by Linnæus in memory of his pupil Peter Forſkal, a Swede, who being ſent, at the expence of the king of Denmark, to inveſtigate the natural productions of the Eaſt, in company with the celebrated Niebuhr, died at Jerim in Arabia, July 11, 1763, aged 31. His notes and deſcriptions, rich in information reſpecting the natural hiſtory of Egypt and Arabia, but not corrected by references to other authors, as they would have been by himſelf for the preſs, were publiſhed in three quarto volumes, under the direction of his fellow-traveller, at Copenhagen in 1775. Linn. Mant. 11. Schreb. Gen. 268. Willd. Sp. Pl. v. 2. 474. Mart. Mill. Dict.

v. 2. Ait. Hort. Kew. v. 2. 121. Juſſ. 403. Gærtn. t. 68. (Caidbeja; Forſk. Fl. Ægyptiaco-Arab. 82.) Claſs and order, *Octandria Tetragynia*. Nat. Ord. *Scabridæ*, Linn. *Urticæ*, Juſſ.

Gen. Ch. *Cal.* Perianth erect, of four oblong, parallel, permanent leaves. *Cor.* Petals eight, rude, ſpatulate, concave, erect, withering, ſhorter than the calyx, the claw and border of equal length. *Stam.* Filaments eight, thread-ſhaped, one within each petal, elaſtic, the length of the calyx; anthers of two roundiſh lobes. *Piſt.* Germens four, diſtant, oblong, woolly; ſtyles briſtle-ſhaped; ſtigmas ſimple. *Peric.* none. *Seeds* four, oblong, compreſſed, tapering at each end, enveloped in wool.

Eſſ. Ch. Calyx of four leaves, longer than the corolla. Petals eight, ſpatulate. Pericarp none. Seeds four, entangled in wool.

Obſ. Linnæus remarked that "the number in the parts of fructification varies, and that the flower is extremely difficult to diſſect and underſtand;" owing to the wool with which all its organs are entangled. He places this genus in *Decandria Pentagynia*. Murray, Schreber, and Willdenow have conſidered it as belonging to *Octandria Tetragynia*. Juſſieu, not without heſitation, but apparently for good reaſons, differs widely from Linnæus and his followers in his view of this flower, conſidering it as monoecious, and underſtanding the petals of Linnæus as monandrous male florets, each of one ſcale, varying in number from ſeven to ten, and ſurrounding the female florets, which are central, and vary likewiſe in number from three to five, the wool being to them in the place of the ſcales of the others. To this it may be objected, that the number of the female organs always keeps pace in *Forſkalea* with the male ones, as in true ſimple flowers, whereas in monoecious, or compound ones, a luxuriance in the one kind is generally, perhaps invariably, compenſated by a deficiency in the other. The analogy of *Parietaria* moreover, a genus cloſely allied to *Forſkalea*, is not favourable to the theory of Juſſieu. We however readily follow this author and Niebuhr in preference to Linnæus and others, in the orthography of the name, and conſequently *Salvia Forſkalii* is the true ſpelling, not *Forſkælii*. Three ſpecies of this genus are known.

1. F. *tenaciſſima*. Linn. Mant. 72. Suppl. 245. Linn. fil. Ic. t. 1. Jacq. Hort. Vindob. v. 1. t. 48. (Caidbeja adhærens; Forſk. Fl. 82. Chamædryfolia tomentoſa Maſcatenſis; Pluk. Almageſt. 97. Phyt. t. 275. f. 6. Luſſaq of the Arabs.)—"Plant clothed with briſtly hairs. Leaves elliptical, pointleſs. Calyx-leaves oblong-lanceolate, acute." Ait. H. Kew.—Native of vallies between the calcareous hills of the deſert to the eaſt of Cairo. This plant has much of the aſpect of the common Pellitory, *Parietaria officinalis*, except a more hoary whiteneſs on the backs of the leaves and about the calyx. It is annual, flowering in the latter part of ſummer, and requires to be kept with us in the green-houſe, where few perſons, except for curioſity, would deſire to have it. The briſtles of the *ſtem* and *leaves* are finely hooked, by which they ſtick to any thing that comes in their way. The *calyx* is enlarged after flowering, and falls off with the ſeed.

2. F. *candida*. Linn. Suppl. 245. Thunb. Prod. Cap. 77. (F. ſcabra; Retz. Obſ. faſc. 3. 31.)—Plant rough with cartilaginous points. Leaves elliptical, wavy, pointleſs. Calyx-leaves obovate, obtuſe—Native of the Cape of Good Hope, from whence, as we learn by the Hortus Kewenſis, it was ſent by Mr. Maſſon to Kew in 1774, where it is kept in the green-houſe, and flowers in June and July. The *ſtem* is perennial and ſomewhat ſhrubby, much branched, rough, like the upper ſide of the *leaves*, with harſh horny points, often hooked. The blunt *calyx-leaves* moreover diſtinguiſh this ſpecies from the preceding.

3. F. *anguſtifolia*. Retz. Obſ. faſc. 3. 31. Murray in Comm. Gott. for 1784. 24. t. 2.—Plant briſtly. Leaves lanceolate, green on both ſides; their teeth briſtly. Calyx-leaves lanceolate, briſtle-pointed. Found by Maſſon in the iſland of Teneriffe. Hort. Kew.—It is annual, kept in the green-houſe, and flowers in July and Auguſt. This is like the other two, but rather more briſtly and with narrower *leaves*, which are ſcarcely hoary at the back, except when young. Their teeth are tipped with ſtraight ſpinous briſtles; their upper ſurface rough with hooked ones. The leaves of the *calyx* are remarkably narrow, and very briſtly. The *petals* are reddiſh.

Linnæus is ſuppoſed in the name of the firſt ſpecies, *tenaciſſima*, to have complimented rather than ſatirized the character of Forſkal, who was an indefatigable and acute obſerver, and did not eaſily forget what he had once acquired. In that of the ſecond, *candida*, one of the laſt names Linnæus ever applied, he unqueſtionably deſigned to do honour to the temper of his friend, whoſe works had juſt been preſented to him, from the king of Denmark, in a ſplendid form, and are now in the hands of the writer of this paragraph.

FORSOOTH, in *Antiquity*, a title of honour, anciently given to ladies, and ſtill retained, as well as dame, in ſome of the exiſting religious communities of Engliſh women, which were eſtabliſhed on the continent above two centuries ago, as forſooth Mary, forſooth Ann, no leſs than dame Mary, dame Ann, &c.

FORST, in *Geography*, a town of Germany, in the principality of Culmbach; 4 miles N. N. E. of Neuſtadt.

FORSTA, a town of Luſatia, on the river Neiſſe; the inhabitants of which are employed in manufacturing fine woollen and linen cloths and carpets, and brewing beer: 54 miles N. N. E. of Dreſden. N. lat. 51° 43'. E. long. 14° 40'.

FORSTENOVE, a town of Germany, in the biſhopric of Oſnabruck; 15 miles from Oſnabruck.

FORSTER, John, in *Biography*, a learned German divine, was born at Augſburg in the year 1495. He received the early parts of his education in his native city; and then went to Ingoldſtadt in Bavaria, where he enjoyed the opportunity of profiting by the inſtructions of the celebrated Reuchlin, who, though at that time in his ſeventieth year, took great delight in aſſiſting and encouraging the literary purſuits of young perſons. Under this tutor Mr. Forſter made great progreſs in his ſtudies, and excelled particularly in the Hebrew and Greek languages. From Ingoldſtadt he went to Leipſic, where he ſtudied theology, and thoſe other branches of literature which were connected with the clerical profeſſion. Here he firſt commenced teacher of the Hebrew language and divinity: he afterwards removed to the univerſity of Wittemberg, where he was admitted to the honour of doctor of divinity. At this univerſity he diſcharged, with high reputation, the duties of public profeſſor of Hebrew, and at the ſame time rendered eſſential ſervice to the Proteſtant religion by his labours as a preacher. When Luther undertook his tranſlation of the bible, he frequently availed himſelf of the aid of Forſter, and ſubmitted to his judgment reſpecting the ſenſe of difficult paſſages more readily than to that of any other man. He died at Wittemberg in 1556, when he was about ſixty-one years old, highly beloved for his candour and amiable diſpoſition, and reſpected for his great literary attainments. He was author of a valuable Hebrew

dictionary, which was printed at Basil in 1557. There were two other persons by the same name: the one a Lutheran divine, professor at Wittemberg, and minister at Eisleben, where he died in 1613. He was author of commentaries on Exodus, Isaiah, and Jeremiah, in three vols. 4to. a treatise "De interpretatione Scripturarum," 4to. and other critical and theological productions. The other, John Forster, entitled to notice, was a jurist at Padua, and author of a work entitled "Processus judiciarius Cameralis." Moreri. Gen. Biog.

Forster, Nathaniel, a learned divine of the church of England, was born at Stadscombe, Devonshire, in the year 1717. Soon after his birth his father, who was a clergyman, removed to Plymouth, where he educated his son in the elements of learning, and then sent him to the grammar-school of that town, of which he was the head scholar before he was thirteen years of age. In 1731 he was removed to Eton, and at the same time entered at Pembroke college, Oxford, in order to entitle him to the benefit of an exhibition of forty pounds per annum. In 1733 he was admitted scholar of Corpus Christi college, and after taking his degrees, he was elected fellow in the year 1739: in the same year he received deacon's orders, and in 1741-2 was ordained a priest. His time was chiefly spent at college in a close application to his studies, by which he acquired a high reputation, and a vast knowledge of the dead languages. His first preferment in the church was the rectory of Heathe, in Oxfordshire, which was presented to him in 1749 by the lord-chancellor Hardwicke, on the recommendation of Dr. Secker, bishop of Oxford, his earliest friend, who also introduced him to the notice of Dr. Butler, at that time bishop of Bristol, who appointed him his domestic chaplain, when he was translated to the see of Durham in 1750. Mr. Forster now quitted the university, and was admitted to the degree of doctor of divinity. He continued chaplain to the bishop of Durham till the death of that prelate, who, though he had not given him any preferment in the church, must have highly esteemed him, as he appointed him executor to his will, with a legacy of 200*l*. Dr. Forster now returned to college, with a determination to devote his time to literary pursuits; but in 1752 he was made one of archbishop Herring's chaplains, who in a short time promoted him to a prebendal stall in the church of Bristol, and presented him also with the valuable vicarage of Rochdale in Lancashire. He was elected a fellow of the Royal Society in 1755: made one of his majesty's chaplains, and appointed preacher at the Rolls chapel. In 1757 he married a lady of considerable fortune, and settled in Craig's court, Westminster; but before the end of the same year he died. Among his connections and friends he could rank almost all the eminent men of his time, and he left behind him a high character for all the private virtues that adorn life. He was author of many works, of which the principal are "Reflections on the natural antiquity of Government, Arts, and Sciences in Egypt," 1743. "Platonis Dialogi quinque: recensuit, notis illustravit, Nathaniel Forster, A M." &c. 1745. "Appendix Liviana, continens I. selectus Codicum. MSS. et editionum antiquarum lectiones, præcipuas variorum emendationes, et supplementa lacunarum in iis T. Livii que supersunt libris. II. J. Frienshemii supplementorum libros X. in locum decadis secundæ Livianæ deperditæ," 1746. "Biblia Hebraica, sine punctis, accurante Nath. Forster, &c. 1750." Gen. Biog.

Forster, John Reinhold, an eminent naturalist and philologist, was the son of a burgomaster at Dirschaw, in Polish Prussia, where he was born October the 22d, in the year 1729. In early youth he had few advantages for education; but about the age of fifteen years, he was admitted into the gymnasium of Joachimsthal at Berlin. Under the tuition of Menzelius and Heinsius, he made considerable progress in the learned languages: and he also devoted a part of his attention to the study of the Coptic, and to the acquisition of several of the modern languages, and particularly the Polish. In the year 1748, he was entered at the university of Halle, where he studied theology, and continued his application to the learned languages, among which he comprehended the oriental. After three years he removed to Dantzic, and distinguished himself as a preacher, imitating the French rather than the Dutch manner; and in 1753, he obtained a settlement at Nassenhuben. In the following year he married his cousin, Elizabeth Nikolai. During his residence in this place, he employed his leisure hours in the study of philosophy, geography, and the mathematics, without desisting from farther improvement in his acquaintance with the ancient and modern languages. With a small income and increasing family, the difficulties he experienced induced him to accept the proposal of removing to Russia, in order to superintend the new colonies at Saratow. Much, however, as he was approved during an interview with the members of government at Petersburgh, some circumstances occurred which rendered his new appointment of short duration; but on his return to the capital, advantageous offers were made to him both by the academy of sciences, and by that of Moscow, both which he thought proper to decline. Having for some time indulged unavailing expectations from the Russian government, he removed to London in the year 1766, with strong recommendations, but with very little money. After his arrival, he received from the government of Russia a present of 100 guineas; and he also made an addition to his stock by the translation of Kalm's Travels and Osbeck's Voyage. At this time lord Baltimore proposed to him a settlement in America, as superintendant of his extensive property in that country; but he preferred the place of teacher of the French, German, and natural history in the dissenting academy at Warrington. This situation, however, he soon abandoned; and returning to London, he was engaged, in the year 1772, to accompany captain Cook, as a naturalist, in his second voyage round the world. At this time he was 43 years of age, and his son George, who went with him, was 17. Upon his return to England in 1775, the university of Oxford conferred upon him the degree of doctor of laws. At this time he was projecting, with the assistance of his son, a botanical work in Latin, containing the characters of many new genera of plants, which they had discovered in the course of their voyage. An account of the voyage having been published by his son in English and German, the father was supposed to have had a considerable share in it; and as he had entered into an engagement not to publish any thing separately from the authorized narrative, he thus incurred the displeasure of government, and gave offence to his friends. Independently of the violation of his engagement, he was also chargeable with having introduced into his work several reflections on the government which appointed, and also on the navigators who conducted the expedition. The father and son, finding that, in consequence of these circumstances, their situation in London was become unpleasant, determined to quit England. Before the execution of their purpose, their condition became embarrassed and distressing; but happily for Mr. Forster, he was invited, in 1780, to be professor of natural history at Halle; he was also appointed inspector of the botanical garden;

and

and in the following year, he obtained the degree of M.D. His health, however, began to decline; and the death of his ſon George ſo deeply impreſſed his mind as to aggravate his other complaints. Towards the commencement of the year 1798, his caſe became deſperate; and before the cloſe of this year, *viz.* on the 9th of December, his life terminated at the age of 69 years and ſome months. Mr. Forſter's diſpoſition was, unfortunately for his happineſs and reputation, extremely irritable and litigious; and his want of prudence involved him in perpetual difficulties. The following character given of him by the celebrated Kurt Sprengel of Halle, is delineated by the partiality of a friend: "To a knowledge of books in all branches of ſcience, ſeldom to be met with, he joined an uncommon fund of practical obſervations, of which he well knew how to avail himſelf. In natural hiſtory, in geography, both phyſical and moral, and in univerſal hiſtory, he was acquainted with a vaſt number of facts, of which he who draws his information from works only has not even a diſtant idea. This aſſertion is proved in the moſt ſtriking manner by his "Obſervations made in a Voyage round the World." Of this book it may be ſaid, that no traveller ever gathered ſo rich a treaſure on his tour. What perſon of any education can read and ſtudy this work, which is unparalleled in its kind, without diſcovering in it that ſpecies of inſtructive and pleaſing information which moſt intereſts man, as ſuch? The uncommon pains which Forſter took in his literary compoſitions, and his conſcientious accuracy in hiſtorical diſquiſitions, are beſt evinced by his "Hiſtory of Voyages and Diſcoveries in the North," and likewiſe by his excellent archeological diſſertation "On the Byſſus of the Ancients." Reſearches ſuch as theſe were his favourite employment, in which he was greatly aſſiſted by his intimate acquaintance with the claſſics. Forſter had a predilection for the ſublime in natural hiſtory, and aimed at general views rather than detail. His favourite author, therefore, was Buffon, whom he uſed to recommend as a pattern of ſtyle, eſpecially in his Epoques de la Nature, his deſcription of the horſe, camel, &c. He had enjoyed the friendſhip of that diſtinguiſhed naturaliſt; and he likewiſe kept up an uninterrupted epiſtolary intercourſe with Linnæus, till the death of the latter. Without being a ſtickler for the forms and ceremonies of any particular perſuaſion, he adored the eternal Author of all which exiſts in the great temple of nature, and venerated his wiſdom and goodneſs with an ardour and a heart-felt conviction, that, in my opinion, alone conſtitute the criterion of true religion. He held in utter contempt all thoſe, who, to gratify their paſſions or imitate the prevailing faſhion, made a jeſt of the moſt ſacred and reſpectable feelings of mankind. His moral feelings were equally animated: he was attracted with irreſiſtible force by whatever was true, good, or excellent. Great characters inſpired him with an eſteem, which he ſometimes expreſſed with incredible ardour."

His other works, beſides thoſe above mentioned, are chiefly compilations and tranſlations. He alſo communicated ſeveral papers to the Royal Society, the Academy of Sciences at Stockholm, the Imperial Academy of Sciences at Peterſburgh, and other learned ſocieties; which appear in their reſpective Tranſactions and Memoirs. Gen. Biog.

Forster, George, ſon of the preceding, was born at Dantzic in 1754, and accompanied his father to England, when he was about 12 years of age. At Warrington, where he ſtudied for ſome time, he acquired a perfect uſe of the Engliſh tongue; and poſſeſſing a retentive memory and fertile imagination, he diſtinguiſhed himſelf by his various literary and ſcientific attainments. We have already mentioned that he accompanied his father in the circumnavigation of the globe; and on leaving England, after their return, he wiſhed to ſettle at Paris. After a temporary reſidence in that city, he removed, in the year 1779, to Caſſel, and undertook the office of profeſſor of natural hiſtory in the univerſity of that place. He afterwards accepted the offer of a chair in the univerſity of Wilna; but found no permanent ſatisfaction in a country where liberty was expiring under the intrigues of Ruſſia and Pruſſia. Deſirous of a retreat, he entered into a treaty with Catherine II., who projected a voyage of diſcovery round the world; but the propoſed expedition was prevented by a war with the Ottoman Porte; and thus the hopes of Forſter were fruſtrated. His active mind, however, led him to wiſh for uſeful employment; and the reputation which he had acquired induced the elector of Mentz to appoint him preſident of the univerſity of that city. He hailed the dawnings of the French revolution, ſays M. Pougens, little apprehending, we may ſay, the clouds that ſubſequently overſhadowed them; and he was deputed by the people of Mentz, who had formed themſelves into a convention, to repair to Paris, and to requeſt that they might be united to the French republic. But whilſt he was thus employed, the city of Mentz was beſieged and taken by the Pruſſian troops. By this diſaſter he loſt his whole property, and his numerous MSS., which fell into the hands of the prince of Pruſſia. The domeſtic uneaſineſs of a conjugal kind, which he afterwards experienced, led him to form a reſolution of viſiting Hindooſtan and Thibet; for which he acquired the neceſſary preparation, by ſtudying the oriental languages: but the chagrin occaſioned by his misfortunes aggravating a ſcorbutic affection, which he had contracted during his voyage round the world, prevented the accompliſhment of his purpoſe, by terminating his exiſtence; which event took place at Paris, February 13th, 1792, at the age of 39 years. His works are "A Voyage round the World, in his Britannic Majeſty's Sloop Reſolution, commanded by Captain James Cook, during the Years 1772, 3, 4, and 5," London, 1777, 3 vols. 4to. This work was tranſlated by himſelf and his father into German, and publiſhed at Berlin, in 2 vols. 4to. 1778-1780. "Reply to Mr. Wales's Remarks on Mr. Forſter's Account of Captain Cook's laſt Voyage," London, 1778, 4to. "A Letter to the Right Honourable the Earl of Sandwich," 1779, 4to. He was concerned for ſome time with profeſſor Lichtenberg of Gottingen, in the publication of the Gottingen Magazine; he alſo wrote ſome papers in the Tranſactions of the Academy of Sciences at Upſal; he had a large ſhare in the "Characteres generum Plantarum, &c." of his father; and was employed by profeſſor Pallas, and others, in the continuation of Martini's Dictionary of Natural Hiſtory. Account of his Life by Pougens. Gen. Biog.

Forster's *Bay*, in *Geography*, a bay of the South Atlantic ocean, on the coaſt of Sandwich Land, between South Thule and cape Briſtol.

Forster's *Harbour*, a bay in Hudſon's ſtrait, Hudſon's bay. N. lat. 62° 18'. W. long. 73° 30'.

FORSTERA, in *Botany*, ſo named by Linnæus a little before his death, and publiſhed by his ſon in the *Supplementum Plantarum*, in honour of the celebrated naturaliſts, John Reinhold Forſter, and his ſon George Forſter; ſee thoſe articles. Linn Suppl. 59. G. Forſter in Act. Nov. Upſal. v. 3.184. Schreb. 607. Willd. Sp. Pl. v.4. 147. Juſſ. 423. Swartz in Schrad. Journ. for 1799. 31. t. 2. and in Sims and Kon. Ann. of Bot. v. 1. 291. t. 6. (Phyllachne; Forſt. Gen. t.58. Linn. Suppl. 62. Schreb. 672. Juſſ. 422.)

422.) Class and order, *Gynandria Diandria*. Nat. Ord. *Campanaceæ*, Linn.

Gen. Ch. *Cal.* Perianth double; one *inferior*, of two or three erect leaves; the other *superior*, of from two to six erect leaves. *Cor.* of one petal, tubular, somewhat bell-shaped; tube short; limb in five or six deep, equal, oblong, spreading segments. *Stam.* Filaments none; anthers two, sessile on the summit of the style, globose, of one cell and two valves, which separate transversely at their outside. *Pist.* Germen inferior, turbinate; style columnar, cylindrical, erect; stigmas two, roundish, concealed by the concave upper valves of the anthers. *Peric.* Capsule oval, of one cell. *Seeds* numerous, inserted upon a central columnar receptacle.

Ess. Ch. Calyx double; inferior of two or three leaves; superior of three to six leaves. Corolla tubular, bell-shaped, in five or six segments. Capsule of one cell. Seeds numerous.

Obs. The above characters are taken from Swartz, who first well understood this singular genus, as well as *Phyllachne* of Forster and Linnæus, which he unites with it. He has hinted, and Mr. Konig in the Annals of Botany confirms the idea, that *Forstera* and some other kindred genera, constitute a new natural order, next to the *Campanaceæ* of Linnæus, *Campanulaceæ* of Jussieu. These genera are *Lobelia*, *Goodenia*, *Scævola*, *Velleia*, *Stylidium*, and possibly one or two more. The latter is the *Ventenatia* of Dr. Smith in his *Exotic Botany*, t. 66, 67, communicated originally by him, under the name of *Stylidium*, to his friend professor Swartz, who published it in the Transactions of the Natural History Society of Berlin, and this name must remain, there being now another *Ventenatia*.

1. F. *sedifolia*. Linn. Suppl. 407. Forst. Act. Nov. Upsal. v. 3. 184. t. 9. Prod. 61.—Stems ascending. Leaves reflexed, obtuse. Flower-stalk elongated. Outer calyx shortest.—Native of high mountains in New Zeeland, where it was discovered by the botanists whose name it bears. The *roots* are perennial, creeping. *Stems* several, ascending, lax, a span high, sub-divided, leafy. *Leaves* loosely imbricated, tongue-shaped, obtuse, entire, recurved, thickish, shining, with a broad keel. *Flower-stalks* terminal, solitary, a finger's length, simple, naked, smooth, single-flowered. *Flower* erect, white, or flesh coloured, red in the orifice, the size of *Androsace lactea*. This is a very rare plant in herbariums, and unknown in gardens, though highly desirable, and unquestionably hardy.

2. F. *muscifolia*. Willd. Sp. Pl. v. 4. 148. (Phyllachne uliginosa; Linn. Suppl. 412. Forst. Magell. 32.)—Stems densely tufted. Leaves closely imbricated, acute. Flower-stalk very short. Outer calyx longest. Native of Terra del Fuego. In habit this pretty plant resembles a moss, forming very compact level tufts. The *stems* when separated are found covered with imbricated, keeled, acute *leaves*.

The *flowers* are small, solitary, terminal, almost sessile, imbedded as it were in the top leaves, white or flesh-coloured, resembling those of the smallest kinds of *Androsace*, to which genus any alpine botanist would, at first sight, suppose this species to belong.

FORSYTHIA, in honour of the late Mr. William Forsyth, F. A. S. and F. S. A. gardener to his majesty at Kensington, author of a Treatise on the Culture and Management of Fruit-trees. He is celebrated for the discovery of a composition for protecting wounded trees from the injuries of the air, and so enabling them to heal, for which he was rewarded by parliament. This genus was named by Vahl, the original *Forsythia* of Walter, Flo. Carolin. 153, proving no other than the *Decumaria barbara* of Linnæus; see DECUMARIA.

This was unknown to Mr. Walter, who therefore does not merit the censure cast on him by Vahl, of changing an established name to no purpose. Vahl. Enum. v. 1. 39. Class and order, *Diandria Monogynia*. Nat. Ord. *Sepiariæ*, Linn. *Jasmineæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, inferior, in four deep, lanceolate, equal segments. *Cor.* of one petal, bell-shaped, cut half way down into four ovate, obtuse lobes. *Stam.* Filaments two, very short; anthers oblong, furrowed, the length of the calyx. *Pist.* Germen superior, ovate, smooth; style thread-shaped, the length of the calyx; stigma capitate, two-lobed. *Fruit* unknown, supposed by Thunberg to be a capsule.

Ess. Ch. Calyx in four deep segments. Corolla bell-shaped, four-cleft. Fruit . . . . .

1. F. *suspensa*, the only known species. (Syringa suspensa; Thunb. Jap. 19. t. 3. Linn. Syst. Veg. ed. 14. 57. Mart. Mill. Dict. v. 4. Willd. Sp. Pl. v. 1. 49. Rengjo; Kæmpf. Amoen. 907.)—Native of Miaco and other parts of Japan, where also it is cultivated for the beauty of its flowers, which come forth in April, before the leaves, but soon fall off. It is a *shrub*, with a climbing *stem*, and long, trailing, opposite, pendulous, smooth *branches*. *Leaves* several from each bud, stalked, ovate, acute, serrated, smooth, thin; the earlier ones simple; the rest ternate. *Flowers* from several opposite buds, towards the ends of the branches, about the size of the blossoms of *Halesia tetraptera*; but yellow, streaked internally with red, each hanging from a simple slender stalk, near an inch long. Willdenow justly remarks that this plant is totally unlike the real species of *Syringa*, and might well constitute a distinct genus, which Vahl carried into effect, though the fruit is as yet unknown to botanists.—The *Forsythia* would be a desirable acquisition for our gardens, being doubtless able to bear our climate as well as the Chinese *Hydrangea*, and calculated for decorating bowers, treillis-work, &c. If botanists would take the pains to furnish travellers with drawings of such plants, even if made but imperfectly from any drawings, plates and descriptions that happen to exist, many valuable species might still be obtained from China and Japan. By such a method, at the command of the present queen of Great Britain, the fragrant *Acorus gramineus*, Dryand. in Ait. Hort. Kew. v. 1. 474, frequently drawn on Chinese papers, as cultivated in pots about houses, was obtained, and first made known to botanists; except indeed that it seems to be the *Acorus Calamus* of Loureiro.

FORT, RAIMOND-JEAN, in *Biography*, called also in Latin *Janfortius*, a physician of distinguished talents, by which he was raised to the highest rank in the profession, although of low origin. He was born at Verona of poor parents, who were unable to afford him any education: but a person of that city, who had remarked his quickness and desire for knowledge, procured him instruction in reading and writing, and afterwards sent him to Padua, where he distinguished himself among his fellow-students in the classes of humanity. This kind patron continued to support him also during his application to the study of medicine, which he honourably terminated by taking the degree of Doctor. He had scarcely quitted the schools, however, before the death of his protector left him without resource. He repaired to Venice, where he was relieved from poverty by the commencement of a small, but successful practice of his profession. Pressed as he was by the difficulty of subsistence, he did not resort to the unworthy means

means of obtaining notoriety, which effrontery and intrigue often lead men to adopt in great cities; he conducted himself with a modesty that is usually the concomitant of a sound understanding. By this mode of conduct he gradually acquired the reputation of one of the most able physicians of Venice; a character which was sanctioned by the senate, who appointed him to the first professorship of medicine in the university of Padua. This office he fulfilled to the admiration of all: for he was not less eloquent in his lectures, than accurate in his observations and prognostics, and successful in his cures. In 1676 the emperor Leopold commanded his attendance at Vienna, in order to consult him respecting his own health: and he gave so much satisfaction to that prince, that he returned to Padua loaded with magnificent presents, and decorated with the title of medical counsellor to the imperial court. The senate of Venice granted him the additional honour of the knighthood of the order of St. Mark, with an augmentation of his stipend, and likewise appointed him honorary professor of Padua. He did not however long enjoy these well-merited honours, for he died at Padua on the 26th of February, 1678, in the 75th year of his age.

This physician was the author of several practical works, of which the following are the titles. 1. "Consilia de Febribus et morbis Mulierum facilè cognoscendis et curandis," Patavii, 1668, folio. 2. "Consultationum et Responsionum Medicinalium centuriæ quatuor," tomus primus, Patav. 1669. fol. Geneva, 1677. 3. A second volume of the same book, at Padua, 1678. And 4. "Consultationes et Responsiones Medicinales," in two volumes, folio, Padua, 1721, which comprehends the two preceding works.

FORT, FRANCIS LE, was descended from a noble family of Geneva, where he was born in 1656, and entered at an early age into the military service of France. He afterwards served as a volunteer in Holland, and was wounded at the siege of Grave. For the sake of preferment he joined a German colonel, who was enlisting a body of men for the czar Alexis of Russia. They arrived at Archangel, and were exposed to extreme danger and want. Le Fort, however, contrived to get to Moscow, and was by his address immediately appointed secretary to the Danish resident. He applied himself to, and soon acquired, the languages necessary to his new situation, and attracted the notice of several persons of distinction, and finally of the young czar Peter. In him he found a patron, and Le Fort was precisely the person wanted to assist the prince in his efforts to raise himself and his country from that state of barbarism in which it was involved at this period. He was immediately promoted to a captain's commission, and was admitted to the confidence of the sovereign. He was employed to raise a body of 12,000 men, and was made their general. Though perfectly unacquainted with naval affairs, he was, soon after, created an admiral, and his activity rendered him very useful in forming the commencement of that marine which was the favourite object of the czar's life. Fort was appointed in 1696 to conduct the siege of Asoph, in which he gained so much reputation that the czar immediately invested him with the chief command of all his troops both by land and by sea. He was appointed to the government of Novogorod, and to the principal post in the ministry. When Peter determined upon travelling for his own improvement, he sent Le Fort embassador to the courts which he intended to visit, and went as a private person in his suite. Though he was ever in high esteem with his master, yet he once narrowly escaped with life, the czar having, in a fit of passion, drawn his sword upon him. When Peter was returned to his recollection he expressed the most unfeigned sorrow for what had happened, and Le Fort retained his favour till his death, in 1699. The czar honoured him with a public funeral, and followed in the procession as a military officer. Le Fort was not a man of extensive knowledge when he was introduced into the Russian service, but he had the seeds of great talents in him, which developed themselves in proportion to his advancement: and he had seen enough of the world to be able to suggest plans on which the improvement of the country depended. Moreri.

FORT, a little castle or fortress; or a place of small extent, fortified by art or nature, or both.

A fort is a work encompassed round with a moat, rampart, and parapet, to secure some high ground, or passage of a river; to make good an advantageous post; to fortify the lines and quarters of a siege.

FORT, *Field*, otherwise called *Fortin* or *Fortlet*, and sometimes *Sconce*, is a small fort, built in haste, for the defence of a pass or post; but particularly constructed for the defence of a camp in the time of a siege, where the principal quarters are usually joined, or made to communicate with each other, by lines defended by fortins and redoubts. Their figure and size are various, according to the nature of the situation, and the importance of the service for which they are intended. Some are fortified with bastions, and some with demi-bastions. A fort differs from a *citadel*, (which see,) as this last is erected to command and guard some town; and from a redoubt, as it is closed on all sides: whereas a redoubt is open on one side. Forts are most commonly made square (see *Plate* IV. *Fortification, fig.* 4.) especially when the pass they are to guard is of any consequence, or the place may easily be approached: the sides of this square are a hundred toises, the perpendicular ten, and the faces twenty-five; the ditch about this fort may be from ten to twelve toises; the parapet is to be made of turf, and fraised, and the ditch palisadoed when dry. There may be made a covert-way about this fort, or else a row of palisades might be placed on the outside of the ditch. A square fort may be fortified in the following manner: having inscribed the square in a circle, divide each of its sides, A B, B D, &c. into two equal parts in the points F, M, &c. from the centre E draw an indefinite line E F; from the centre draw also the lines E A, E B, E D, E C, to the angles of the square; divide the side A B into eight equal parts, and set off one of these parts from F to G, and from G draw the lines of defence A G, B G; divide another side of the square into seven equal parts, and set off two of those parts from A to K, and from B to L, which will be the faces of the bastions; take the distance K L in your compasses, and set it off on the lines of defence from K to H, and from L to I, and draw H I, which will be the curtin, and the lines K I, L H, will be the flanks. Or, it may be otherwise fortified thus: let the side A A (*fig.* 5.) be a hundred and thirty fathoms; the demi-gorge A B twenty-five fathoms; and with the compasses opened to the length of the pinched line B C B, which is the diagonal of two sides, from each of which there has been taken twenty-five fathoms, upon the extremity opposed to the angle which they form, describe two arcs above the angle of the figure, alternately making use of the points B for centres; then draw lines from the points of intersection of the arcs D, to the point which served for centres B, upon which points B, raise the flanks B E perpendicular to the opposed lines of defence B D.

FORT *paine, & dure.* See PAINE.

FORT *royal*, is a fort whose line of defence is at least twenty-six fathoms long.

FORTS,

FORT, *Star*, is a ſconce or redoubt, conſtituted by re-entering and ſalliant angles, having commonly from five to eight points, and the ſides flanking each other.

To deſcribe a ſtar-fort.—Deſcribe a hexagon *a* B C *d e f* (*fig.* 6.); divide one of its ſides into four equal parts; and on the centre of this ſide raiſe the perpendicular D A equal to one fourth of the ſide B C. From the point A draw the faces A C and A B, and let the ſame operations be performed with reſpect to the other ſides of the hexagon.

FORTS are ſometimes made triangular, only with half baſtions, as in *fig.* 7. This, as well as the ſquare and pentagonal fort, (*figs.* 8. and 9.) may be deſcribed in the following manner. Parallel to the inner figure, whether it be a triangle, ſquare, or pentagon, whoſe ſide A B may be ſuppoſed about eighteen yards, deſcribe an outward figure at the diſtance of about four or five yards from it, or farther, if neceſſary, whoſe ſides are E D, E F, &c. Divide each ſide, as E D, E F, &c. into three equal parts, one of which is E I, F L, &c. and in theſe ſides prolonged, take D G, E H, &c. each equal to one of thoſe three parts. From the points G, H, &c. thus found, draw the lines of defence to the angles of the outward figure, as H D, &c. and from the points I, L, &c. draw the flanks I K, L M, &c. perpendicular to the ſides E D, E F, meeting the lines of defence in K, M, &c. Or the flanks may be drawn, by continuing the line D I towards E, and taking I P equal to twice I E; from P as a centre, with the radius P I, cut the line of defence in K, and draw the flank I K. Then to each face H K, flank K I, and curtin I G, make a parapet of about ſeven feet thick, or more if neceſſary, expreſſed in the figures, by drawing lines at that diſtance on the inſide of the ſeveral parts. Leave a proper berm of about four or five feet broad, and make a ditch about five or ſix yards wide, whoſe outer line or counterſcarp is to be parallel to the faces and curtins only. A fort thus conſtructed is more capable of defence than one without flanks; for the curtin I G is defended by the flank I K; and the face H K has ſome defence from the part D G. In the conſtruction of triangular forts, (*fig.* 10.) inſtead of making half baſtions at the angles, whole ones are placed in the middle of the ſides. The gorges of theſe baſtions may be from twenty or twenty-four toiſes, when the ſides are from a hundred to a hundred and twenty; the flanks are perpendicular to the ſides, from ten to twelve toiſes long, and the capitals from twenty to twenty-four. If the ſides happen to be greater or leſs, the parts of the baſtions are likewiſe made greater or leſs in proportion: the ditch round this fort may be ten or twelve toiſes wide. The ramparts and parapets of theſe works are commonly made of turf, and the outſide of the parapet fraiſed. Forts are often made of various figures, regular or irregular, and ſometimes in the form of a ſemi-circle, eſpecially when they are ſituated near a river, ſea, or at the entrance of a harbour; by which figure they are able to fire at the ſhips on all ſides. When a fort is to be built on a neck of land formed by the confluence of two rivers, or in the windings of a river, in order to prevent an enemy from tranſporting any thing by water, or to prevent their ſhips paſſing that way, the figure of the fort muſt be adapted to the ſituation, in ſuch a manner, that there may be no place for landing troops out of the reach of the fire of ſome work or other; and the ſide next to the land ſhould always be better fortified than the other parts near the river, as being more liable to an attack. There are two principal errors committed in the conſtruction of forts near the ſea, or navigable rivers, which ſhould be carefully guarded againſt; the one is, that of making the parapet too low, ſo that perſons behind it may be fired upon from the round top of a maſt, by which the gunners are obliged to abandon their guns, and ſave themſelves by flight: to remedy this inconvenience, the parapet ſhould be nine or ten feet high, and the batteries may be covered above by making an arch over every piece, left open behind to let out the ſmoke, or with planks, like ſheds, over which may be ſcattered earth or dung about a foot and half thick, to prevent the wood from taking fire.

The other fault is, leaving forts or batteries open behind, or very little fortified towards the land, ſo that the enemy may land men in the dark and ſurprize them, by which the guns placed in them become not only uſeleſs, but ſerve rather to deſtroy them. A fort, or battery, therefore, ſhould be fortified all round with a good rampart and ditch, at leaſt, or with an addition of outworks, if the place is of any importance: the rampart ſhould be fraiſed, and the ditch have a row of paliſades planted in the middle of it, if it be dry. In the conſtruction of all forts, it ſhould be remembered, that the figure of feweſt ſides and baſtions, that can probably anſwer the propoſed defence, is always to be preferred; as works on ſuch a plan are ſooner executed, and with leſs expence: beſides, fewer troops will ſerve, and they are more readily brought together in caſe of neceſſity. See *Military* CONSTRUCTION.

FORTS, *Vitrified*, ſtructures of a ſingular kind, occurring in the Highlands and northern parts of Scotland, the walls of which ſeem to have been melted into a ſolid maſs, reſembling the lava of a volcano. Mr. Williams, an engineer, ſuggeſts, in a treatiſe upon the ſubject, that theſe walls are the works of art; whilſt others are of opinion, that they ſhould be traced to a volcanic origin. Theſe buildings are commonly ſituated on the ſummits of ſmall hills, commanding extenſive views of the adjacent vallies or of the country below them. The area on the eminence, varying in extent, as ſome have ſuppoſed, in proportion to the number of cattle which the proprietor had to protect, or the dependents he was obliged to accommodate, was ſurrounded with a high and ſtrong wall, the ſtones of which were for the moſt part entirely melted; while others, which are not ſo completely fuſed, are ſo far ſunk in the vitrified matter as to be quite incloſed in it; and the fuſion of ſome has been ſo perfect, that the ruins reſemble maſſes of coarſe glaſs. Among thoſe who allow theſe vitrified ſtructures to be artificial works, ſome maintain that they were vitrified for the purpoſe of cementing the materials together; whilſt others think that the vitrification is accidental. Mr. Tytler, in his diſſertation, ſuggeſts that theſe forts were conſtructed, not only before the Roman invaſion, but before the introduction of the Druidical rites into Britain.

FORT is alſo uſed as a *geographical* appellative in various inſtances; ſome of which we ſhall recite.

FORT *Amſterdam*, a fortreſs of Africa, on the Gold coaſt, near Little Cormantin, whence the Engliſh were expelled by the Dutch in 1665.

FORT *Ann*. See ANN.

FORT *Auguſtus*. See AUGUSTUS.

FORT *des Ajutels*, a fort of France, in the department of the Channel; four miles N.W. of Cherburg.

FORT *Badenſtein*, a fort of Africa, on the Gold coaſt, belonging to the Dutch.

FORT *Barnevelt*, a fort on the ſouth coaſt of the iſland of Bachian, garriſoned by the Dutch. See BACHIAN.

FORT *Barrington*, a town of America, in Georgia, on the coaſt of the Atlantic; 50 miles S.S.W. of Savannah. N. lat. 31° 30′. W. long. 81° 55′.

FORT *La Bay*, a fort on the ſouthern extremity of a bay in lake Michigan, denominated by the French the "bay of

of Puants," but called by the Engliſh, ſince they have had poſſeſſion of it, the "Green bay," from its appearance. It is ſurrounded by a ſtockade, and garriſoned by the Engliſh with an officer and 30 men.

Fort *Bourbon*. See Bourbon.

Fort *de Broto*, a fort on the N. coaſt of Sicily; nine miles W.N.W. of Pati.

Fort *Chamblee*. See Chamblee.

Fort *Charles*, a fort at the S.W. extremity of the iſland of Barbadoes, S. of Bridge-town, and terminating Charles's bay.

Fort *Charlotte*, a fort on the iſland of Shetland or Mainland, firſt built by Oliver Cromwell, to defend the town and harbour of Lerwick; its name was given to it in 1781, when it was repaired and garriſoned: one mile N.W. of Lerwick.

Fort *Chippeway*. See Chippeway.

Fort *Chriſtianſburg*. See Christiansburg.

Fort *Church-hill*. See Church-hill.

Fort *Clarendon*, a fort on the weſtern ſide of the iſland of Barbadoes, between Speight's town and Hole town.

Fort *Conde de la Mobile*, a fort of Weſt Florida, at the N. extremity of Mobile bay. N. lat. 30° 34′. W. long. 88° 2′.

Fort *Crevecœur*, a fort of Africa. See Crevecoeur.—Alſo, a fort of America, in Weſt Florida, in St. Joſeph's bay. N. lat. 29° 51′. W. long. 85° 30′.

Fort *Culonge*, a fort of Lower Canada, on the Utawas; 170 miles W. of Montreal.

Fort *Cumberland*. See Cumberland.

Fort *Dauphin*, a ſea-port of the iſland of Hiſpaniola, in the Weſt Indies, ſituated on the N. ſide of the iſland, with a ſpacious harbour. N. lat. 19° 42′. W. long. 72° 40′. See Dauphin.

Fort *Delagarta*, a fort on the coaſt of Portugal; ſeven miles N.N.W. of Viana.

Fort *Detroit*. See Detroit.

Fort *Edward*, a town of America, in New York, ſo called from its fortifications, now diſmantled; 33 miles N. of Albany.

Fort *Erie*. See Erie.

Fort *de Eſtrica*, a fort of Portugal, in the province of Entre Duero é Minho; 20 miles N. of Braga.

Fort *di Faro*, a fort and light-houſe, on the N.E. coaſt of Sicily. N. lat. 38° 15′. E. long. 16°.

Fort *de Ferrières*, a fortreſs of France, in the department of the Tarn; 10 miles E. of Caſtres.

Fort *Fontanelle*, a fort of Barbadoes, in St. Michael's pariſh, on the W. coaſt N. of Bridge-town.

Fort *Franklin*, a fort of America, in Pennſylvania, erected in 1787, at a place formerly called "Venango," on the Allegany river, 46 miles S. of lake Erie. N. lat. 41° 23′. W. long. 79° 50′.

Fort *Frederick Henry*, a fort of Brabant, at the mouth of the Scheldt; 10 miles N.W. of Antwerp.

Fort *Frontenac*, a fort of N. America, in lake George, taken from the French in 1756, though defended by 60 pieces of cannon, and 100 men, beſides Indians.

Fort *de Fuentes*, a fortreſs of Italy, at the place where the Adda enters the lake of Como; deſtroyed by the French in 1796; 30 miles N. of Como.

Fort *Galet*, a fortreſs on the coaſt of France; half a mile N. of Cherburg.

Fort *George*, a regular fortification of Scotland, in the county of Inverneſs, ſituated on a long and narrow neck of land called "Ardarſier," ſurrounded on three ſides by the ſea, covering ten acres, begun in the year 1747, and completed in twenty years at an expence of 160,000*l*. It is capable of containing 10,000 men, with barracks for 6000. It mounts 100 cannon, moſtly 42-pounders; 11 miles N.E. of Inverneſs.—Alſo, a fort of America, in New York, at the ſouth extremity of lake George; 42 miles N. of Albany.

Fort, *Half-moon*, a fort of Barbadoes, on the W. coaſt, N. of Speight's-town.

Fort, *Hallets*, a fort of Barbadoes, on the W. coaſt in the pariſh of St. Michael, N. of Bridge-town, and near Fontanelle fort.

Fort *Hamilton*, a fort of the weſtern territory of America, on the Meami. N. lat. 39° 18′. W. long. 84° 50′.

Fort *Hardy*, a fort of America, in the ſtate of New York; 25 miles N. of Albany.

Fort, *Haywood's*, a fort of Barbadoes, near Speight's-town.

Fort *de Hue*, a fort of France, in the department of the Channel; three miles E. of Cherburg.

Fort *Hommet*, a fort of France, in the department of the Channel; two miles N.W. of Cherburg.

Fort *James*, a fort of Africa, on the Gold coaſt.

Fort *Jefferſon*, an American fort in Kentucky, on the Miſſiſſippi. N. lat. 36° 36′. W. long. 89° 46′.—Alſo, a fort in the weſtern territory of America, on White river. N. lat. 39° 58′. W. long. 85° 25′.

Fort *Knox*, a fort in the weſtern territory of America; on White river. N. lat. 39° 37′. W. long. 85° 10′.

Fort *Leon*, a fort of Louiſiana, on the Miſſiſſippi; five miles S. of New Orleans.

Fort *Leſſa*, a fort on the W. coaſt of Portugal; five miles N.W. of Oporto.

Fort *Leydſaambeyde*, a Dutch fort on the Gold coaſt.

Fort *Ligonier*, a fort of America, in Pennſylvania, 36 miles E. of Pittſburg. N. lat. 40° 16′. W. long. 79° 15′.

Fort *Longlet*, a fort on the coaſt of France, near Cherburg.

Fort *Louis*, now called *fort Vauban*, a fortreſs of France, in the department of the Lower Rhine, built by Louis XIV. on an iſland formed by the Rhine; 18 miles N.N.E. of Straſburg.—Alſo, a fort of Senegal, built by the French, but taken in 1758 by the Engliſh.—Alſo, a fort on the ſouth coaſt of Hiſpaniola.

Fort *Marlborough*. See Bencoolen.

Fort *Mackintoſh*, a fort of America, in Pennſylvania, on the Ohio; 22 miles N.W. of Pittſburg. N. lat. 40° 42′. W. long. 80° 21′.

Fort, *Maywek's*, a fort of Barbadoes, in St. Lucy's pariſh, N. of Speight's-town.

Fort *Meami*, a fort of N. America, on the Meami. N. lat. 41° 20′. W. long. 84° 56′.

Fort *Medoc*, a fort of France, on the river Garonne, oppoſite to Blaye.

Fort *Mirabouc*, a fort of France, in the department of the Po; 10 miles W. of Pinerolo.

Fort *Mooſe*, a fort at the ſouth end of St. James's bay, in Hudſon's bay, at the mouth of Mooſe river.

Fort *Naſſau*, a fortreſs of Brabant, on the Scheldt, between Tolen and Berg-op-zoom.—Alſo, a fortreſs of Africa, on the coaſt of Guinea, with a good harbour, built by the Dutch in 1612.—Alſo, a fort on the north coaſt of the iſland of Timor.—Alſo, a fort on the iſland of Cadſand.

Fort *Nieulet*, a fortreſs of France, near Calais and the ſea, ſerving to guard the ſluices.

Fort *Omonville*, a fort of France, on the N. coaſt of the department of the Channel; eight miles W.N.W. of Cherburg. N. lat. 49° 43′. W. long. 1° 44′.

Fort *Oſwegatchy*, a fort of Upper Canada, on the S. ſide of the river St. Lawrence; 60 miles N.E. of lake Ontario.

Fort *Panmure*, a fort of America, in the country of the Natches.

Fort *Patience*, a fortreſs of Flanders, on the coaſt oppoſite to Zealand, between Sas de Ghent and Yſendick.

Fort *Penthievre*, a fort of France, in the department of the Morbihan, ſituated on the peninſula of Quiberon; 15 miles S.E. of L'Orient. N. lat. 47° 33′. E. long. 3° 3′.

Fort *Philippe*, a fortreſs of France, in the department of the North; 2 miles from Gravelines.

Fort *Portage*, a port of Upper Canada, on the river Utawas; 120 miles W. of Montreal.

Fort *de Porto de Cam*, a fort on the weſt coaſt of Portugal, near the Atlantic; 6 miles N.N.W. of Viana.

Fort *de Porta*, a fort on the weſt coaſt of Portugal, near the Atlantic; 5 miles N. of Viana.

Fort *de Povoa*, a fort of Portugal, in the province of Entre Duero é Minho; 1 mile N. of Villa de Conde.

Fort *Queen*, a fort of Barbadoes; 1 mile N. of Hole town.

Fort *Querqueville*, a fort of France, in the department of the Channel; 3 miles N.W. of Cherburg.

Fort *de Rego de Foz*, a fort on the weſt coaſt of Portugal, near the Atlantic; 2 miles N.W. of Viana.

Fort *Royal*, a fort of Africa, built by the Danes, and called "Frederickſburg;" but its name was changed when the Engliſh became the poſſeſſors of it.—Alſo, a town of the iſland of Martinico, ſituated on the ſouth coaſt. N. lat. 14° 34′. W. long. 61°.—Alſo, a fort built by the French on the weſt coaſt of the iſland of Martinico.—Alſo, a town, called "St. George," ſituated on a ſpacious bay on the weſt coaſt of the iſland of Grenada, and capital of the iſland. This town poſſeſſes one of the ſafeſt and moſt commodious harbours for ſhipping in the Engliſh Weſt Indies, and has been not long ago fortified at a very great expence. It is built chiefly of brick, and divided by a ridge, running into the ſea, and forming on one ſide the "Carenage," and on the other the bay: ſo that there is the "Bay-town," with a handſome ſquare and market-place; and the "Carenage-town," in which the merchants principally reſide; the ſhips lying land-locked, and in deep water, cloſe to the wharfs. On the ridge ſtands the church, and on the promontory above it is a large old fort, built of ſtone, and large enough to accommodate an entire regiment. N. lat. 12° 4′. W. long. 61° 32′.

Fort *St. Anthony*, a fort of Africa, on the Gold coaſt, in the country of Axim, belonging to the Dutch.

Fort *St. Catalina*, a fort of Portugal, in the province of Beira; 2 miles S. of Villa Nova de Moncarras.

Fort *St. David*, or *Tegapatam*, a fortreſs of Hindooſtan, on the coaſt of Coromandel, ſeated on a branch of the river Panaur, in a ſmall tract of country bought of a Mahratta prince for 30,000*l.*, and firſt built in the year 1686, for the uſe of the Engliſh Eaſt India company, and much ſtrengthened about the year 1750 by Mr. Robins. It is the ſtaple of this country for fine dimities and painted cottons. About four miles from the fort is a famous Indian fig-tree, under the ſhadow of which it is ſuppoſed 10,000 perſons may ſtand without inconvenience; 1 mile N. of Cuddalore.

Fort *St. Donas*, a fortreſs of Flanders, built by the Spaniards, between Dam and Sluys.

Fort *St. George*. See Madras.

Fort *St. Joſeph*. See Gallam.

Fort *St. Julian*, a fort of Portugal, on the north ſide of the mouth of the Tagus; 9 miles below Liſbon.

Fort *St. Julien*, a fort of Egypt, on the left branch of the Nile, between Roſetta and the ſea.

Fort *St. Lucar*, a fort of Braſil, at the mouth of the river Jaguaripe. S. lat. 4° 2′.

Fort *de St. Martino*, a fortreſs of Etruria, built by Coſmo the Great, on a mountain near the river Sieve; 10 miles N. of Florence.

Fort *St. Martin de Ré*, a fortreſs of France, in the iſland of Ré, near the town of St. Martin.

Fort *St. Mary*, a fortreſs on the eaſt coaſt of the iſland of Guadaloupe.—Alſo, a fortreſs of Genoa, on a rock nearly ſurrounded by the ſea.—Alſo, a fort of Weſt Florida, on the eaſt ſide of the river Miſſiſſippi; 6 miles S.E. of New Orleans.

Fort *St. Michel*, a fortreſs of Spain, in Eſtramadura, near the town of Badajoz.—Alſo, a fortreſs of France, on the Meuſe, oppoſite to Venlo.

Fort *St. Nicolas*, a fortreſs of Dalmatia, near the town of Sebenico.

Fort *St. Philip*, a fortreſs of the iſland of Minorca, ſituated on a rock near the coaſt, to defend port Mahon.—Alſo, a fortreſs of the iſland of Tercera, near the town of Angra.

Fort *de St. Tiago*, a fort of Portugal, on the coaſt of the Atlantic, in the province of Entre Duero é Minho; 7 miles N.N.W. of Viana.

Fort *St. Yago*, a town of South America; 10 miles N. of Cumana.

Fort *Saſtingue*, a fort of Flanders, on the Scheldt, between Hulſt and Berg-op-zoom.

Fort *Schloper*, a fort of Upper Canada, near the falls of Niagara.

Fort *Sinclair*, a fort of America, on the right bank of the river Hudſon. N. lat. 43° 15′. W. long. 82° 21′.

Fort *Stanwix*, a ſmall ſquare log fort, in the ſtate of New York, defended with four baſtions, and a ſtockaded covert way, without any other out-works.

Fort *Tete*, a fort and town of Africa, in Mocaranga, on the Zambeſe. S. lat. 16° 5′. E. long. 33° 3′.

Fort *Trinité*, a fort on the weſt coaſt of the iſland of Martinico.

Fort *de Verchères*, a fort of Canada, which took its name from that of a French lady who defended it in 1690, when it was attacked by the Iroquois Indians.

Fort *Urbino*, a fortreſs of Italy, in the department of the Amona; 13 miles E. of Bologna.

Fort *Wallis*, a fortification of the United States of America, on the North river, connected with Weſt point.

Fort *Waſhington*, a fort on the iſland of New York, on the eaſt ſide of Hudſon's river.—Alſo, a fort in the weſtern territory of United America, on the right bank of the Ohio; 10 miles W. of Columbia. N. lat. 38° 57′. W. long. 84° 45′.

Fort *Wedenburg*, a town of Africa, on the Gold coaſt.

Fort *Wentworth*, a fort of New Hampſhire, on the Connecticut. N. lat. 44° 32′. W. long. 71° 30′.

Fort *William*, a ſmall fortreſs of Scotland, in the county of Inverneſs, built in the reign of king William III. on the ſcite of a fort conſtructed by Cromwell, in a plain, on a navigable arm of the ſea, called Loch Eil, near the influx of the Lochy and Nevis. Although this is not a ſtrong place, it was gallantly defended againſt the rebels in 1746. Several years ago, a fourth part of the wall was undermined and ſwept away by the Nevis; nor is there any proſpect of its being repaired. It is occupied by a company of invalids. The village in its neighbourhood is called Maryborough.

A mile thence, at the mouth of the Lochy, is Inverlochy caſtle, at the foot of Beneviſh, a mountain 4,370 feet above the level of the ſea. A poſt-office was eſtabliſhed at Fort William in 1764; 130 miles N. of Edinburgh. N. lat. 56° 48′. W. long. 5° 6′.

Fort *William*. See Calcutta.

Fort *William-Henry*, a fort of America, in Pennſylvania, at the foot of the Blue Mountains; 20 miles N.W. of Reading.

Fort, *Fr.* loud; *temps fort*, the accented part of a bar, in *Muſic*. See Accent, Tact, and Trine.

FORTAMENTE, in the *Italian Muſic*, the ſame with forte.

FORTAVENTURA, or Fuerte-ventura, in *Geography*, one of the Canary iſlands, about 50 miles long, and from 8 to 24 broad. The ſoil is in general fertile in corn, roots, and fruits, and beautifully diverſified with hills and vallies, well watered, and ſupplied with a variety of timber. This iſland produces, beſides the other fruits common to the Canaries, abundance of dates, maſtic, and olives, with archil for dyeing, and a ſpecies of fig-tree, that yields a medicinal balm, as white as milk, but of virtues unknown in Europe. In Fortaventura a great quantity of goat-milk cheeſe is made; the iſland breeding annually more than 50,000 kids, each of which weighs between 40 and 50 pounds. The fleſh is fat, better coloured, and ſweeter than in any other country. The principal towns of this iſland are La Villa in the centre, and Olivia near the northern extremity; on the eaſt coaſt there are alſo three ſea-ports, called Langla, Tarrafata, and Pozzo Negro; and there are ſeveral villages. The number of inhabitants is about 10,000. The climate of this iſland and Lancerotta is exceedingly ſalubrious. N. lat. 28° 4′. W. long. 14° 32′.

FORTE, *Ital.* loud, in *Muſic*. This term is uſed in the ſeveral inſtrumental parts of a muſical compoſition, for enforcing the tones of a paſſage; to ſing loud, put out the voice, produce or draw a great degree of ſound from an inſtrument. It is likewiſe uſed to annul the effect of a preceding piano.

FORTE-PIANO, an Italian compound ſubſtantive, of the ſame import, in muſic, as chiaro-ſcuro in painting. Forte-piano is the art of enforcing or enfeebling ſounds in imitative melody, as is done in ſpeech, which it imitates. We not only ſpeak with different degrees of force, when animated and impaſſioned, but when calm and tranquil. Muſic, in imitating various accents and tones of ſpeech, ſhould imitate the intenſity and remiſſion, and be ſometimes loud, ſometimes ſoft, and ſometimes in a whiſper; and this is what the Italians in general mean by forte-piano. Theſe two words, tranſpoſed, imply the keyed inſtrument, which, from its power over loud and ſoft, at the pleaſure of the performer, is called a *Piano-forte*, which ſee, and Harpsichord.

FORTESCUE, *Sir* John, in *Biography*, an Engliſh judge, third ſon of ſir Henry Forteſcue, lord-chief-juſtice of Ireland, was born in the pariſh of Wear Gifford in Devonſhire, from whence he removed to Lincoln's Inn, and was made ſerjeant at law in 1430, he having already diſtinguiſhed himſelf as a ſound lawyer, and an excellent lecturer on the laws. In 1442 he was elevated to the chief juſticeſhip of the king's-bench, and was probably the principal adviſer of Henry VI., to whom, in all his misfortunes, he faithfully adhered. When the ſucceſs of Edward IV. obliged Henry to take refuge in Scotland, Forteſcue attended him, and it was at this period he was created chancellor of England. For his general attachment to the intereſts of his maſter, he was in 1461 attainted of high treaſon, and another perſon appointed chief juſtice in his ſtead. He was never acknowledged chancellor by Edward's government, nor did he ever exerciſe the office in England. In 1463 he accompanied queen Margaret, prince Edward, and others of the adherents of the houſe of Lancaſter, in their flight to Flanders, and paſſed many years upon the continent as an exile. In this ſituation he compoſed his celebrated work, entitled "De Laudibus legum Angliæ," addreſſed to prince Edward, ſon of Henry VI. with the expreſs purpoſe of giving him juſt notions of the laws and conſtitution of his country. This work was not publiſhed till the reign of Henry VIII. ſince which period it has gone through many impreſſions; the beſt edition is ſaid to be that of 1775, with notes by Mr. Gregor. When the affairs of the houſe of Lancaſter ſeemed to take a turn, he, in company with the queen and prince, came to England, and was taken priſoner after the battle of Tewkeſbury in 1471, which annihilated the hopes of the houſe of Lancaſter. Edward releaſed and pardoned him, but probably not till he had written or promiſed to write a retractation of a paper he had formerly compoſed and circulated againſt the right and title of the houſe of York. After this he lived in retirement, and in his privacy drew up a work in Engliſh, on "The difference between an abſolute and limited Monarchy, as more particularly regards the Engliſh conſtitution." He wrote ſome other treatiſes which have never been made public. He lived to the age of ninety; the time of his death is not exactly aſcertained, but he was interred in the pariſh church of Ebrighton in Glouceſterſhire, of which place he poſſeſſed the manor. His work "De Laudibus legum Angliæ," is written in Latin in the form of a dialogue, and is a valuable record of the grounds and principles of the laws of England as they were underſtood at that time, and of various circumſtances relative to the mode of education in the inns of court. It is, however, rather a panegyric of the common law than a fair compariſon of it with the civil or other foreign ſyſtems. His other work, "On the Difference between an abſolute and limited Monarchy," firſt publiſhed by lord Forteſcue, in 1714, was chiefly a repetition in Engliſh of what is ſaid in the other piece concerning the conſtitution of England, with the addition of ſome obſervations meant for the ſervice of king Edward. Biog. Brit.

Fortescue *Bay*, in *Geography*, a bay of South America, in the ſtraits of Magellan. S. lat. 53° 39′. W. long. 73° 22′.

FORTESSA, an iſland in the gulf of Venice. N. lat. 44° 40′. E. long. 14° 48′.

FORTH, one of the moſt conſiderable rivers in Scotland, riſes out of two lakes at the foot of a mountain called Ben Lomond, in the ſhire of Dumbarton, and running nearly from weſt to eaſt, the whole breadth of this part of the iſland, almoſt divides it into two parts. The length of the Forth, from the ſource to its confluence with the German ocean in a direct line, is upwards of ninety miles; but ſo ſinuous is the courſe, that calculating its various windings, the diſtance cannot be leſs than two hundred and fifty. This characteriſtic the river aſſumes when only an inconſiderable rill, whilſt it winds through the mountains, collecting the tributary ſtreams. Having received a large ſupply of water from the rivers Teuth, Ardoch, and Allan, it enters the extenſive plain termed the Carſe of Stirling, about ſix miles weſtward of that town. Of its ſinuoſity here ſome idea may be formed, when it is known that the diſtance from Stirling to Alloa by land is only ſix miles; but by water twenty-four. It here ſeems as if unwilling to leave the country, prolonging its ſtay by lengthening its courſe; which

Gilpin ſo ſtrikingly deſcribes. "In this ſinuous navigation, were the mariner to truſt entirely to the ſails, he would have to wait for the benefit of every wind round the compaſs ſeveral times over." In theſe meanders it forms numerous peninſulæ, on one of which, oppoſite to the caſtle of Stirling, ſtands a ruined tower, the only remaining veſtige of the abbey of Camburkenneth, formerly the moſt wealthy monaſtery in the kingdom. The turnings and windings of the river through a rich and diverſified country, the numerous manſions on its margin, the white ſails of the veſſels mingling with the trees in every direction, form a coup d'œil of intereſting and pictureſque ſcenery. After paſſing Alloa, it expands into a bay near twenty miles long, and of conſiderable breadth; which being ſhut in by the contraction of the river at Queen's ferry, where it is not more than two miles wide; and ſtill further by the ſmall fortified iſland of Inchgarvie, ſituated in its channel; forms one of the fineſt roadſteds in the iſland. Thence expanding into a frith, with ſeveral ſmall iſlands, and on one of which, May, a light-houſe is erected, it forms ſeveral excellent harbours, both on the northern and ſouthern banks; particularly Leith roads, where it is nine miles over; and waſhing the ſhores of Haddington and Fife, falls into the German ocean. The river abounds with various kinds of white fiſh, and ſeveral valuable ſalmon fiſheries are eſtabliſhed in the upper part of its courſe; particularly at Alloa, Kincardine, Torryburne, and Culroſs: and the frith uſually receives an annual viſit of a ſhoal of herrings, equal to thoſe frequenting other parts of the eaſtern coaſt. The Forth is navigable up to Stirling bridge for veſſels of eighty tons, and for merchant veſſels of any draft of water as far as Grangemouth, where it is joined by the canal, uniting this river with the Clyde. From this communication, the numerous harbours on the coaſts of the frith, and the inexauſtible ſtores of coal, iron ore, and lime-ſtone, as well as the manufactures of the counties of Perth, Fife, Stirling, and the two Lothians, occaſion ſuch a reſort of veſſels, that the tonnage of the Forth nearly rivals the Thames.

FORTH and *Clyde canal*, is a navigable cut, which, connecting the rivers Forth and Clyde, forms a junction between the German ocean and the Iriſh ſea. The utility of conjoining large rivers, for the purpoſe of extending their navigation, muſt be obvious to every reflecting mind, and in no inſtance did the geographical features of the country, and the circumſtances which imperiouſly called for the execution of ſuch a work, appear more ſtriking than in this. The two rivers appeared to look with wiſhful eyes towards each other, and a natural paſſage preſented itſelf through the mountains for conducting the union canal. Previous to this being made, the trade of this poſſeſſed no channel with the other ſide of the iſland, but by immenſe maritime diſtance round the Land's End; or by the leſs circuitous route, but dangerous paſſage of Pentland frith. Such an idea was conceived ſo early as the reign of Charles II., and the ſcheme met with ſome conſideration; but that was not an age for this kind of national improvement. It then lay dormant till the year 1723, when a ſurvey was made of the line of country by Mr. Gordon; ſtill the undertaking was declined by the conſideration of the expence. It was again revived in 1762; and a ſurvey made by a Mr. Mackell, and another by Mr. Smeaton in 1764. From theſe ſurveys the practicability of the plan was aſcertained, but its eligibility was yet queſtioned on the ground of the eſtimated expence, eighty thouſand pounds. In the mean while a ſmaller canal was projected to extend from Glaſgow to the Forth; parliament, however, refuſed to ſanction the ſcheme on account of the ſmallneſs of the ſcale. Mr. Smeaton was then called in again to make a ſurvey and eſtimate for cutting a canal, of ſuch a breadth and depth, as would admit coaſting veſſels to paſs from ſea to ſea. A ſubſcription was accordingly opened, a bill obtained for leave to execute the plan, and the whole being placed under the direction of the able engineer who ſurveyed the ground, the undertaking commenced on July 10, 1768. After expending 150,000*l.* and overcoming difficulties which ſeemed at firſt inſurmountable, it was rendered navigable as far as Stockingfield, where a branch, called Monkland, extends to the collieries to the eaſt of Glaſgow. The ſubſcription and an additional loan having been exhauſted, the work was here ſtopped, and in this ſtate it remained till the year 1784, when the company, having obtained 50,000*l.* by forfeited eſtates, and an act of parliament for varying the line, Mr. Robert Whitworth, being appointed engineer, began to proſecute with great vigour and effect the further execution of the original plan. On the 28th of July, 1790, this immenſe undertaking was completed, and the navigation opened from ſea to ſea. Thus, with the aid of the collateral branch, a communication is formed between the great emporium of the north, Glaſgow, and both ſides of the iſland. The whole length of the canal is thirty-five miles from the mouth of the river Carron, to Dulmoreburn-foot, on the banks of the Clyde; riſing and falling 160 feet, by means of 39 locks. In its courſe it paſſes over rocks, through precipices, deep moſſes, over quick-ſands, and in places is guarded by banks twenty feet high; croſſes two conſiderable rivers, the Kelvin, and Luggie, with numerous rivulets and ſtreams, by 10 large, and 33 ſmaller aqueducts or water bridges. That over the former river is a grand object, conſiſting of ſeveral arches, the centre one of which is 90 feet, forming an arcade 420 in the ſpan in length, and 65 feet high. Various roads alſo traverſe the canal by the aid of 33 draw-bridges. The dimenſions of it, though greatly contracted from the original deſign, are far ſuperior to any work of the kind in South Britain. The Engliſh canals are in general from three to five feet deep; from 20 to 30 feet wide; and the lock gates from ten to twelve feet; ſufficiently capacious however to anſwer the purpoſes of inland carriage, from one town to another, for which they were excluſively deſigned. The following particulars will enable the reader to inſtitute a compariſon.

	Feet.
The medium width of the ſurface - -	56
Do. of the bottom - - -	27
Depth on the average from ſea to ſea -	8
The fall of each of the 39 locks -	8
The breadth of each lock - -	20
The length of do. between the gates -	74

The contrivance for ſupplying the canal with water was alone a difficult and arduous undertaking. No leſs than ſix reſervoirs were found expedient; one near Kylſith covers a ſurface of 50 acres of land; another conſiſts of 70; and the whole occupy about 409, containing by meaſurement 12,679 lockfulls of water. The expence of the whole concern amounted to 300,000*l.* The toll for the whole line is 5*s.* 10*d.* per ton; againſt this is to be placed ſafety, time gained in paſſing from coaſt to coaſt; and the difference in inſurance, that uſually in time of war being in coaſting it from 15*l.* to 20*l*; and by the canal, 5*l.* Phillips's General Hiſtory of Inland Navigation, and Sinclair's General Statiſtical Account of Scotland.

FORTIFICATION, called alſo *Military Architecture*, is the art of fortifying or ſtrengthening a place, by making works around the ſame, to render it capable of being defended.

fended by a ſmall force, againſt the attacks of a more numerous enemy.

Some authors go back to the beginning of the world for the author and origin of military architecture. According to them, God himſelf was the firſt engineer; and paradiſe, or the garden of Eden, was the firſt fortreſs. Cain improved on the hint, in building the firſt city, Gen. iv. 17. After him came Nimrod, Gen. x. 10. Then Semiramis, as Poliænus relates, Stratagem. lib. viii. cap. 27. The Canaanites, Numb. xiii. 19. Deut. i. 28. David, 2 Sam. v. Solomon, 2 Chron. viii. 4. Rehoboam his ſon, 2 Chron. xi. 5. and the other kings of Judah and Iſrael; and at length the Greeks and Romans. Vitruvius, lib. x. cap. ult. and lib. i. cap. 5.

Such is the ſeries of thoſe who fortified places; to which might be added Pharaoh, the perſecutor of the Iſraelites, who built the cities of Pithom and Raamſes, Exod. i. 11.

In thoſe remote times, when the property of individuals was leſs valuable, or owing to the little progreſs made by mankind in the arts of deſpoliation, the only fences in uſe were ſuch as ſufficed to prevent the depredations of wild beaſts, and to prevent cattle from ſtraying among the few ſcattered patches of cultivation, or into thoſe immenſe wilderneſſes then unſubdued by the labour of man. At length the pleaſures of ſociety, added to the occaſional neceſſity for bartering with, or ſeeking the aid of neighbours, led mankind into cloſer compact, and ultimately to approximate ſo near as their ſeveral tempers or views might allow; and thus in time little hamlets and villages chequered the more open ſcites; theſe, again, accumulated ſo as to contain much property, and to excite among the more lawleſs a deſire to bereave them of whatever cattle, grain, &c. they might by their induſtry and frugality have amaſſed.

Hence aroſe that imperious neceſſity, which unfortunately for mankind has, notwithſtanding our boaſted civilization, been far from decreaſing. In times of yore, the conteſt was only between rival towns, and the fate of both was ſoon decided. Now we fight for kingdoms, while an inveterate hatred and jealouſy are handed down from one generation to another, like an heir-loom, founded on ſome paltry contention, or on ſome abſurd claim, in which the people at large are neither benefited nor even conſulted.

The means of defence naturally grew as the means of attack became more powerful; which, of courſe, they could not fail to do, in conſequence of the increaſe of faction, and of the intereſt taken by numbers in the cauſe of ſome plauſible pretender, or of ſome ambitious and daring adventurer. But it was not to be expected that the means of reſiſtance would be extended beyond what might be neceſſary to oppoſe the means of attack; therefore thoſe primary engines, the catapulta, the battering-ram, &c. were oppoſed by heavy maſſes of ſtone. The engineer confined himſelf to very ſmall projections, which, if we are correctly informed, in the firſt inſtance impended over certain parts of the wall, at various diſtances, like modern balcony-windows; theſe were gradually augmented both in area and in depth, until they became what are now called *round-baſtions*.

It does not appear that any important change took place for many centuries, nor, indeed, until ſome time after the invention of gun-powder, when battering cannon formed a part of the aſſailants' means, and ſpeedily evinced how little reliance could be placed on thoſe walls, which had formerly defied the powers of the ſeveral engines then in uſe; nor was it until iron ſhots were ſubſtituted for thoſe of ſtone, that the efficiency of artillery was properly underſtood. That being eſtabliſhed, the whole ſyſtem of defence was neceſſarily made to conform to the counteracting of thoſe deſtructive engines which now were introduced as the ordinary means of attack. The ſword and buckler, the lance, dart, javelin, ſling, bow and arrow, &c. loſt their reputation, and, dwindling into inſignificance on the great ſcale, were reſerved for individual conteſt, or for the minor purpoſes of deſultory warfare. It now became indiſpenſable, that the circumvallations ſhould be ſtrengthened, and to conſtruct ſuch ſtupendous bulwarks as might not only oppoſe the newly deviſed miſſiles, but, at the ſame time, ſupport ſimilar means of deſtroying the invading army and its batteries. By the exterior addition of deep ditches, and various outworks, great difficulty and delay were oppoſed to the beſiegers; while flanks, cavaliers, and eſpecially mines, were added for the more effectual accompliſhment of their deſtruction.

The great outline was thus marked out, but it remained for the moderns to bring the ſyſtem to perfection; for we find, that although the fortifications of the fifteenth century diſplay obvious improvements upon the ancient conſtruction, the grand principles were little underſtood, and that the minutiæ of this now important ſcience remained, until within a very few years paſt, moſt wretchedly defective. Men of genius, profiting by that experience which upheld the errors of engineers then conſidered ſkilful, at length remedied in part the defects of the old ſchool, and led the way to that exactneſs of proportion, and to that ſyſtematic arrangement, which characterize the works of our time.

We are not to conclude that this ſcience is confined merely to drawing out ſuch defences as ſhould ſuffice to prevent, or at leaſt ſo to retard the neceſſity for a ſurrender, as to coerce the beſiegers to evacuate their trenches; the immenſe armies now conſtantly brought into the field, and the heavy trains of artillery by which they are ever attended, occaſion not only an adequate preparation for reſiſtance, but the neceſſity for eſtabliſhing lines of communication of depots, &c. all of which muſt be on the beſt conſtruction for defence, containing ſafe lodgment for a ſufficient garriſon, together with ample and ſecure magazines for ſtores and proviſions. Conſequently, the engineers muſt poſſeſs great readineſs of computation, of diſcernment, and of appropriate reſource and application.

Without all theſe qualities the moſt ſcientific officer may fall into diſrepute; for, however valuable a perfect acquaintance with the theory may appear, yet the merely planning in the cloſet, and the laying down on a large plain ſuch lines of defence as may appear, in ſuch a ſituation, totally incapable of defeat, ſo far as may relate to mutual ſupport, and the great work of procraſtination, will be of no avail, if the other eſſentials which depend wholly on judgment and experience be wanting; the whole may be rendered abortive, and become contemptible, merely from a want of appropriateneſs in point of locality.

The period, in which the modern practice of military architecture may be ſuppoſed to have taken its riſe, was that in which the old circular towers were firſt converted into baſtions, about the year 1500. See BASTIONS.

The firſt authors who have written of fortification, conſidered as a particular formed art, are Latreille, Alghiſi, Marchi, Paſino, Ramelli, Cataneo, and Speckle, who, as Mr. Robins ſays, was one of the greateſt geniuſes that has applied to this art. He was architect of the city of Straſburgh, and died in the year 1589. He publiſhed a treatiſe of fortification in German, which was reprinted at Leipſic in 1736. Robins's Math. Tracts, vol. i. preface, p. 9.

After them Errard, engineer to Henry the Great of France;

France; Stevinus, engineer to the prince of Orange; Marolois, the chevalier de Ville, Lorini, Coehorn, the count de Pagan, and the marſhal de Vauban; which laſt two noble authors have contributed greatly to the perfection of the art. To whom we may add Scheiter, Mallet, Belidor, Blondel, Muller, &c.

Under the head of CONSTRUCTION, *Military*, we have entered at length on the ſeveral proportions of fortifications conſidered in its ſeveral claſſifications, and have ſhewn the ſeveral component parts, as formed and ſituated according to the ſyſtems adopted by the moſt celebrated engineers; therefore we abſtain from giving, in this place, any detail of their ſeveral principles; confining ourſelves to whatever may appertain to the ſcience in a general point of view.

FORTIFICATION, *the art of*, may be diſtinguiſhed into two parts, *viz.* the *elementary*, or *theoretical*, and *practical*.

Elementary, or *theoretical*, fortification conſiſts in tracing the plans and profiles of a fortification on paper, with ſcales and compaſſes; and in examining the ſyſtems propoſed by different authors, in order to diſcover their advantages and diſadvantages: whereas *practical* fortification conſiſts in forming a project of a fortification, according to the nature of the ground, and other neceſſary circumſtances, tracing it on the ground, and executing the project, together with all the military buildings, ſuch as magazines, ſtore-houſes, bridges, &c.

Fortification again is either *offenſive* or *defenſive*. *Offenſive* fortification is the ſame with the attack of a place, and is the art of making and conducting all the different works in a ſiege, in order to gain poſſeſſion of the place. See ATTACK and SIEGE.

Fortification, *defenſive*, or *Defence*, is the art of defending a town that is beſieged, with all the advantages which the fortification of it will admit. See DEFENCE.

Fortification is generally divided into two diſtinct branches, *viz.* natural and artificial; and again into regular and irregular. In natural fortification but little is required of the engineer; the defences offered by ſituations nearly inacceſſible rendering the aid of art ſometimes ſuperfluous, or nearly ſo; therefore, in ſuch inſtances but few additions are needful, and thoſe chiefly with the intention of preventing a *coup de main*. For want of ſuch a precaution, many important poſts have been ſuddenly and eaſily taken, which no army, however numerous and well provided, could have forced, unleſs indeed by ſtarvation, into capitulation. It would be impoſſible to afford any inſtruction regarding the works neceſſary in this branch of defence, ſince every thing muſt depend on local circumſtances, in the proper adaptation of which the engineer has the moſt favourable ſcope for a diſplay of talent.

This applies equally to offenſive and to defenſive conſtruction; the former applying chiefly to the various works uſed in attacks and ſieges, and the latter to the more general purpoſes of defending towns, forming depots, commanding, or poſſeſſing particular ſituations, ſcouring thoſe parts which admit of approach, protecting or covering harbours, &c. and, in general, more tending to ſelf-preſervation, and to controul, than aiming to annoy others, or to the acquiſition of dominion. When works are built in a ſolid manner, ſuch as ſhould laſt for many years, they are called permanent: of this claſs are all citadels, fortreſſes, commanding redoubts, and block-houſes, &c. When raiſed only for any particular purpoſe, after the completion of which they are either deſtroyed or abandoned, they are ſaid to be temporary: of this kind are all entrenchments made for covering of the flanks, &c. of armies while in the field; the trenches opened by beſiegers, with all their ſupporting or cautionary lines; batteries made on emergency; together with all, under whatever term they may be denominated, which have only a periodical utility.

With reſpect to whatever relates to regular fortifications, we have already, under CONSTRUCTION, *Military*, diſplayed not only the ſyſtems moſt generally approved, but their good and bad qualities, for the expoſition of which we are indebted to gentlemen whoſe profeſſional ſkill is too pre-eminent to be dependent on our applauſe. There the principles laid down by that great maſter of the ſcience, Errard, together with the ſeveral variations adopted by Vauban, Blondel, count Pagan, Bombelle, the Chevalier de Ville, Sardi, Coehorn, Belidor; the marquis de Montalembert, &c. &c. may all be ſeen both abſtractedly, and contraſted in the moſt perſpicuous manner. In the ſame place we have furniſhed a complete detail of the ſeveral features of regular fortification, and explained their ſeveral intentions. It is here proper to remark, that fortifications can be conſidered regular only when the encloſed area is of ſuch a form, whether a triangle, a ſquare, a circle, an elliplis, as may be inſcribed in a regular manner according to geometrical operations.

It is uſual, indeed indiſpenſable, to divide the great ſurrounding line, or circumference, into as many faces, or portions, as may be beſt adapted to the conſtruction of ſuitable defences according to one or other of the three ſyſtems; namely, great, mean, and little. The number and extent of theſe faces muſt be regulated as well by the extent, as by the form of the area to be incloſed. Small circles may be divided into five or ſix faces; moderately extenſive ovals may have ſix alſo; while both circles and ovals of greater range will demand one or more additional faces; in order to reduce the exterior lines of defence within ſuch bounds as may duly proportion the faces and flanks in every part, and keep the angles within juſt limits.

Whatever may be the arrangement, it muſt ever be attended to, as a fundamental axiom, that every part may be defended by ſome other ſtanding within the ordinary point-blank range of a muſket. Whenever this point is overlooked, the defences will be proportionably weakened, according to the undue prolongation of the faces, the abſence of protecting flanks, and the conſequent deficiency of mutual ſupport.

Taken in the aggregate, a fortification ſhould not be deemed "irregular," merely becauſe the ſeveral faces may be in ſome degree diſſimilar, provided each face be in itſelf regular, and that the junctions of the ſeveral faces of the connecting baſtions be ſeverally effected in a regular manner. But this can reſult only from a great attention to conſtruction, and can never take place where the figures or their proportions are heterogeneous; ſuch as half a ſquare, and half a pentagon: whereas the half of a ſquare may be united with the half of a hexagon, or any figure whoſe multiple is 2. So may half a pentagon be united with half an enneagon, (or figure of nine ſides) though they have no common multiple, becauſe in each there would be half a baſtion, and half a curtain for their reſpective terminations, which could of courſe be eaſily blended.

Let us ſuppoſe that the circumference of an area be elliptic; the two more circular parts, namely, thoſe ſtanding at the extremities of the conjugate diameter, may be fortified according to that ſyſtem their radius may ſuggeſt, ſay according to the mean ſyſtem, while the two long ſides, being each ſegments of larger circles, will probably require to be divided each into two faces, all of which will be moſt appropriate to the great ſyſtem. One end may have a horn-work, the other a crown-work, and the ſeveral faces of the

two

two long ſides may have each a raveline, with, or without lunettes, tenaillons, counter-guards, bonnets, fleches, &c. yet the whole may bear ſufficient types of regularity to allow its coming under that deſignation; the rules neceſſary for the due combination of a regular and perfect ſyſtem of defence, as founded on approved ſyſtems, being, in every inſtance, obſerved.

The figure, and the number of faces into which it is to be portioned off, being determined upon, it then becomes a queſtion whether the works are to be planned *outwards* or *inwards*. In the former caſe, the figure becomes the interior lines, and a great addition is made to the area, but the works will be far more extenſive, and require a more numerous garriſon than when the place is to be fortified *inwards*, whereby all the works are thrown within the figure, to the great diminution of the area, and conſequent reduction of the works, which may then be defended by about one-third the number of men required in the other mode.

The proper *defilement* of the ſeveral works, as relating to the body of the place, muſt ever be attended to. By this term we comprehend the ſpread, or arrangement, of the outworks in that ſubordinate manner progreſſively, whereby thoſe moſt remote are invariably under the command of thoſe nearer, from the main defences included in that line called the principal, which uſually conſiſts of alternate curtains and baſtions. Every outwork muſt defend, or prevent the approach to, ſome particular point; or it muſt occupy ſome ſpot which might alſo give advantage to the enemy. Whatever be its ſituation or intention, it ſhould be ſo conſtructed as never to ſerve as a ſecure lodgment when taken by the enemy, nor ſhould its face or its flanks preſent the means of attacking others of the defences. This precaution can be properly effected only by keeping the ramparts ſo low as to be commanded from every part of the interior, and by cauſing the flanks to be expoſed to ſome powerful flanking fire, whereby the enemy would be too ſeverely galled to admit of his retaining poſſeſſion. Further, the aſpect of every ſuch outwork ſhould be carefully averted from the poſſibility of making even a grazing fire upon other defences; to inſure which, the angle made therewith ought not to be leſs than 120 degrees, for proximate, and 150 degrees for more remote batteries.

In moſt fortifications, the garriſon and the ſtores, but eſpecially the ammunition, are lodged in ſecurely vaulted buildings, which, from their power to reſiſt the fall even of the largeſt ſhells, are deſignated "bomb proofs," that is, proof againſt bombs; many of the more retired parts of the body of the place, ſuch as the curtains, are vaulted in a ſuitable manner for the accommodation of the troops, and magazines for powder are built in various parts, ſo as to be ſufficiently near to the ſeveral works they are to ſupply. For the deſcription of *magazines*, we refer to that article.

The ramparts have rarely ſufficient *talus*, or ſlope, within, to admit of men aſcending directly from the terre plein of the interior; though in ſome looſe ſoil the angle is ſo great as to offer conſiderable facility in that reſpect; but it being neceſſary to provide means for the paſſage of heavy ordnance up and down, as well as to favour the eaſy and ready acceſs of troops to every part of the defences, long ſlopes, called "ramps," are made in various parts, but eſpecially within the ſeveral faliant angles; theſe ſhould be from eight to twelve feet wide, according to their ſituation and importance, and ought to be very firmly ſupported at their ſides, eſpecially if not made to lie along the inſide of the rampart. The aſcent, or elevation of a ramp, ſhould never exceed thirty degrees; but, where practicable, they are better under, than over, twenty degrees.

In every fortified place great attention ſhould be paid to the ready acceſs of troops from every quarter towards each ramp. This can be effected only by a proper diſtribution of the ſeveral ſtreets and avenues, and by keeping full thirty yards or more clear all around the interior. The houſes neareſt to the ſeveral works ſhould be allotted to the garriſon, or to ſuch volunteers, &c. as might be able, in caſe of a ſurprize, to man the works inſtantly; while thoſe parts neareſt to the magazines and principal defences ſhould be occupied by perſons appertaining to the artillery. Should an enemy even ſucceed in a *coup de main*, ſo far as to aſcend to the body of the place, they might, by ſuch an allotment, be driven from the ramparts; or if they ſhould deſcend into the interior, might be oppoſed by a formidable force collected from the houſes, overlooking the body of the works.

To favour the ſorties made by the garriſon for the purpoſe of ſtorming the trenches of the beſiegers, and of demoliſhing their batteries, magazines, &c. ſally-ports are made in various parts, generally concealed from the knowledge of all but a few, and carefully cloſed until ſuch time as a ſortie is about to take place. Counter-mines are made under the ſeveral defences, with the view to prevent the enemy from carrying their galleries under them; and mines, as well as ſmaller *fougaſſes*, are ſunk with the intention of blowing up ſuch outworks as, when poſſeſſed by the enemy, might prove obnoxious to the defendants.

In every fortified place, a ſufficient ſupply of good water is indiſpenſable. If conduits proceed from a river, lake, &c. they muſt be ſecured from the enemy's ſhot, and, where neceſſary, be amply defended by ſuitable works. Large ponds ſhould be made in every fortreſs where ſpace can be allowed, and in every outwork one or more wells of proper diameter, and ſecurely framed, or lined with maſonry ſhould be ſunk. In fact, the utmoſt attention ſhould be paid to the furniſhing every quarter abundantly, and to preſerving ſuch as may be carried off the tops of houſes &c., during falls of rain, by means of pipes leading to ciſterns concealed under ground.

Hiſtory furniſhes various moſt encouraging inſtances of the good effects reſulting from the fortitude of garriſons, weak in numbers, and even indifferently ſupplied. We need look no farther back than to the glorious defence made by the unfortunate city of Saragoſſa; and to the wonderful obſtinacy with which the brave inhabitants, both male and female, of Gerona, contended againſt a very ſuperior and highly diſciplined army. The chances of war are greatly in favour of any garriſon under fair circumſtances; if it be ſtrong and well appointed, it may make ſo many ſorties, as to harraſs the beſiegers greatly; and eventually may be ſo ſucceſsful as to cut off large portions from time to time; ſo that when added to thoſe diſeaſes ever attendant upon fixed camps, the enemy may be unable to continue the ſiege. Few ſituations admit of a blockade, which can rarely be attempted by any army not very far ſurpaſſing the garriſon in numbers; therefore occaſional ſupplies and reinforcements may be generally expected. Conſidering alſo the immenſe loſſes to which the aſſailants are ſubject when their approaches are puſhed near to the body of the place, and the uncertainty attendant upon the attempt to force a paſſage through any breach that may be made, it ſhould appear that much remains in the power of an orderly and brave garriſon, even after ſuch advantages may have been gained by the beſiegers, as ſhould lead to the opinion of their being ſoon in poſſeſſion of the place. What with cutting off diſmantled works, filling the breach with burning faggots, cotton ſteeped in oil, &c. mining, traverſes, ſhowers of grenades, and of grape-ſhot, it is evident that the aſſailants may have to overcome the moſt formidable obſtacles, and

after all be obliged to allow the garriſon, to retreat by ſome oppoſite outlet, leaving them in poſſeſſion of a ruined fortreſs! If the retreat be made to a good citadel, the advantage gained may be purely nominal; and the beſiegers may be happy to relinquiſh thoſe defences, to gain which ſo much time, treaſure, and blood were expended.

Field-fortification is generally of a temporary nature, and abounds with variety; no two ſituations being exactly ſimilar. Here the engineer has a noble opportunity for the diſplay of ſkill. It often happens that a ſmall, or inferior army is compelled to chooſe, and that too without much delay, ſome ground affording natural advantages, whereon to entrench and to make a ſtand. No time is left for deep reſearch, for conſultation, for ſubſtitution, or for the correction of errors. In ſuch caſe the weak points muſt be firſt attended to, and ſecured ſo far as circumſtances may permit; after which the ſtronger poſitions muſt be amply fortified, and rendered both compact in themſelves, and aids to the weaker poſts. By theſe means a very powerful line of defence may be eſtabliſhed, care being taken to place the artillery in thoſe places moſt conducive to their full effect, and in particular guarding the moſt acceſſible parts in ſuch manner as ſhould deter the enemy from approaching. In ſome inſtances it is expedient to allure towards ſome point apparently weak, and, when it is attacked, to open various maſked batteries ſuddenly on the flanks of the aſſailants. This never fails to diſcourage, and at all events creates much doubt, while it eſtabliſhes the reputation of the defenders, and cauſes them to be treated with much diffidence and reſpect.

The following practical maxims, regarding the conſtruction of field works, may prove acceptable.

1. The ſpot on which the works are to be conſtructed ſhould determine their figure; no ſacrifice of ſtrength ſhould be made in order to preſerve any regular form, that diſpoſition being the beſt which occupies the ground to the greateſt advantage.

2. All ſlopes, and approaches of every deſcription, ſhould be ſubjected to the direct fire of the defenders; obſerving that the ſmall arms being in ſuch caſes of material ſervice, the ſeveral flanking parts ſhould never exceed the diſtance of two hundred yards, but that, if poſſible, the whole of the ſurrounding country, for five hundred yards at leaſt, ſhould be diſcoverable, and open to the fire from the works.

3. Works that are intended for the defence of a defile, ſhould always be within muſket ſhot (*i. e.* 200 yards), ſo that if taken by the enemy, they may to him be equally untenable.

4. In flanking-defences, thoſe which ſtand at right angles are preferable, becauſe the fire from one face is always parallel to the other face, and muſt, of courſe, take the aſſailants in flank by a direct fire thereon: a matter known to be of ſingular importance, eſpecially where new levies man the works; it being extremely difficult to enforce a proper attention to taking a cool and deliberate aim.

5. If a ſaliant-angle is leſs than 60 degrees, it will expoſe its faces to be enfiladed by an enemy ſituated nearly in the line of its capital, and it will beſides be weak in many reſpects; beſides preventing the other defences from projecting in a proper manner, leſt they ſhould become ſubject to its operations, if the raveline, redan, &c. it compoſes, ſhould fall into the hands of the enemy.

6. On the other hand, re-entering angles ſhould never be greater than 120 degrees; becauſe that is the utmoſt ſcope that can poſſibly be allowed for the direction of even muſketry, when ſerving as a flanking-fire. Cannon can rarely graze upon the adjacent battery or flank, when the re-entering angle exceeds 105 degrees; the declination of the embraſures not allowing more than from 10 to 12 degrees of lateral inclination.

7. Always make the entrance to a redoubt, or other work of that nature, ſomewhere in its rear, or in whatever part may be leaſt expoſed; taking eſpecial care ſo to cover the entrance by traverſes, either plain, curved, or angular, ſuch as may expoſe the enemy, ſhould he attempt to force an entrance, to a galling fire, as well as to ſhowers of grenades, ſtones, or any other mode of annoyance. Where practicable, every entrance ſhould have a draw-bridge, or at leaſt a *chevaux de frize*; or, for want of them, an *abbatis* made of trees, of which the branches have been lopped to points outwardly arranged, may prove an excellent defence.

8. Where the entrance muſt be made ſomewhere in the front, it ſhould be in ſome re-entering angle, and always in a curved or angular direction, ſo as to prevent cannon-ſhots from ſcouring the path-way. This may alſo be prevented by throwing ſeveral traverſes acroſs; cauſing all who enter to paſs round their ends by means of indentations in the lateral wall, or paliſades: but this latter mode is ill ſuited to the paſſage of guns, and is moſt applicable to *caponnieres* leading from bonnets, fleches, and other ſuch out-works that are chiefly intended as poſts for muſketry only, and which may be manned only on particular occaſions.

9. All troops or batteries acting within narrow limits, which gradually extend in front, are ſubject to the inconvenience of preſenting a leſs front than the enemy can ſhew in oppoſition thereto. It therefore requires much caution and judgment, when taking poſt, with a view to ſelf-defence, not to become expoſed to ſuch diſproportionate powers. It is ſometimes better to retreat altogether into a paſs, fortifying the entrance internally, than to cover it exteriorly. Every thing muſt depend on circumſtances; but there ſhould be no means omitted to prevent the enemy from coming round on the flanks, as they will aſſuredly do, if localities may permit.

10. A poſition commanded, eſpecially by muſketry, from any eminence in front, flank, or rear, muſt, generally ſpeaking, prove untenable. Where the opening for ſuch command is very confined, it may perhaps be cut off by epaulements, raiſed to a ſuitable height, ſo far as to obſtruct any plonging fire; but the *ricochet* fire can only be prevented by ſuch a number of traverſes as may effectually cover the interior. Hence nothing ſhort of peremptory neceſſity ſhould induce to taking up ſuch a poſition. Obſerve, that of all fires, that upon a flank, which is called "enfilading," is the moſt deſtructive.

11. No reliance can be placed on a poſt, of which the rear is ſubject to attack. If, notwithſtanding every precaution, this liability may exiſt, the beſt chance is to keep a good look out; and in caſe the enemy ſhould attempt an attack in that quarter, to abandon the poſt, and either to charge him in front while his force is divided, or to allow his penetrating far enough in the rear to be attacked with effect, either by the whole, or by ſuch a detachment of the garriſon as circumſtances may dictate. It is ſcarcely ever practicable to fortify againſt both front and rear, without dividing the defenders in ſuch manner as muſt weaken, and ſubject the party to deſtruction. A redoubt well conſtructed, or a well choſen ſpot, open on all ſides, will, in ſuch caſe, be preferable to any lines badly covered in their rear.

12. In drawing out lines of defence, &c. make the faces directly towards thoſe parts moſt ſubject to attack; keeping the angles (eſpecially the ſaliant) out of thoſe directions that may ſubject them either to aſſault, or to be enfiladed.

13. Knowing

13. Knowing the ſtrength of your force, take care to proportion your defences accordingly: give from ſix to eight paces, or ſay twenty feet at the moſt, for every piece of ordnance; and for every firelock allow two feet. If there ſhould be no cannon to provide for, one foot only ought to be allowed for each firelock; obſerving that the infantry are always ſuppoſed to be drawn up two deep: thoſe on the *banquette* never to fire until thoſe on the *terre plein* may have loaded, except on emergency.

14. In the above computation, always caſt out a ſixth part of your force, both artillery and muſketry, to be in reſerve: the former to replace any that may be damaged; the latter to aid wherever the garriſon may be hard preſſed, as well as to fill up vacancies.

15. The interior of a work ſhould never be ſo crowded as to debar the garriſon from moving freely, and eſpecially from lying down. It is uſual to compute that each piece of artillery, with its appurtenances, and the men employed to work it, will occupy about 220 ſquare feet. This relates to field pieces; but heavy ordnance will demand full half as much more. For every muſket a ſpace of 18 feet ſhould be allowed; but in this much muſt depend on climate. Where extreme heats are prevalent, double that area will be indiſpenſable; while, in very cold ſituations, much leſs may ſuffice. Interior ſpace is, however, always deſirable, provided the defences be not thereby ſo extended as to render the garriſon unequal to their maintenance.

16. The ſubſtance of parapets for field-works muſt depend both on the weight of metal oppoſed to, and mounted on, them; the ſoil will alſo occaſion much variety; but, if moderately firm, it ſhould be at leaſt 12 feet in thickneſs; but 15 will, in moſt caſes, be better. Thoſe intended to reſiſt muſketry only need ſeldom exceed 8 feet: in many caſes, eſpecially where found clay can be obtained, leſs may ſuffice. The height muſt conform to local circumſtances; obſerving that the *banquette* ſhould always be raiſed to $4\frac{1}{2}$ of the creſt, otherwiſe men of ordinary height could not level over in a proper manner.

17. Works made on the borders of ravines muſt be ſo conſtructed as to have full command down to the bottom of every part, and eſpecially of all deſcents to them from the oppoſite ſide. Such may be very eaſily covered; but where that advantage does not exiſt, the ditch muſt be made as wide and as deep as may ſuffice at leaſt to ſupply ſoil for the ramparts and parapets. No batteries can be better than thoſe excavated from maſſes of rock, or obdurate tough ſoil, inacceſſible towards the front. But ſuch are rarely reſorted to in this branch of fortification. Mounds of earth may either be cut through for embraſures, ſo as to cover the cannon; or they may be ſcarped both within and without in ſuch manner as to prove admirable lines, mounting the cannon *en barbet*. If a wide range towards the flanks is requiſite, this latter mode is highly appropriate.

18. In the conſtruction of *tetes de pont*, always ſelect a re-entering angle, where ſuch can be found properly ſituated. This will prevent the enemy from commanding the flanks and rear; as he inevitably would, if the works were conſtructed upon a ſaliant angle of the ſtream. Beſides, in the former mode, the defenders may line the oppoſite banks, on both ſides of the bridge, with additional defences, that would act on the flanks of thoſe advancing to the attack, as well as when abſolutely croſſing upon the bridge, which might of courſe be deſtroyed by the fire of heavy artillery.

19. Four magazines ſhould be ſo divided along your works, as to afford a ready ſupply to every part; yet ſhould each be ſo far removed as to prevent material injury to the defences, in caſe of exploſion. If duly ſunk, and covered by epaulements, and by an adequate load of ſoil ſupported on faſcines, &c. reſting on good props, they will be in little danger even from the heavieſt ſhots thrown by cannon; but it will not be eaſy to give them ſtrength enough to reſiſt the fall of a heavy ſhell. The apertures of all magazines ſhould face towards that quarter leaſt expoſed to the enemy's fire.

For the minor parts of conſtruction, we refer our readers to the articles FASCINE, GABION, BATTERY, &c. where the ſeveral proportions and uſes of each will be found detailed. To conclude this ſubject, we ſhall briefly obſerve, that the ſame general principles, which govern in the conſtruction of *permanent* fortifications, apply, ſo far as circumſtances may admit, to the projection and to the raiſing of *field-works* in general. The mutual ſupport of contiguous parts muſt ever be the principal conſideration.

FORTIFICATION is alſo uſed for the place fortified: or the ſeveral works raiſed to defend and flank it, and keep off the enemy.

All fortifications conſiſt of lines and angles, which have various names, according to their various offices.

The principal angles are thoſe of the centre, the flanking angle, flanked angle, angle of the epaule, &c.

The principal lines are thoſe of *circumvallation*, of *contravallation*, of the capital, &c. See each in its place.

Fortifications are divided into *regular* and *irregular*, and again into *durable* and *temporary*. *Regular* fortification is that wherein the baſtions are all equal; or that which is built in a regular polygon, the ſides and angles whereof are generally about a muſket-ſhot from each other.

In a regular fortification, the parts being all equal, have the advantage of being equally defenſible; ſo that there are no weak places. *Irregular* fortification is that wherein the baſtions are unequal, and unlike; or the ſides and angles not all equal, and equidiſtant.

In an irregular fortification, the defence and ſtrength being unequal, there is a neceſſity for reducing the irregular figure, as near as may be, to a regular one; *i. e.* inſtead of inſcribing it in a circle, it ſhould be inſcribed in an oval, ſo that one half may be ſimilar and equal to the other half.

And as the irregularity of a figure depends on the quantity of angles and ſides; the irregularity of a fortification ariſes either from the angles being too ſmall, or the ſides being too long, or too ſhort.

Conſequently an irregular figure being propoſed to be fortified; all the angles, with the quantity of the ſides, muſt be found, to be able to judge how it is to be formed. See *Plate* V. *Fortification*, *fig.* 1. which repreſents a fortification inſcribed in an oval.

In this caſe the ſides C D, G H, on the flat parts, are ſtronger than the ſides A B, E F, on the narrow parts, ſuppoſing all the exterior ſides equal, and the place equally fortified. When the angles B C D, C D E, of the polygon are very great, and the beſieger comes within a ſmall diſtance of the works, he cannot approach nearer, without being ſeen in front, except by a direct ſap, with traverſes; and as this way of approaching preſents but a ſmall front, the beſieged, who have a much larger, may oppoſe with peculiar advantage: whereas, if the angles H A B, A B C, of the polygon, are very ſmall, the beſiegers carry their approaches to the counterſcarp itſelf, and have always a larger front than the beſieged; and, as the beſiegers muſt extend their approaches to three fronts, whether they are ſmall or large, the work of the approaches before the front B C D E will be to the work before the front H A B C, as the line B E is to the line H C, nearly, *i. e.* as the greater

axis of the oval is to the leſs; and therefore the front C D, on the flat ſide, is ſtronger than the front A B, on the narrow ſide; conſequently, the longer C D is, ſo that the lines of defence are within the reach of muſket-ſhot, and the angles B C D, C D E, are the ſame, the ſtronger will the front be; ſince the works become more ſpacious, hold more troops to defend them, and the beſiegers are obliged to extend their trenches farther. Moreover, the greater the angles of the polygons B C D, C D E, are, the exterior ſides being the ſame, the ſtronger will be the front C D; becauſe the length of the line B E increaſes, and the extent of the beſiegers approaches in proportion; and, therefore, the ſtrength of a fortification increaſes in proportion to the number and length of its ſides; ſo that a dodecagon is ſtronger than an octagon, when the length of their ſides is the ſame. However, as it is found difficult to inſcribe a polygon in an ellipſe or oval, the following more eaſy method will anſwer the purpoſe. Reduce the ſpot of ground to be fortified to the figure A C E G (*fig.* 2.) and draw B E, A F, parallel to each other; draw C H, D G, perpendicular to theſe lines, and at equal diſtance from the points B and E, and let their interval be equal to that of the lines B E and A F: then draw D C, G H, parallel to A F and B E, and equally diſtant from them; and from their interſections C, D, G, H, with D G, C H, as centres, deſcribe arcs, with a radius equal to C D or G H, ſo as to interſect the lines A F, B E, in A, B, E, F; join the points A, B, E, F, and A B C D E F G H will be an oblong octagon, having one half ſimilar and equal to the other half. If a hexagon be to be deſcribed, inſtead of drawing the two lines C H, D G, one will be ſufficient; in a decagon there muſt be three, and four in a dodecagon. If the ſides cannot eaſily be made equal, then the ſides A B, E F, on the narroweſt part of the polygon, ſhould be the longeſt, becauſe it is the weakeſt. But when the figure cannot in any reſpect be made regular, the ſtrength of each ſide muſt be eſtimated according to the works a beſieger is obliged to make in the attack, and according to the obſtacles he meets with in his approaches. Muller's Elements of Fort. p. 146, &c.

Durable fortification is that built with deſign to remain a ſtanding ſhelter for ages. Such are the uſual fortifications of cities, frontier places, &c.

Temporary fortification is that erected on ſome emergent occaſion, and only for a little time.

Such are field-works, caſt up for the ſeizing and maintaining a poſt, or paſſage; thoſe about camps, &c. as circumvallations, contravallations, redoubts, trenches, batteries, &c. See each article.

FORTIFICATION, *Marine*, is ſometimes uſed by way of diſtinction from *land* fortification. and denotes the art of raiſing works fit for the defence of a harbour againſt the attacks of any kind of ſhipping; but the works proper for this purpoſe depend in a great meaſure on the principles employed in the fortification of towns. However, attention ſhould be given to the ſituation of roads or harbours in contriving works for their defence: *e. gr.* when a town lies open to the ſea, on a curved, or ſtraight bold ſhore, and has before it a ſufficient depth of water and good anchorage, the ſhips, in this ſituation, may be well defended by forts built near the water's edge on each ſide of the anchoring place, ſo contrived as to have two or three batteries, one higher than the other, and furniſhed with a ſufficient number of cannon, carrying ſhot from twenty-four to forty-eight pounds. A town, in this ſituation, may be defended by a rampart, or wall, well flanked, built along the ſhore, beſide the fortifications on the land ſide. The works along the ſhore ſhould be carried ſo near to the water's edge, that troops, attempting to land under the cannon of a fleet, might not find ground on which to intrench themſelves. Farther, when a harbour, being a bay, has a ſhoal or ſmall iſland lying before its entrance, a ſtrong fort ſhould be built upon the iſland, in a place where it can command the entrance on both ſides, if the iſland be not too large; otherwiſe two or more forts ſhould be erected in ſuch places as may command the avenues to the bay; other forts ſhould alſo be raiſed on the moſt convenient points of land, forming the mouth of the bay. Again, when the harbour is in a bay, whoſe points, forming the entrance, ſtretch into the ſea, and approach one another within cannon ſhot; ſuch a harbour may be fortified by building on both ſides of its entrance one or more forts; and, if poſſible, a fort ſhould alſo be built within the harbour's mouth in ſuch a manner, that its cannon can rake the ſhipping fore and aft as they come in.

When a harbour is formed by a cluſter of iſlands, it is eaſily fortified, if the channel between the iſlands is not too wide for the command of cannon from one or both ſhores; but if it be too wide, the ſhipping that rides there muſt be defended from the batteries on the ſhore. When the harbour lies in an inlet, or river, ſome miles above its mouth, a fort built at each point of the entrance, when the paſſage lies ſtraight, and can be commanded from ſide to ſide, and two others between them and the harbour, but not directly oppoſite, unleſs the breadth of the channel requires it, will be a proper ſecurity for the ſhipping in ſuch a harbour; and if the channel or river is winding, the forts ſhould be built where they can command a reach at leaſt, or be ſo placed at the bends, as to command two adjacent reaches. See FORTS, and Robertſon's Treat. of Marine Fort. part ii. § 2. For the fortification of harbours by booms, ſee BOOM.

FORTIFICATION, *Profile of a*, is a repreſentation of a vertical ſection of a work, ſerving to ſhew thoſe dimenſions which cannot be repreſented in plans, and are neceſſary in the building of a fortification. This profile is conſtructed in the following manner: provide a ſcale of equal parts, adapted to the perpendicular height of the work, *e. gr.* let *a b*, *Plate* V. *fig.* 3. be a ſcale of twenty toiſes; and let A B repreſent the level of the ground plane, ſo that thoſe parts of the fortification which are above the ſurface of the ground, or below it, may be above or below this line in the profile. From the point A, in the line A B, take A C = four toiſes three feet, for the interior talus or ſlope of the rampart; at C erect a perpendicular C D of three toiſes eighteen feet for the height of the rampart; through the point D draw an indefinite line D N parallel to A B, in which take D E = 5 toiſes for the breadth of the terre-plein of the rampart; at the point E erect the perpendicular E F = 2 feet from the height of the banquette, and draw F H parallel to D N, making F G and G H each equal to three feet. Draw the line E G, which will repreſent the talus of the banquette, and G H will be the upper part of it; on the point H erect the perpendicular H I = $4\frac{1}{2}$ feet from the height of the parapet above the banquette. From I, draw the indefinite line I K parallel to D N, in which take I L = $1\frac{1}{2}$ foot, and draw H L which will be the interior ſide of the parapet: take L K = 3 toiſes for the thickneſs of the parapet, and from the point K let fall the indefinite line K P, perpendicular to the line A B, and produce it below A B: in this line take K M = $2\frac{1}{2}$ feet, and draw the line L M for the upper part of the parapet, which is a talus, that the ſoldier on the banquette may be able to diſcover the covert-

way

way and the glacis. On the point N, where D N interſects K P, as a centre, with a radius of one foot, deſcribe a ſmall ſemi-circle, which repreſents the cordon; take N P = 6 toiſes, and from the point P draw an indefinite line P n parallel to A B, which will repreſent the bottom of the ditch, the depth of which is ſuppoſed to be equal to the height of the rampart. Take N O = 5 feet for the thickneſs of the revetement of the cordon, and from the point O draw the indefinite line O Q parallel to N P; this will be the interior ſide of the revetement of the point P, where the line P n meets the line N P; take P R = 7 feet, or about the fifth part of its height N P, for the talus of the revetement, and draw the line N R, which repreſents the ſcarp or exterior ſide of the revetement: take R S = 1 foot for the jutting of the foundation, and draw S T perpendicular to P n, making it equal to two or three toiſes from the depth of the foundation; draw T Q parallel to P n, and let it interſect O Q in Q; and let Y & be drawn parallel to N M, and at the diſtance of three feet for the revetement of the parapet. In order to repreſent the profile of the counterfort or buttreſs, when there is any, take O V = 9 feet, and draw V X parallel to O Q; V X, Q O, will repreſent this profile, by means of which the revetement O R is ſtrengthened. That the terre-plein of the rampart may have a proper declivity for carrying away the water which falls upon it, let D W be equal to 1 $\frac{1}{2}$ foot, and draw W E, which will repreſent the upper part of the rampart, and the line A W repreſents the ſlope of its interior ſide. Suppoſe the breadth of the ditch to be twenty toiſes, and lay this down from P to n; and on the point n erect the perpendicular n m, terminated by the line A B at m, which will be the limit of the conterſcarp. At the diſtance of three feet from this line, and parallel to it, draw z y, which will give the thickneſs of the revetement of the conterſcarp; n u = 3 feet will be the talus of this revetement, and the line u m the exterior ſide of it. The foundation may be made to terminate at the diſtance of about ſix inches from the point u. Let m c = 5 toiſes be the breadth of the covert-way, and at the point c erect a perpendicular c d = 2 feet for the height of the banquette. Draw d f parallel to A B, and equal to one toiſe, in which take d e and e f each equal to three feet.

Draw the line c e for the talus of the banquette, and e f will be the upper part of it: from the point f erect a perpendicular f l = 4 $\frac{1}{2}$ feet, for the height of the parapet of the covert-way above the banquette. Produce f l till it cuts A B in r; take r g = 20 toiſes from the breadth of the glacis, and draw l g, which will repreſent the glacis, or the declivity of the rampart of the covert-way: in this line take l h = 1 foot, and draw h f, which will be the interior ſide of the parapet of the covert way; after which let there be a paliſade conſtructed on the banquette, and the profile is finiſhed. Encyclop.

FORTIFIED Place, a *fortreſs*, or *fortification*, *i. e.* a place well flanked and ſheltered with works. See *Plate* V. *Fortification*, *fig.* 4. with the explanation annexed to it, and *fig.* 5. which repreſents a fortified place beſieged.

Places fortified after the modern way conſiſt chiefly of baſtions and curtains, and ſometimes of demi-baſtions, according to the ſituation of the ground: of cavaliers, ramparts, fauſſe-brayes, ditches, counterſcarps, covert-ways, half-moons, ravelines, horn-works, crown-works, out-works, eſplanades, redents, and tenailles. See each under its proper article, Bastion, &c.

There are other moveable and additional parts; as bermes, parapets, banquettes, embraſures, cordons, boyaux, moulinets, chevaux de friſe, chauſſetrapes, galleries, mantelets, batteries, ſaps, mines, blinds, gabions, and paliſades. See each in its place, Berme, Parapet, &c.

Several of theſe works, again, conſiſt of diverſe parts, which have different denominations: thus, a baſtion conſiſts of faces, flanks, caſemates, orillons, gorge, &c. which ſee. See Fort, Fortress, Fortification, and *Military* Construction.

Fortified *Iſland*, in *Geography*, an iſland in the Indian ſea, about a mile in circumference, ſtony by nature, and fortified by art at a very great expence; the only landing-place being at the gate way, which is defended by ſtrong works: about a mile from the coaſt of Malabar, oppoſite to Onore. N. lat. 14° 15′. E. long. 74° 4′.

FORTIGUERRA, Nicholas, in *Biography*, an Italian poet and churchman, was deſcended from an ancient family, and born about the year 1674. Little is known of his early life, but he was advanced to a biſhopric by Clement XI. He ſeems to have ſet his heart upon a cardinal's hat from Clement XII. It was, however, delayed ſo long, that Fortiguerra fell into a lingering illneſs through chagrin and diſappointment, which carried him off, in 1735, at the age of ſixty-one. As an author, he is principally known by a burleſque poem, entitled "Ricciardetto," written in defence of the ſuperiority of Taſſo over Arioſto. The poem is in eaſy verſe: the compoſition was pleaſant, but fanciful. It was firſt publiſhed in 1738 in 4to., and afterwards at Paris, in 3 vols. 12mo. He publiſhed a tranſlation in verſe of the comedies of Terence, printed in 1736, with the Latin text.

FORTIN, or Fortlet, a diminutive of the word *fort*, importing a little fort, or ſconce, called alſo field fort.

Fortin, *Star*, is that whoſe ſides flank each other, &c. See *Star* Fort.

FORTIORI. *A multo Fortiori*. See Multo.

FORTIS Aqua. See Aqua *Fortis*.

FORTISSIMO, Ital., in *Muſic*; the ſuperlative degree of *forte*, implies very loud. The comparative degree of *forte* is *più forte*, more loud.

FORTITUDE, in *Moral Philoſophy*, is one of thoſe virtues which have been long diſtinguiſhed by the appellation of cardinal virtues; the other three being prudence, juſtice, and temperance. To fortitude, indeed, the name of virtue has been particularly appropriated, not only by profane authors, but alſo in the ſacred writings. (See 2 Pet. i. 5.) Nor is this appellation miſapplied, if we conſider that the mind muſt be prepared by this virtue to acquire, and alſo to maintain the reſt. True fortitude ſhould be diſcriminated from that mechanical courage, or natural intrepidity and daringneſs, which is often exhibited by thoſe who have a great deal of fire in their conſtitutions. Accordingly we may define it to be, ſuch a firmneſs and reſolution of ſpirit, inſpired by a ſenſe of what is juſt and honourable, as amidſt all the dangers and evils incident to human life, enables a man ſteadily to purſue the dictates of conſcience and prudence. The *ſeat* of this virtue is the ſoul; whence it follows, that brawny limbs, a firm conſtitution, and fermented blood, are not the qualities which conſtitute a hero. The vigour of nature may be a good foundation for courage; but this is a quality of the mind, and conſiſts particularly in the reſolution of the will, ſupported by reaſon and reflection. The *objects* of courage are the evils of life; and the office of fortitude is to qualify our fears of thoſe evils, that they may never confound and aſtoniſh the

mind; and when any of them arrive, to encounter and ſuſtain them with an equal mind. Fortitude will alſo arm us with reſolution to perform any action which duty demands, however difficult or hazardous; and to perſevere in well-doing, though with the proſpect of various evils; and when any of theſe befal us, courage will ſo ſtrengthen and ſupport us, that we may not ſink under them, or be tempted, through impatience, to forſake our duty. Courage, we may obſerve, does not exclude all fear, and therefore the declaration of Ariſtotle, Ἀφοβος ὁ Ανδρειος, the valiant is fearleſs, muſt be underſtood in a qualified ſenſe. There are ſome things which ought to be feared; for as Ariſtotle obſerves (Ad Nicom. l. iii. c. 6.), "it is for a man's credit to fear infamy, and his diſgrace not to be afraid of it." To which we may add, the diſpleaſure of an almighty God. Not to fear infamy, as the moraliſt now cited obſerves, is a ſign of impudence; and not to fear God is a ſign of impiety. As there are ſome evils which ought to be feared, there are alſo ſome conſtitutions, in which it is impoſſible that fear ſhould be wholly extinguiſhed by fortitude; its office in this caſe is ſo to moderate and rule the paſſion of fear, that it may not deprive him of ſelf-poſſeſſion, and of the full uſe of his reaſon and liberty. In eſtimating the degree of fortitude, and its value in a moral view, allowance ſhould be made for the difference of conſtitutions and of circumſtances. The *rule* or *meaſure* of fortitude is a conſcientious prudence; and conſequently, if we conſider it as a moral virtue, it then does not pertain to the ſoldier, who fights merely for pay or fame; to the man of honour, who gives or accepts the challenge; and much leſs to the ſelf-murtherer. Fortitude, according to the definition given of it by Cicero (De Off. l. ii. c. 13.), is a ſuperiority of mind both to pain and labour; and agreeably to this definition, we may diſtinguiſh fortitude into *active* and *paſſive*: the former denotes a virtuous ardour of mind, which carries a man on towards the glorious end he has in view, notwithſtanding the labours, dangers, and difficulties that lie in the way; and this again may be divided into *civil* and *military*, to the former of which Cicero (De Off. l. i. c. 22.) gives the preference. To this we may apply the fine lines of Horace (l. iii. od. 3.)

"Juſtum, et tenacem propoſiti virum,
Non civium ardor prava jubentium,
Non vultus inſtantis tyranni
Mente quatit ſolida:———"

"The man reſolv'd and ſteady to his truſt,
Inflexible to ill, and obſtinately juſt,
May the rude rabble's inſolence deſpiſe,
Their ſenſeleſs clamours, and tumultuous cries:
The tyrant's fierceneſs he beguiles,
And the ſtern brow, and the harſh voice defies,
And with ſuperior greatneſs ſmiles."—Addiſon.

Paſſive fortitude imports a mind firm and erect under evils.

The extremes of this virtue are, on the one hand, raſhneſs and inſenſibility, and, on the other, timidity and impatience. The virtues reducible to this head of courage, are magnanimity, equanimity, patience, meekneſs, conſtancy, and preſence of mind.

Some writers have diſtinguiſhed between fortitude and courage, repreſenting the former as being always a virtue, and the latter as a virtue or vice, according to circumſtances. Thus, a contempt or neglect of danger, without regard to conſequences, may be called courage, which depends partly on habit, partly on ſtrength of nerves, and partly on want of conſideration; whereas fortitude is the virtue of a rational and reflecting mind, and is founded on a ſenſe of honour and regard to duty. Fortitude, as it reſpects different ſorts of evils, is variouſly denominated; with reſpect to danger in general, it is called intrepidity; in reference to the perils of war, valour; with reſpect to pain of body or diſtreſs of mind, patience; as it reſpects labour, activity; in reference to injury, forbearance; and to the general condition, magnanimity.

FORTORE, in *Geography*, a river of Naples, which runs into the Adriatic, two miles E. of Civita a Mare.

FORTRESS. Although it is common to call every defenſible work a fortreſs, that deſignation cannot in ſtrictneſs apply to any which are not fortified in ſuch manner as may be perfectly independent, and capable of holding out, until, by means of a breach in ſome part of the main defences, an enemy may be authorized to force an entrance. With reſpect to a *coup de main*, every fortreſs is equally ſubject when inſufficiently garriſoned, or deſtitute of proviſions and of ammunition, or if proper precautions are not taken to prevent a ſurprize. According to the rules of defence, every fortreſs ſhould be ſtored for ſix months, or at the leaſt for four; when ſituate near to an enemy's territory, ammunition and proviſion, equal to full eight months conſumption, ought to be laid in; ſo that the garriſon might maintain itſelf until the return of that ſeaſon, when the ſiege muſt, generally ſpeaking, be raiſed. The importance of a poſition, for inſtance, ſuch as Gibraltar, may demand, that ſtores of every deſcription for two years be properly ſecured in bomb-proofs. With reſpect to the general principles of *fortification*, we muſt refer our readers to that head; as alſo to Construction, *Military*, under both which much uſeful information will be found.

FORTROSE, in *Geography*, ſituated on the north-ſide of the Murray frith, is a royal burgh, compriſing two towns, *viz.* Roſemarkie and Chanonry, united under a charter granted by king James II. in the year 1444, and confirmed with greater immunities by James VI. in 1612. Roſemarkie was of high antiquity, having been erected into a royal burgh by Alexander II. Chanonry lies nearly a mile to the weſt, and is ſo denominated from having been at one period the reſidence of the biſhop of Roſs, but is now the ſeat of a preſbytery. By virtue of its charters it was entitled to enjoy the ſame privileges and liberties as the town of Inverneſs; and, conjointly with the latter town, Nairn and Forres, ſends one member to the Britiſh ſenate. It is deſcribed at that time as a place of conſequence, where the arts and ſciences flouriſhed; and the ſeat of law, phyſic, and divinity, for this part of the kingdom. The town, at preſent ſmall, compriſing 278 houſes, and 1289 inhabitants, ſtill owes the little conſequence it poſſeſſes to the recent eſtabliſhment of an academy, under the direction of a rector and two maſters, for the inſtruction of youth in claſſical learning and natural philoſophy. Two parts of the ancient cathedral remain: one uſed as a place of ſepulture for the family of Mackenzie; and the other as a ſeſſions-houſe, the vaults below ſerving for a priſon.

Dr. George Mackenzie, the author of the "Lives of the moſt eminent Writers of the Scots' Nation," was a native of this place.

Eight or nine miles N. W. of Fortroſe, on the road to Dingwall, lies the barony of Ferrintoſh, in the pariſh of Urquhart, which poſſeſſed, from 1690 to 1786, an exemption from the duties of exciſe on ſpirits diſtilled from grain of the growth of that diſtrict. N. lat. 57° 34′. W. long. 4° 5′.

FORTUNA Equestris. See Equestris.

Fortuna, in our ancient *Law-Books*, is the ſame with what we call *treaſure trove*.

"Theſaurum

"Theſaurum ducente fortuna invenire inquirendum eſt per 12 juratores pro rege, &c. quod fideliter preſentabunt, &c. omnes fortunas, abjurationes, appella, &c."

Some pretend it alſo ſignifies *fortuito occiſos*; but this ſeems to be very fanciful.

FORTUNATE ISLANDS, in *Ancient Geography*, an appellation which has given the critics and antiquaries great perplexity; being the name of a place famous for golden apples which grew there; or, as Varro ſays, for ſheep with golden fleeces.

The ancients deſcribe them as ſituate without the ſtraits of Gibraltar, in the Atlantic ocean. The common opinion of the moderns takes them for the Canary iſlands; this is grounded principally on the ſituation and temperature of thoſe iſlands, which render the uſe of cloaths there unneceſſary; and from the abundance of oranges, lemons, grapes, and other delicious fruits growing there.

Ol. Rudbecks has found a very different place for them. That learned author, who makes his native country, Sweden, the ſcene of all that is great and extraordinary in ancient tradition and fable, will have the Fortunate iſlands to be Sweden, and the delicious fruits, talked of by the ancients, his imagination ſuggeſts were nothing but the virtue and good manners which anciently flouriſhed in that cold hyperborean nation.

FORTUNE, Τυχη, is a name unknown in the earlier ages; and does not occur, as a divinity, either in Homer or Heſiod; as not being invented in their time.

In after-days it was introduced as a machine; and made to ſerve diverſe purpoſes in natural philoſophy and theology.

The moſt ancient circumſtance we know concerning this goddeſs is, that Bupalus, a great ſtatuary and architect, was the firſt who made a ſtatue for her in the city of Smyrna; and that this ingenious artiſt thought fit to repreſent her with the polar ſtar upon her head, holding in her left hand the horn of Amalthea, commonly called the Cornucopia. By the firſt of theſe ſymbols he is thought to have deſigned to expreſs the power of this goddeſs over the world, and by the ſecond that ſhe was the diſpenſer of all goods. After him came Pindar, continues Pauſanias, who celebrated this divinity in his verſes, and gave her the name of Pharopolis, or the protectreſs of cities; ſuch is nearly the origin of the worſhip of Fortune in Greece, a modern divinity not known before Pindar. In after-times the Greeks erected to her ſeveral temples. The inhabitants of Antioch, as well as thoſe of Smyrna, held her in high veneration; and it is not improbable that ſeveral other people imitated their example. Among the encomiums given to this goddeſs by Pindar, he made her one of the Parcæ, and to have the greateſt power of them all, whence we may conclude, that ſhe was confounded with thoſe inexorable goddeſſes, or, ſpeaking more accurately, with Deſtiny itſelf, that blind divinity, who diſtributed good and evil at random: and ſuch was the idea which the Greeks entertained concerning her.

The Romans conceived of her in a ſimilar manner; ſince their moſt ancient Fortune being that which was worſhipped at Antium, and which was confounded with the Lots, the uſe of which was ſo famous in that city, it is evident they did not diſtinguiſh her from Deſtiny, or that fate which the Geeks called *Eimarmene*. The Romans, content at firſt with conſulting the Lots and Fortune at Antium, adopted at laſt this divinity, and eſtabliſhed her worſhip in their city, where ſhe had afterwards a great number of temples. The firſt was erected to her by Servius Tullius, and hence we deduce the date of the introduction of her worſhip into Rome. This edifice was conſecrated to her under different names, under which various appellations ſhe had appropriate temples, as we learn from Livy and Plutarch. A ſecond temple was built by Ancus Martius to Fortune, under the title of *Fortuna virilis*; and ſhe had likewiſe another under the name of *Female fortune*; and none but newly married perſons were permitted to worſhip her. It is probable, that the Roman ladies were at the charge of building that edifice; accordingly it was reported, that at the finiſhing of it, the goddeſs had uttered theſe words, "Recté me matronæ vidiſtis, ritéque dedicaſtis." Fulvius Flaccus raiſed the moſt magnificent temple of all to this goddeſs, under the appellation of the "Equeſtrian fortune." That which was erected to her by Q. Catulus was dedicated to the "Fortune of the day," *Fortunæ hujuſce diei*. If that which Nero conſecrated to her was not the moſt magnificent, it was the moſt ſingular and ſplendid, in regard to the materials of which it was formed. It was entirely of one ſort of ſtone found in Cappadocia, called by Pliny *Phingias*, the marble of which, beſides its remarkable hardneſs, was ſo white and glaring, that it is ſaid, when the gates were ſhut one ſaw in it clearly. This temple was afterwards incloſed within that emperor's golden houſe. The ſame goddeſs had another in the new ſtreet under the title of "Fortune with breaſts," who was repreſented much like Diana of Epheſus, and Iſis, whoſe head-dreſs ſhe wears upon ſome figures which are ſtill preſerved. Domitian built another temple to "Fortune of happy arrival," *Fortunæ reduci*, an expreſſion which often occurs on medals, as well as that of *Fortuna redux*.

Plutarch, in an expreſs treatiſe of the Fortune of the Romans, accounts for the practice of the ancient poets, who ſeem to make Jupiter the author of all the evils of life. Mankind, he obſerves, before the name of Fortune had got into the world, perceiving a certain arbitrary cauſe, diſpoſing of things in an irreſiſtible manner, called it *God*: but the ſame cauſe being often obſerved to act at random, and without any rule or order at all, the ſupreme being came to be diveſted of the attribute; and Fortune, or Deſtiny, acknowledged in his ſtead.

It is not eaſy to unravel what the ancients meant by the name Fortune. The Romans underſtood by it a principle of fortuity, whereby things came to paſs, without being neceſſitated thereto; but what and whence that principle is, they do not ſeem to have ever preciſely thought; whence their philoſophers are often intimating, that men only framed the phantom Fortune, to hide their ignorance; and that they call Fortune whatever befals a man without his knowing for what purpoſe. Hence Juvenal, ſat. x. ver. 366, affirms, they were men who made a deity of Fortune:

"Nullum numen abeſt, ſi ſit prudentia; ſed te
Nos facimus, Fortuna, deam cœloque locamus."

The ingenious Mr. Spence gives another reading of this paſſage:

"Nullum numen habes, ſi ſit prudentia; ſed te
Nos facimus, Fortuna, deam cœloque locamus."

This reading, he thinks, agrees beſt with the context: Juvenal ſays, ver. 356, that the two things we ſhould pray for are good health and good ſenſe; that we might be the authors of our own happineſs if we pleaſed, ver. 363. that virtue is the only way to true happineſs, ver. 364. that if we ourſelves are prudent, Fortune has no power over us; and that in truth ſhe is no goddeſs at all, and has only uſurped a ſeat in heaven from the folly of mankind, ver. 366. Fortune was not conſidered as a deity by the old Romans, but was made ſo by the devotion and folly of the vulgar; and Mr.

Mr. Spence ſays, that he has ſeen an ancient gem, in which Cybele, the mother of the gods, is repreſented as turning away her head from Fortune, in an attitude of diſowning and rejecting her. Polymetis, p. 150, 154, &c.

According to the opinion of the heathens, therefore, fortune, in reality, was only the arrival of things in a ſudden and unexpected manner, without any apparent cauſe or reaſon; ſo that the philoſophical ſenſe of the word coincides with what is vulgarly called *chance*.

But in religion it had a farther force; altars and temples in great numbers were conſecrated to this fortune, as a deity. This intimates that the heathens had perſonified, and even deified, their chance; and conceived her as a ſort of goddeſs, who diſpoſed of the fate of men at her pleaſure. Hence that invocation of Horace, "O diva, gratum quæ regis Antium," in the thirty-fifth ode of the firſt book, where he recommends Auguſtus, then preparing for a viſit to Britain, to her protection. From theſe different ſentiments it may be inferred, that the ancients at one time took Fortune for a peremptory cauſe, bent upon doing good to ſome, and perſecuting others; and ſometimes for a blind inconſtant cauſe, without any view or determination at all.

If then the word Fortune has no certain idea in the mouth of thoſe who erected altars to her; much leſs can it be aſcertained what it denotes in the minds of thoſe who now uſe the word in their writings.

They who would ſubſtitute the name Providence in lieu of that of Fortune, cannot give any tolerable ſenſe to half the phraſes wherein the word occurs.

Horace paints the goddeſs, preceded by neceſſity, holding nails and wedges in her hands, with a cramp-iron, and melted lead to faſten it; rarely accompanied with Fidelity, unleſs when ſhe abandons a family; for in that caſe Fidelity never fails to depart with her, as well as friends.

She is diſreſpectfully ſpoken of by moſt of the Roman writers, and repreſented as blind, inconſtant, unjuſt, and delighting in miſchief. Ovid. ad Liv. ver. 52. ver. 374. Hor. lib. i. od. 34. ver. 26. lib. iii. od. 29. ver. 51. Statius, Theb. xii. ver. 505. However, they had a good as well as a bad Fortune, a conſtant and inconſtant Fortune, the latter of which was repreſented with wings, and a wheel by her. Hor. lib. iii. od. 29. ver. 56. We are wholly ignorant of the nature of that worſhip which the Romans paid to bad Fortune; but that they did pay homage to her is certain, ſince, according to Cicero (De Nat. Deor. l. iii.), ſhe had an altar on the Eſquiline mount. As the inhabitants of Antium adored at the ſame time two fortunes, called *Fortunæ geminæ*, the twin fortune, it is probable that theſe were good and bad fortune. Martial, who alſo ſays they were ſiſters, adds, that they iſſued forth oracles upon the ſea ſhore. Suetonius calls the two fortunes "the Lots of Antium," becauſe it was by the Lots they were conſulted.

Juvenal alludes to a ſtatue of Fortune, which exhibited her under a very good character, as the patroneſs of the poor infants that were expoſed by their parents in the ſtreets. Sat. vi. ver. 605.

The painters repreſent her in a woman's habit, with a bandage before her eyes, to ſhew that ſhe acts without diſcernment; and ſtanding on a wheel, to expreſs her inſtability. The Romans, ſays Lactantius, repreſented her with a cornucopia, and the helm of a ſhip, to ſhew that ſhe diſtributes riches, and directs the affairs of the world. In effect, it is with ſuch characters, that we ſee her repreſented on ſo many medals, with the inſcriptions, FORTVNA AVG. FORTVNA REDVX. FORTVNAE AVG. or REDVCIS, &c. Sometimes ſhe is ſeen pointing at a globe before her feet, with a ſceptre in one hand, and holding the cornucopia in the other.

The Romans, as he have already obſerved, had a virile as well as a muliebrian Fortune for the objects of their adoration: the *Fortuna virilis* was honoured by the men, and the *Fortuna muliebris* by the women.

They honoured Fortune alſo under a variety of other appellations. The Fortune worſhipped at Antium was probably of the moſt exalted character of any among the Romans, if we may judge by the account which Horace gives us of the great ſolemn proceſſions that were made to her. Hor. lib. i. od. xxxv. ver. 22. But the moſt celebrated temple of Fortune was at Prænefte. Statius ſpeaks of ſeveral Fortunes there, and calls them the *Prænefſinæ ſorores*. Lib. i. Sylv. iii. ver. 80.

On the reverſe of a medal of Commodus, we have a repreſentation of Fortune, under the quality, or ſurname of *Manens, i. e. ſtable, permanent;* holding a horſe by the reins. On the Greek medals we meet with ΑΓΑΘΗ or ΚΑΛΗ ΤΥΧΗ, *Good Fortune.* Conſtantine gave the epithet *anthouſia, i. e. flouriſhing*, to the Fortune of his new city Conſtantinople.

FORTUNE, *Part of.* See PART.

FORTUNE *Bay*, in *Geography*, a bay on the S. coaſt of Newfoundland; 20 miles N. W. of Placentia bay. This extenſive bay is interſperſed with ſmall iſles, and within it are many bays, with great depth of water.

FORTUNE *Iſland*, or *Good Fortune Iſland*, a ſmall iſland in the Indian ſea, near the S. W. coaſt of the iſland of Sumatra. S. lat. 1° 35′. E. long. 90° 25′.—Alſo, a ſmall iſland in the Eaſt-Indian ſea, near the N. coaſt of the iſland of Celebes. N. lat. 0° 50′. E. long. 123° 48′.

FORTUNE, *Iſlands of*, two ſmall iſlands and rocks, near the W. coaſt of Kerguelen's land. S. lat. 49° 21′. E. long. 68° 15′.

FORTUNE-*tellers*. Pretenders to tell fortunes, and to any crafty ſcience for the diſcovery of ſtolen goods, are puniſhable by impriſonment, pillory, and binding to their good behaviour, and ſhall be deemed vagabonds. Stat. 9 Geo. II. cap. 5. ſect. 4. Stat. 17 Geo. II. cap. 5. ſect. 2. See CONJURATION.

FORTY DAYS. See QUADRAGESIMA, and LENT.

FORTY *days court*. See ATTACHMENT *of the foreſt*.

FORTY *hours, prayers of*. See HOURS.

FORTY-*ſhilling Land*, in *Agriculture*, is a term applied in Scotland to a certain portion of arable land. But the forty-ſhilling land of old extent conſiſted of eight *oxgangs*, or one hundred and four acres.

FORULI, in *Ancient Geography*, a town of the Sabines, mentioned by Virgil. According to Strabo, it was ſeated on a rock, and very favourable in this reſpect for the accommodation of thoſe who might at any time engage in a revolt. Its preciſe ſituation is not aſcertained.

FORUM, in *Antiquity*, is uſed in divers acceptations; ſometimes for a place of traffic, anſwering to our market-place; in which ſenſe it has uſually ſome adjective added to it, as *forum boarium*, market for oxen and beef; *forum ſuarium*, for ſwine; *forum piſcarium*, for fiſh; *forum piſtorum*, for bread; *forum cupedinarum*, for dainties; and *olitorium forum*, the herb-market.

FORUM, again, is uſed for any place where the governor of a province convenes his people to give judgment, according to courſe of law.

Whence a man is ſaid *forum agere*, when he keeps the aſſizes; *forum indicere*, when he appoints the place where they are to be kept, &c.

FORUM was alſo a public ſtanding place in the city of

Rome, where cauſes were judicially tried, and orations delivered to the people.

Of theſe *fora*, called *civilia*, in contradiſtinction to thoſe of the firſt kind above-mentioned, which were denominated *venalia*, there were ſeveral; at firſt only three, *viz.* Romanum, Julianum, and Auguſtum; but that number was afterwards increaſed to ſix, by the addition of the Tranſitorium, called alſo Palladium; the Trojanum, and Saluſtii forum.

The firſt, and moſt eminent of theſe, was the forum Romanum, called alſo *forum vetus*; and abſolutely, *forum*, or *the forum*. In the time of Romulus this was only a large open ſpace without buildings or any other ornament. Tullus Hoſtilius firſt incloſed it; the elder Tarquin adorned it with porticos; and ſucceeding kings, conſuls, and magiſtrates, rendered it at length one of the nobleſt places in the world. It was called "Forum Romanum," or ſimply "Forum," by way of eminence, on account of its antiquity in compariſon of the other *fora*, and of its moſt general uſe in public affairs. Martial and Statius, for the ſame reaſon, give it the name of "Forum Latium;" Ovid the ſame, and of "Forum Magnum;" and Herodian calls it τὴν ἀρχαίαν ἀγορὰν, the old forum. The Comitium, uſed ſometimes for holding the *comitia* (which ſee), was a part of this forum, in which ſtood the *roſtra* (which ſee), a ſort of pulpit, adorned with the beaks of ſhips taken in a ſea-fight from the inhabitants of Antium. In this the cauſes were pleaded, the orations made, and the panegyrics ſpoken by perſons at the death of their friends or relations. Near this was the "Puteal." Of this place critics have given different accounts; but the opinion of M. Dacier ſeems to be the moſt probable; who ſays, that the Romans, whenever the thunder fell upon a place without a roof, took care, from ſuperſtitious motives, to have a ſort of cover built over it, which they called "Puteal." This had the name of "Puteal Libonus," and "Scribonium Puteal," becauſe Scribonius Libo erected it by order of the ſenate. The prætor's tribunal, which ſtood very near it, is often denoted by the ſame expreſſion.

The "Julian forum," called alſo "Cæſar's," was built by Julius Cæſar with the ſpoils taken in the Gallic war. Its area alone, as Suetonius informs us, coſt one hundred thouſand ſeſterces; and Dio affirms, that it much exceeded the Roman forum.

"Auguſtus's forum" was built by Auguſtus Cæſar, and was reckoned by Pliny among the wonders of the city. The moſt remarkable curioſity it preſented was the ſtatues in the two porticos on each ſide of the main building. In one were all the Latin kings, beginning with Æneas; in the other, all the kings of Rome, beginning with Romulus; moſt of the eminent perſons in the commonwealth, and Auguſtus himſelf among the reſt; with an inſcription upon the pedeſtal of every ſtatue, expreſſing the chief actions and exploits of the perſon it repreſented. This forum was reſtored by the emperor Adrian.

"Nerva's forum" was begun by Domitian, but finiſhed and named by the emperor Nerva. In this forum Alexander Severus ſet up the ſtatues of all the emperors that had been deified, in imitation of what Auguſtus had done in his forum. This forum was called "Tranſitorium," becauſe it lay very convenient for a paſſage to the others; and "Palladium," from a ſtatue of Minerva which was ſet up in it. Scarcely any thing remains of this forum, except an old decayed arch, which the people, by a ſtrange corruption, inſtead of Nerva's arch, call Noah's ark.

"Trajan's forum" was built by the emperor Trajan with the produce of the ſpoils which he had taken in his wars. The porticos round this forum were exceedingly beautiful and magnificent, covered with braſs, and ſupported by pillars of more than ordinary ſize, and exquiſite workmanſhip.

The forum of Conſtantinople was erected by Conſtantine, when he eſtabliſhed this city on the commanding eminence of the ſecond hill, where he had pitched his tent, during the ſiege and conqueſt of Byzantium. This edifice was of a circular, or rather elliptical form: the two oppoſite entrances formed triumphal arches; the porticos, which incloſed it on every ſide, were filled with ſtatues; and the centre of the forum was occupied by a lofty column, of which a mutilated fragment is now degraded by the appellation of the "burnt pillar." This column was erected on a pedeſtal of white marble, twenty feet high; and was compoſed of ten pieces of porphyry, each of which meaſured about 10 feet in height, and about 33 in circumference. On the ſummit of the pillar, above 120 feet from the ground, ſtood the coloſſal ſtatue of Apollo, which was of bronze, and had been tranſported hither from Athens or from a town of Phrygia; and was ſuppoſed to be the work of Phidias. The artiſt had repreſented the god of day, or, as it was afterwards interpreted, the emperor Conſtantine himſelf, with a ſceptre in his right hand, the globe of the world in his left, and a crown of rays glittering on his head. This ſtatue was thrown down under the reign of Alexis Comnenus.

FORUM is alſo uſed among Caſuiſts, &c. for juriſdiction. Thus they ſay *in foro legis*, or the outer forum, *i. e.* in the eye of the laws, or the common courſe of juſtice: *in foro conſcientiæ*, or the inner forum, *i. e.* in the eye of God, or man's own conſcience.

There are a great many things not condemned *in foro legis*, which yet are criminal *in foro conſcientiæ*.

FORUM *Adriani*, in *Ancient Geography*, *Voorbourg*, a place in Inſula Batavorum, S.E. of Lugdunum Batavorum; where Adrian eſtabliſhed a kind of mart for the purpoſe of carrying on his negociations with Great Britain.——*Alieni*, a town of Gallia Ciſpadana, inhabited by the Lingones; now *Ferrara*.——*Appii*, a town of Italy, in Latium, on the Appian way, at the 43d mile-ſtone from Rome; built by Appius, who formed the way denominated from him. See FOSSA *Nuova*.——*Aurelii*, a town of Italy, in Etruria, between Centumcellæ and Coſa; long ſince utterly deſtroyed.——*Ceramorum*, a conſiderable town of Aſia, and the laſt of Myſia, 12 paraſangs from Peltæ.——*Calviſii*, *Calviſano*, a town of Italy, in Gallia Ciſalpina, in the canton of the Cenomanes.——*Caſſii*, *S. Maria Forcaſſi*, a town of Italy, in Etruria, between Tarquinii to the weſt, and Falarii to the eaſt.——*Claudii*, *Oriolo*, a maritime town of Italy, in Etruria, to the ſouth-eaſt of Carara.—Alſo, a town of Gaul, in the province of the Alps, the capital of the Centrones.——*Cornelii*, *Imola*, a town of Gallia Ciſpadana, W. of Ravenna, and S.E. of Bologna.——*Decii*, a town of Italy, in the country of the Sabines; ſuppoſed to be at or near *Furano*.——*Diuguntorum*, or *Jutuntorum*, *Crema*, a town of Inſubria (Ptol.), in Gallia Tranſpadana, S. of Bergomum.——*Egurrorum*, a town of Spain, in the Tarragonnenſis, ſeated on the Silus, in the country of the Aſturi, W. of Aſturica; ſuppoſed to be the preſent *Medina de Rio Seco*.——*Flaminii*, a town of Italy, S.W. of Nuceria.——*Fulvii*, a town of Italy, in Liguria, ſeated on the Padus, N.W. of Dertona; ſuppoſed to be Valence, in the duchy of Milan.——*Gallorum*, *Caſtel-Franco*, a ſmall town of Gallia Ciſalpina, S.E. of Mutina.—Alſo, a town of Spain, in the Tarragonnenſis, and country of the Vaſcones, N.W. of Oſca.——*Julii*, *Frejus*, a town ſituated on the coaſt of Gallia Narbonnenſis, W. of the iſland of Lero. See FREJUS.——*Lebuorum*, or *Libicorum*, a town of Italy,

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in Gallia Cifalpina; fuppofed to be *Borgo Lavizaro*, in the duchy of Milan.——*Lepidi, Regio*, a town of Italy, in Gallia Cifalpina.——*Licinii, Pieve d' Incino*, a town of Italy, in Gallia Tranfpadana, in the canton of the Orobii.——*Limicorum, Ponte de Lima*, a town of Spain, in the country of the Callaici Braccarii, fituated on the Limia——*Livii, Forli*, a town in the S.E. part of Gallia Cifpadana.——*Narbafarum*, a town of Spain, in the territory of the Callaici, towards the confines of Lufitania, S.E. of Aquæ Flaviæ.——*Neronis, Forcalquier*, a town of Gallia Narbonnenfis, N.E. of Catuiaca.——*Novum, Fornove*, a town of Gallia Cifpadana, towards the fouth, near the Tarus. —Alfo, a town of Italy, in the Samnium, N.E. of Beneventum, and at a fmall diftance from it. Its ruins appear near Paduli. —Alfo, a town of Italy, in the country of the Sabines; the fame, according to the abbé Chauppy, with *Forum Decii*.——*Popilii*, a town of Gallia Cifalpina, S.E. of *Forum Livii*.—Alfo, a town of Italy, in Lucania, S.E. of Vulci.——*Segufianorum*, a town of Gallia Celtica; now *Feuris en Forez*.——*Sempronii, Foffombrone*, (which fee,) a town of Italy, in Ombria, upon the Metaurus, S.E. of Urbinum Metuarenfe.——*Statielliorum, Villa de Fo*, a town of Italy, in Liguria.——*Tiberii, Keyferftulh*, Germ. denoting the throne of Cæfar, a town of Gallia Celtica, belonging to the Helvetians, fituated on the Rhine, not far from the frontier of the Rhætii and Vindelicii.——*Truentinorum*, a town of Gallia Cifalpina, in Emilia.——*Vibii*, a town of Gallia Cifalpina, in the country of the Taurini.——*Voconii, le Canet*, a town of Gallia Narbonnenfis, 22 miles W. of Forum Julii. When the fenate of Rome was delivered from the horror of profcriptions, it caufed to be erected in this place a temple to Clemency, in which they fet up the ftatue of this virtue, together with that of Cæfar, to whom fhe prefented her hand.——*Vulcani, Solfatara*, a place of Italy, in Campania, near Puzzuoli. Pliny calls it the the Campi Phlegræi.

FORWARD, a word of command, ufed in our *Military Tactics*, when it is intended that fections, platoons, or battalions, &c. fhould advance in that direction to which they are at the time fronted. Forward-wheeling is likewife ufed in contradiftinction to backward-wheeling, as explained under the heads of Evolution and Tactics. The former caufes the wheeling body to be thrown in advance of its former pofition; the latter places it behind the line it had occupied. The many inconveniences attendant on wheeling forward have occafioned that mode to be lefs ufed than formerly; wheeling backwards being found to anfwer far better in all cafes where there may be fufficient fpace towards the rear to admit of the feveral fections, platoons, &c. being thrown back. No larger body than a grand divifion, which we fuppofe to contain nearly 200 men, ought ever to wheel forward; nor more than a fingle company, rated at 100 men, to wheel backward.

FORZA de Agro, in *Geography*, a town of Sicily, in the valley of Demona; 20 miles S. of Meffina.

Forza, *St. Leonardo*, a town of Naples, in the Abruzzo Citra; 6 miles E.S.E. of Valva.

FOS di Novo, a town of Etruria, and capital of a marquifate, to which it gives name; 4 miles E. of Sarzana.

FOSCAGNO, a town of Italy, in the county of Bormio; 8 miles N.N.W. of Bormio.

FOSCARINI, Michael, in *Biography*, a noble Venetian, born in 1728, was employed by his government to continue the hiftory of Venice by Nani. His part of the work forms the tenth volume of the "Collection of Hiftorians of Venice." It is in 4to., and was publifhed in the year 1718. He died in 1692, leaving likewife behind him two novels, which are printed among thofe of the Academy of Incogniti.

FOSENO, in *Geography*, a fmall ifland in the North fea, near the coaft of Norway. N. lat. 60° 45'.

FOSEY, a town of Bengal; 20 miles S.S.E. of Mahmudpour.

FO-SHAN, or Fo-chan, a village of China, fo called becaufe it is not inclofed by walls, and has not a particular governor, although it carries on a great trade, and contains more houfes and inhabitants than even Canton itfelf. This village, which is diftant four leagues from Canton, is reckoned to be three leagues in circumference, and to contain a million of inhabitants, who are occupied in various manufactories.

FOSS, or Fosse, a river of England, which runs into the Oufe, near York.

Foss *Navigation*, is the parliamentary name of an inland navigation, purfuing the courfe of the Fofs river in the North Riding of Yorfhire, from the Ouſe river at York city, to a place called Stillington Mile. See Canal.

Foss, or *Foffe*, in *Fortification*, a French word, literally meaning a ditch, adopted in our language, and efpecially applied to the ditch or moat furrounding fortified places, or made in the front of entrenchments, &c. for the purpofe of preventing furprize, and of protracting the defence made by the garrifon. Under the head of Construction, *Military*, the proper dimenfions and form of that excavation which furnifhes foil for the formation of the ramparts, and which becomes the foffe, will be found exemplified according to the fyftems adopted by the moft eminent engineers; it would therefore be fuperfluous to repeat in this place all that intereſting detail which under that ticle referred to may be feen, not only abftractedly, but according to the feveral relations the foffe bears to the feveral members of the fortification. Here we fhall confine ourfelves to a few remarks relating to the advantages attendant upon dry and upon wet ditches.

Wherever the opportunity may offer, it fhould be made a rule to conftruct the ditch fo that it could be filled with water at pleafure. For this purpofe, ample fluices ought to be laid, fhutting with gates in the ordinary manner, but effectually fecured from the enemy; who might otherwife choak the channels, and prevent the gates from opening; or, if it fhould better fuit their purpofe, might open the gates, fo as to allow the water to retire with an ebbing tide, &c. Much will depend on the manner in which that part of the ditch lying between the curtain and the raveline in its front, may be occupied. If there be a tenaille, and that it be intended to keep that fpace dry, fo as to allow of large bodies of troops proceeding from the principal, or body of the place, to the tenaille, and from that to the raveline, or *vice verfâ*, it will be neceffary to throw up embankments in the form of *demi-caponnieres*, from that part of the revetement under the orillon, to the interior line of the rampart; thus cutting off the flow of water, and confining it to thofe parts of the ditch in front of the feveral baftions, and under the ravelines, &c. into all which it fhould flow through proper arched channels.

The embankment above-mentioned is called a *batardeau*, and is ufually furnifhed with a row of very ftout paliſades, which being below the ordinary level of thofe fhots directed at the flanks of the baftions, commonly efcape injury until the enemy may be able to make a lodgment on the creft of the glacis. Of courfe, under proper precautions, the batardeau proves an efficient means of preventing any *coup de main* in that quarter from fucceeding.

In order to ftrengthen the defences ſtill more, it is common to fink channels called *cunettes*, or *cuvettes*, in the centres of the ditches, parallel with the faces of the baſtions.

These ſhould be from 14 to 16 feet wide, and about nine or 10 feet deep; the ſides being lined with maſonry: the cunette is ordinarily kept full of water, and proves an admirable preſerve for large quantities of fiſhes; which being under the notice of various centinels, are not ſubject to be poached. The cunette is likewiſe a great check upon thoſe who may be diſpoſed to deſert, and ſerves as a formidable impediment to the ſmuggling of ſpirits, &c. into the body of the fortreſs.

It muſt be obvious that a wet ditch muſt preſent numerous obſtacles in the way of the beſiegers, who cannot always command the means of paſſing a foſſé from 30 to 50 yards broad, perhaps from 12 to 24 feet deep, and having a cunette ſunk along its centre; even though they ſhould have breached the flanked angles of a baſtion, and made a lodgment in the covert-way. But, on the other hand, the difficulty of maintaining the communication between the body of the place and the outworks during a ſiege, when the bridges are ordinarily much damaged, and perhaps rendered unſerviceable, is a great drawback on this kind of defence. The embarraſſments to which ſuch a circumſtance as the want of a competent bridge may give birth, muſt be too obvious to require any detail. A dry ditch affords conſiderable convenience to the garriſon, not only in the ordinary way of communication, but it enables large bodies of men to paſs freely, and with far leſs expoſure than on a bridge, to and fro; ſo that a ſally may uſually be made with promptneſs and ſecrecy. Should the enemy poſſeſs themſelves of a raveline, the defenders may eſcape into the ditch by means of ſmall eſcaliers of maſonry, commonly called *pas de ſourés*, and take ſhelter in the tenaille, if there be one; otherwiſe they may retire into the flanks of the baſtions by means of eſcaliers concealed behind the orillons. In a wet ditch no additional works can be conſtructed; whereas, in a dry one, ſuch retrenchments, or even redoubts, may be raiſed, as may not only give the enemy conſiderable trouble, but eventually ſerve to diſlodge him, or to render what would otherwiſe have proved important acquiſitions, perfectly uſeleſs and unavailing.

But in ſome ſituations it is impoſſible to keep a foſſé of proper depth free from water; while in others, whether owing to the looſeneſs of ſoil, or to the elevation of the works above the ordinary level of the country, it is equally ſo to obtain any adequate depth of water. Beſides, in ſuch elevated ſituations, it may often be in the power of the enemy to drain off the water. Where a very ample body of water can be retained above the ordinary level of the country, and the ſurrounding plain contiguous to the defences may lie very low, it may be ſometimes practicable to let off the water ſuddenly, thereby to form a moraſs, ſuch as muſt give the beſiegers infinite trouble.

Foss, *Advance*. See Advance.

Foss, *Van*. See Van.

Foss-*way*, is one of thoſe celebrated great roads, that traverſed this iſland at a very early period of its hiſtory, veſtiges of which are traceable in various diſtricts; while, in others, they have been obliterated by the progreſs of cultivation, or the direction of the lines coaleſcing with the preſent turnpike roads. It has been generally admitted by antiquarian topographers, that four principal ways, or ſtreets, as they have been uſually termed, extended from ſeveral points of the compaſs, and, paſſing through the interior, formed lines of communication with the oppoſite coaſts. But the accounts given of them are ſo obſcure and contradictory, as to form a very inadequate clue for purſuing their courſe with deſired exactneſs; while the deſtructive hand of time, and the labours of huſbandry, by daily diminiſhing their remains, render the taſk of aſcertaining the bearing progreſſively more difficult. The four great roads were the Hermine or Ermine ſtreet, the Icknild or Ricknild ſtreet, the Watling ſtreet, and the Foſs-way. Beſides theſe, there were two other great roads, but of leſs extent, *viz.* the Via Devana and the Julia Strata; with numerous croſs and connective communications, denominated vicinal ways, which were the means of intercourſe between the ſeveral ſtations; the names and diſtances between which formed the ſubject of the curious topographical work, the Itinerary of Antoninus.

As to whom theſe early great national improvements are attributable, no doubt can be fairly entertained: for, though Ranulphus Higden, in his Polychronicon, aſcribes them to Molmutius, a Britiſh king; and a manuſcript, entitled Eulogium, preſerved in the Cotton collection, adduces them as the work of Belinus, the ſon of Molmutius; and theſe opinions have been adopted, without examination; yet from the accounts given of the labours and improvements of the Romans, while in poſſeſſion of Britain, and the internal evidence ariſing from the conſtruction of the roads, they are decidedly referable to that ingenious people. It is well aſcertained, that the Roman method of forming roads was to lay the foundations deep, and to uſe ſuch durable materials that they became perfectly ſolid buildings, and ſo compact that they could not have been more firm if vaulted and arched. A ſection made of a portion of the Foſs-way, for the purpoſe of diſcovering the mode of conſtruction, and the kind of materials uſed in theſe roads, afforded the following reſult: Stones, clunch, hard gravel, indurated clay, and various other kinds of earth, in layers, like the ſtrata obſervable in mines; a layer of clay was ſucceeded by a ſubſtance of a binding quality, then a layer of flat ſtones, next chalk, over which was laid rough gravel, till the road was raiſed from ſix to eight feet in height, and the top crowned or coped with a ridge, gently riſing from the ſides to the centre, that the rains falling upon it might run off, leſt by ſoaking in they might ſoften the cementing bodies, and injure the work. Similar ſubſtances and plans of conſtruction have been apparent in the other great roads, in places where they have been broken up, to take the materials for repairing adjacent highways.

Theſe muſt have been arduous and expenſive undertakings, at a time when the country was in ſuch an unimproved ſtate, that the very attempt to remove the difficulties of communication was a ſtriking proof of their exiſtence and inconvenience. But the Romans, as lords of the countries they conquered, poſſeſſed the wealth of labour to a vaſt extent: they had the command of the natives, their carriages and cattle; while the ſoldiers alſo, when unoccupied in military expeditions, were conſtantly employed in works of public utility. If, therefore, the requiſite materials lay at a conſiderable diſtance, they had the means of procuring and tranſporting them to the deſired places: and ſuch was the enterpriſing and decided character of that people, they would have whatever conſtructive materials they might chooſe, that their works, as bridges, roads, aqueducts, fortifications, &c. ſhould be grand and magnificent like themſelves.

Reſpecting the bearing of theſe roads, much has been advanced by hiſtorical and topographical writers; and it ſtill forms an intereſting ſubject of antiquarian reſearch. A manuſcript, marked Nero D 1, among other additamenta at the end of Matthew Paris's works, in the Britiſh Muſeum, contains a rude draught and deſcription of theſe roads, which, from recent diſcoveries, and attempts to aſcertain their reſpective lines and bearings, appears tolerably correct.

correct. In this plan, the Hermine or Ermine ſtreet is repreſented as proceeding from the ſouthernmoſt part of the iſland, directly north; the Icknild or Ricknild ſtreet, in a line from eaſt to weſt; the Watling ſtreet, from Dover to Cheſter; and the Foſs-way, from Totneſs in Devonſhire to Caithneſs in the north-eaſt of Scotland. But as it does not appear that the Romans ever penetrated further north than the ſouthern bank of the river Tay, it is more probable that this, like the Hermine ſtreet, terminated at the Linea valli, or Roman wall. The ſouthern end perhaps might have been at the city of Exeter, the Iſca Danmoniorum of the Itinerary, and the ſtation where the legio ſecunda of the Roman army was quartered, while their operations were confined to Britannia Prima. Of the track the Foſs-way made through the counties of Devon and Somerſet few veſtiges have been diſcovered. It has been traced in the vicinity of Bath, the Aquæ Solis of Antoninus, where it was met by another road, which, coming weſtward from the Severn, formed a continuation of the Julia Strata. Entering Wiltſhire, the Foſs paſſes North Wraxal to Shire-ſtone, and leaving Tetbury about a mile and a half to the eaſt, enters Glouceſterſhire, near the village of Kemble, proceeding to the ſtation of Durocornovio, the preſent town of Cirenceſter; where it is traverſed by another Roman road coming from the ſouth-eaſt, on which are the ſtations deſcribed in the fourth Iter; and which is ſtill recorded by the names of ſeveral places on the line retaining the Britiſh name of *Sarn*, equivalent to the Latin *ſtratum*, *viz.* North and South Sharncote, Sharnton, Sarney, &c. The progreſs of the Foſs from Cirenceſter is through Northleach, Slaughter, Stow-on-the-Wold, Moreton-in-Marſh, and Lemington, where it receives a vicinal, or croſs road, leading, according to Dr. Plot, from Woodſtock in Oxfordſhire. Leaving Lemington, and paſſing Stratton-in-the-Foſs to Whitchurch, it enters Warwickſhire at Stretton-ſuper-Foſs. Along this part of the line it is very conſpicuous, running through an iſolated part of Worceſterſhire, croſſing the river Stour at Hawford; and a little to the weſt of Compton, Combrook, and Lighthorn, it leads to a large Roman encampment at Cheſterton, near which it takes a direction over the river Leam, on the eaſt of Honingham, to Upper Stretton; whence it is very viſible over Dunſmore heath, in its courſe to Britford-upon-the-Avon; and going by the village of Brinklow, through Stretton-under-Foſs, where it appears like an open ditch, the materials having been taken away for repairing ſome adjacent road; and leaving Monk's Kirby on the eaſt, it bids adieu to this county at Highcroſs, interſecting the Watling ſtreet at nearly right angles, at which junction was the ſtation Bennonæ. Through Leiceſterſhire it ſhapes its courſe almoſt parallel with the river Soar near Sharnford, which derives its name from the road, as did the places previouſly mentioned in Glouceſterſhire, and appears very conſpicuous in Greenlane, over the incloſures to Narborough; it then coaleſces with the preſent turnpike, and continues with it till within the diſtance of four miles from Leiceſter, and croſſing a branch of the Soar at Langham bridge, it enters by the weſt gate of the town, the ancient ſtation Ratæ of the Itinerary. Leaving the county town, and going through Thurmaſton, it paſſes by a large oblong tumulus at Shipley hill to Syſton, and beyond Ratcliff proceeds over Thruſſington Wolds, which Higden termed the Waſtes, keeping near the verge of the diſtrict formerly called Churn wood, to Soxhill, where are another large tumulus, and the remains of an entrenched camp. Here it is viſible as a high ridge, which in many places is paved, or pitched with pebbles and other ſtones, and is interſected by a vicinal road, that connects it with the Hermine-ſtreet. Hence it proceeds to the ſtation Vernometum, near Willoughby in Nottinghamſhire; through this county it proceeds in a northerly direction over the Wolds, whence deviating a little to the north-eaſt it enters Bridgeford, the ſtation Mardunum of the ſixth and eighth iters; beyond which it is traceable on the weſt ſide of the preſent turnpike, in the incloſures called Eaſt-Bridgeford fields. Horſley, in his Britannia Romana, having fixed the ſtation Ad Pontem, near Southwell, carries the Foſs through that town. But the ſcite of this ſtation was more probably at or near Newark, by which, according to exiſting records, reſpecting alterations allowed to be made in the road, called in the charters, Via regia, the Foſs evidently paſſed. North of the town it is viſible, proceeding to North Collingham, where Gale and Stukeley fix the ſtation Crocolana, and Horſley at Brough in the immediate vicinity. Between this and Lindum, Lincoln, it is very conſpicuous; at which city, by ſome authors, the Foſs is ſuppoſed to terminate. But Dr. Bennet, biſhop of Cloyne, and the Rev. Mr. Lemon, who in the years 1778 and 9, travelled in queſt of the direction of the Foſs, from its commencement in Devonſhire, obſerve that it extends in a north-eaſterly direction from that ancient city by Burgh, on the ſmall river Bain, to Ludford, where they ſuppoſe was the ſtation Bannovallum. But this has every appearance of being only a vicinal way, and the road in queſtion more probably continued northerly on the line which they conſider forms part of the Hermine-ſtreet; an error which will be noticed in the deſcription of that road. In this point of bearing it proceeds to the ſtation Ad Abum at Wintringham, where by a ferry it croſſes the Humber. On this part of the line, which is ſtraight, the road is, in many places, particularly through the Woodlands, paved with flat-ſtones, ſet edge-wiſe in a ſtrong cement, and conſiderably raiſed; but over the heath it is formed of the uſual ſtrata. By the ferry of Ad Abum its progreſs was to the ſtation Delgovitia, at Wigton, whence it went to Eboracum, York. What was its exact direction, or how far beyond this ſtation it extended north, the reſearches of antiquaries have not been able to aſcertain. It is probable, that the termination was at the Picts wall; but equally improbable that it ever communicated with the ſhore of Caithneſs.

See Cotton MSS. in the Britiſh Muſeum; Leland's Itinerary; Stukeley's Itinerarium Curioſum; Horſley's Britannia; and the Beauties of England and Wales.

FOSSA, in *Anatomy*, a technical word, denoting ſuperficial cavities in the bones or other parts.

Fossa, in our *Ancient Cuſtoms*, was a ditch full of water, where women committing felony were drowned; as men were hanged. "Nam et ipſi in omnibus tenementis ſuis omnem ab antiquo legalem habuere juſtitiam, videlicet ferrum, foſſam, furcas, et ſimilia." In another ſenſe it is taken for a grave, as appears by theſe old verſes:

"Hic jacent in foſſa Bedæ venerabilis oſſa:
Hic eſt foſſatus, qui bis erat hic cathedratus."

Fossa, in *Geography*, a town of Italy, in the department of the Panaro; three miles N. of Mirandola.

Fossa *Clodia*, or *Claudia*, *Chiozza*, a town of Italy, in Venetia. Pliny.

Fossa *Nuova*, in *Geography*, a village and abbey of Italy, ſituated on the ruins of the little town of Forum Appii, mentioned in the Acts of the Apoſtles, and by Horace in his account of his journey to Brunduſium.

"—— Inde Forum Appii
Differtum Nautis, cauponibus atque malignis."

" To Forum Appii thence we ſteer, a place
Stuff'd with rank boatmen, and with vintners baſe."
Francis.

In the memoirs of St. Thomas Aquinas it is ſaid, that he was taken ill as he paſſed this way, and was carried to this convent, where he died. Legendary ſtory ſays, that his body was afterwards required by the king of France, and ordered to be carried to Thouloufe: but one of the monks, before the removal of the body, cut off the ſaint's head, and annexed another in its room: the true head was hid in the wall of the convent, and afterwards found, as the monkiſh fable reports, as freſh as the day when it was cut off, in conſequence of ſome ſcratching and knocking which occaſioned the walls being pulled down. Foſſa Nuova is two miles S. of Piperno.

FOSSAGLIO, a town of Italy, in the department of the Upper Po; five miles N. of Cremona.

FOSSANO, a town of France, in the department of the Stura, ſeated on the Stura, denominated, on account of its famous ſprings, "Fons Sanus," whence by corruption was formed Foſſano; erected into a biſhopric, under the archbiſhop of Turin in 1592, and taken by the French in 1796. Beſides the cathedral, it contains three pariſh churches, three convents, and about 900 inhabitants; five miles E. of Savigliano.

FOSSARII, in *Antiquity*, a kind of officers in the eaſtern church, whoſe buſineſs was to inter the dead.

Ciaconius relates that Conſtantine created 950 foſſaries, whom he took out of the divers colleges or companies of tradeſmen: he adds, that they were exempted from taxes, ſervices, burthenſome offices, &c.

F. Goar, in his notes on the Greek Euchologion, inſinuates that the foſſarii were eſtabliſhed in the times of the apoſtles; and that the young men who carried off the body of Ananias, and thoſe perſons full of the fear of God, who interred St. Stephen, were of the number.

St. Jerom aſſures us, that the rank of foſſarii held the firſt place among the clerks; but he is to be underſtood of thoſe clerks only who had the direction and intendance of the interment of the devout.

FOSSAT, in *Geography*, a town of France, and chief place of a canton in the department of the Arriege, and diſtrict of Mirepoix; 21 miles W. of Mirepoix. The town contains 889, and the canton 9578 inhabitants, on an extent of 170 kiliometres, and in 10 communes.

FOSSE, Charles La, in *Biography*, a painter of hiſtory and landſcape of great celebrity in France, but not very juſtly entitled to his fame; as may be ſeen by one of his works now on a cieling at the Britiſh Muſeum, painted originally at the command of Ralph, duke of Montagu, in the reign of James II.

He was born at Paris in 1640, and was a diſciple of Le Brun; but was afterwards ſent by Louis XIV. to ſtudy in Italy. He formed his taſte more upon the Venetian than the Roman ſtyle; for which reaſon his works have far leſs of correctneſs in drawing, than richneſs of colour; and by this means, perhaps, he obtained a good reputation, when more ſkilful men, whoſe talents were directed to higher objects, would have been neglected. We have particularized him here becauſe he was the artiſt employed to decorate Verſailles, Trianon, Marly, and the palaces of many of the nobility of France, when it was the faſhion to load ſtaircaſes and cielings with abſurd allegories and taſteleſs compoſitions of groteſque ſcenery. La Foſſe died in 1716, aged 76.

Fosse, Anthony de la, was born at Paris in 1653. He devoted himſelf to polite literature, and obtained conſiderable reputation as an author. He is known alſo in the political world as ſecretary to the marquis de Crequi in the war in Italy, and after this to the duke d'Aumont in his government of the Bolonnois. He wrote Italian with the utmoſt facility, and ſo well, that for an ode, which he compoſed in the language, he was received into the Academy Degli Apatiſti at Florence. His chief literary compoſitions were tragedies, ſeveral of which, particularly that entitled "Manlius Capitolinus," were ſucceſsful on the ſtage. He tranſlated, or rather paraphraſed, Anacreon, which was publiſhed with ſome miſcellaneous poetry in the year 1704. He died in 1708. His works were publiſhed in two vols. 12mo. in 1755. The verſes of La Foſſe are extremely laboured, and are ſaid to have coſt him more pains in expreſſion than in the thought. Moreri.

Fosse, in *Gardening*, is a ſort of ſunk fence, large ditch, or *ha-ha*, made on the outſides or boundaries of ornamented grounds, in order to extend the proſpect in an uninterrupted manner. Fences of this nature are formed of different depths and breadths, according to circumſtances; but ſix or ſeven feet in depth, and ten or fifteen in width, are the moſt common. Where the extent of pleaſure-ground is inconſiderable, theſe fences give the particular parts of the garden or grounds an air of larger extent than they really poſſeſs; as at a diſtance nothing of them is ſeen, ſo that the adjacent fields, &c. appear to be connected with them: where the pleaſure-ground is ſituated near to a park, paddock, or any ſpacious field open to an agreeable proſpect, they are often continued round, as far as they are agreeable, from the walks of the pleaſure-grounds or other garden grounds.

Works of this kind are formed in different ways, but always ſo as to ſerve the purpoſe of fences, and afford an uninterrupted view of the whole extent of the ground.

One method of conſtructing them is with an upright ſide next the garden or pleaſure-ground, or in the contrary direction, according to circumſtances and ſituation, five, ſix, or ſeven feet deep, faced with a wall of brick, ſtone, or ſtrong poſt and planking; the other ſide being made ſloping outward from the bottom of the upright wall, &c. gradually, with an eaſy ſlope of fifteen or twenty feet diſtance, or more, ſo as to render the declivity as eaſy and imperceptible as poſſible, both to take off all ſtiff and ditch-like appearance, and that when in a field or park, no ground may be loſt from its being capable of being converted into graſs. The top of the upright ſide ſhould be made nearly upon a level with the adjacent pleaſure-ground, and always a little higher than the top of the ſlope on the oppoſite ſide, being laid with graſs correſponding to the adjoining garden or pleaſure-ground; unleſs it be thought convenient to continue a gravel-walk that way; in which caſe, a proper verge of graſs ſhould conſtantly be preſerved between the walk and the edge of the foſſe; the ſlope ſide ſhould alſo have its top always nearly on a level with the adjacent ground of the field, park, or part where it is formed; and the ſide finiſhed with a regular ſlope from top to bottom, being alſo ſown or laid down in graſs, which will always preſerve the ſlope in due form, and have an agreeable appearance to the ſight at all ſeaſons.

Where in forming this kind of foſſe, by reaſon of water it cannot be got deep enough to form the upright ſufficiently as a fence, a *chevaux de friſe* of wood-work may be erected along the top, projecting outward in a nearly horizontal poſition, or as much ſo as to riſe but very little above the level of the top of the perpendicular ſide on which it is fixed, that it may not obſtruct the view, or be very

perceptible from the garden or pleaſure-ground, which it is intended to improve.

There is another fence of this ſort which is formed with both ſides ſloping, and in perpendicular depth from four to five or ſix feet, having a fence near that height arranged along the bottom; the ſides being ſloped gradually from the bottom to ten or twenty feet width, or more at top; as the more eaſy and imperceptible the ſlope the better, particularly on the field-ſide. The ſides muſt be ſown or laid with graſs. In this, as both ſides are ſloped, a fence along the bottom is neceſſary as a defence againſt cattle, &c. which may be either ſtrong paling, or any kind of paliſado-work, the height in proportion to the perpendicular depth of the ſunk fence, as the top ſhould not be higher than that of the ſlopes in ſuch caſes.

It is uſual, in conſtructing the firſt ſort of fences of this nature, to begin by ſetting out the intended width by two ranges of ſhort ſtakes; then to level in the ſtakes by notching, according to the intended height of the top on each ſide, correſponding with the adjacent ground, making up both the top lines with earth firmly, according to the line of level marked on the ſtakes; then, cloſe along the ſide of the line of the intended upright ſide, proceeding to dig a trench three feet wide, perpendicularly to the intended depth; and as the labour goes on to work alſo the ſloping-ſide gradually down, ſtill continuing digging the trench perpendicularly next the garden, &c. till arrived at the proper depth: when it is neceſſary to level the bottom equally along according to the lines of level at top; and having proceeded ſo far, then, according to the line of level at top and bottom, to trim and finiſh off the ſloping ſide regularly, ſo as to form an even ſlope from the outſide line at top to that at bottom: as to the upright ſide, a wall muſt be erected to the height of the line of level at top, making good the ground behind the wall firmly as the building advances, and finiſhing the top with a coat of turf, level with the adjoining ground; at the ſame time alſo finiſhing the ſlope, either by ſowing it with graſs-ſeeds, or laying it with turf, as may be the moſt convenient in the particular circumſtances.

But in forming the ſecond ſort of foſſe, it is directed to ſet out the width by two lines of ſtakes; then to level them in, and make up the ground of each line according to the mark of level, as before; thus, exactly along the middle, between the two lines of ſtakes, to dig a trench two or three feet wide, to the intended depth of the fence, ſloping each ſide a little as the work goes on, ſtill continuing the trench perpendicularly, till arrived at the due depth; then, as in the former caſe, to level the bottom to an equal depth by ſtakes, agreeable to the lines of level at top: when this is effected, finiſh off both ſlopes evenly from each line of level at top to that at bottom, and ſow each ſlope with graſs-ſeeds, or lay them with turf, as moſt proper. The fence along the bottom may be either cloſe-paling, rails, or paliſadoes, as moſt convenient; the height proportionable to the depth of the foſſe, but not higher, or at leaſt but very little, than the line of level at the top of the foſſe.

In the execution of the work in both caſes the internal materials ſhould be well trodden down, or rammed in, in order that the whole may be rendered perfectly ſolid, and prevented from ſinking irregularly and being thrown down.

FOSSENET, in *Geography*, a town of France, in the department of the Upper Garonne; 7 miles W. of Rieux.

FOSSES, a town of France, in the department of the Sombre and Meuſe, and chief place of a canton in the diſtrict of Namur, ſituated between the Sombre and the Meuſe; 7 miles W. of Namur. The town contains 1574, and the canton 13,780 inhabitants, on a territory of 270 kiliometres, and in 25 communes.

FOSSETA, a town of Italy, in the Treviſan; 12 miles E.S.E. of Trevigio.

FOSSILS, in *Mineralogy* and *Geology*, a term which, in its ſtrict and uſual ſignification, is ſynonymous with that of *mineral*; being applied to the inorganic bodies that are formed in, and at the ſurface of the earth, according to phyſical and chemical laws. (See MINERALS.) The French, we ſuppoſe, were the firſt who diſtinguiſhed by this appellation thoſe animal and vegetable remains that, owing to particular circumſtances, inſtead of decaying when buried in the earth, have more or leſs preſerved their original form and ſtructure, and are found penetrated by, or even converted into, ſubſtances belonging to the mineral kingdom. Theſe ſubſtances, before their natural hiſtory began to be elucidated, were denominated *lapides idiomorphi*, *figurati*, *diluviani*, &c.; but ſuch names ſoon gave way to that of *petrifacta*, or *petrifactions*, which was adopted in almoſt all languages. In latter times, however, the denominations *extraneous* or *adventitious foſſils*, propoſed for this order of natural bodies by ſir John Hill, have been revived by ſome authors. Mr. Parkinſon, conſidering the word "petrifactions" inadmiſſible as a general term, recommends the appellation of "ſecondary foſſils," while "primary foſſils" are to him thoſe ſubſtances which are ſuppoſed to be natives of, and to have exiſted primitively in, the ſubterranean regions. Mr. Martin, in his "Outlines," prefers the terms *reliquium* and *reliquia* (which ſhould be *reliquiæ*). But neither of them appearing ſatisfactory, we ſhall, in this work, retain the old appellation *petrifactions*; to which we refer the reader for a hiſtory of the ſubſtances in queſtion: for though we are aware that its etymology refers only to a converſion into ſtone, yet in this, as in many other caſes, recourſe muſt be had to the well known rule *a potiore fit denominatio*. And, indeed, even thoſe writers who reject the word "petrifactions" as not ſufficiently general, retain another of the ſame import in all the generic names of the extraneous foſſils, ſuch as ornitho*lithus*, ichthio*lithus*, helmintho*lithus*, &c.

FOSSIL-*plant*. See PLANT.

FOSSILS, *Marine*. See MARINE.

FOSSIL-*ivory*. See IVORY.

FOSSIL-*ſalt*. See SALT.

FOSSIL-*wood*. See WOOD.

FOSSIL *Coal*, in *Agriculture*, an inflammable ſubſtance which is ſaid to be capable of being rendered ſoluble by ſaline ſubſtances, in which ſtate it may probably be found beneficial to the farmer.

FOSSIL *Manure*, is that ſort which is of a foſſile nature, and which is raiſed from the bowels of the earth. Lime, marle, and other ſimilar ſubſtances, are moſtly conſidered as of the foſſil kind by writers on huſbandry.

FOSSOMBRONE, in *Geography*, a town of Italy, in the duchy of Urbino, ſeated on the Metro; the ſee of a biſhop, ſuffragan of Urbino; erected out of the ruins of Forum Sempronii, which was deſtroyed by the Goths and Lombards; 10 miles S.E. of Urbino. N. lat. 43° 42′. E. long. 12° 44′.

FOSSORES, in *Natural Hiſtory*, a name given to a ſpecies of ſmall worms hatched from the eggs of a fly, which feeds on the parenchymatous ſubſtance of the leaves of plants, burying themſelves between the two membranes. Theſe animals in general are called by Reaumur aſcarides,

but as they greatly differ in their ſize, and in their manner of eating and deſtroying leaves, the ſmall ones, which eat but ſlowly, and gnaw their way in crooked furrows, are called by him foſſores parvi; and on the contrary, thoſe which eat away all that lies before them, and are of a ſomewhat larger ſize, are called foſſores magni. See ASCARIDES.

FOSSUM, in *Geography*, a town of Norway, in the dioceſe of Aggerhuus; 23 miles W. of Chriſtiania.

FOSTA, a town of Sweden, in the province of Smaland; 21 miles E. of Upſal.

FOSTAL, in *Agriculture*, is a term ſignifying the way that leads from the main road to a farm-houſe.

FOSTAT, called alſo *Maſr* and *Maſr-el-Atik*, and by the Venetian merchants, and ſome modern travellers, *Old Cairo*, in *Geography*, a town of Egypt, ſituated between Grand Cairo and the Nile, about half a league from Boulac. In the 20th year of the Hegira, ſays Elmacin in his hiſtory of the Arabs, Amron, ſon of Eleas, built Maſr Foſtat on the ſpot where he had formed his camp, previouſly to his beſieging Alexandria. The general, on his return from his conqueſts, laid the foundation of a town there, to which he gave the name of "Foſtat," ſignifying in Arabic "tent." Afterwards the governors ſent by the caliphs made it their place of reſidence. It took the ſurname of "Maſr" as it is ſaid, from Mizraim, the ſon of Ham, who ſettled in Egypt; a name which Memphis had borne before, and which the Arabs always beſtow on the capital of Egypt. Its ſituation on the banks of the Nile, and near a canal that communicated with the Red ſea, rendered it in a ſhort time very flouriſhing. It was about two leagues in circumference, when Schaouar, 500 years after its foundation, delivered it up to the flames, in order to prevent its falling under the dominion of the French. Its power terminated with this epocha. With its inhabitants, it loſt its commerce and its riches. It was then that Grand Cairo, having become the reſidence of the grandees and the kings of the country, received the pompous epithet of Maſr; and that Foſtat aſſumed that of El-Atik, which ſignifies "the ancient," and which it bears at this day. Maſr-el-Atik is not now half a league in circumference; but it is ſtill very populous, and has conſiderable trade. This town indicates the ſcite of the Babylon of Egypt; and it is the port for the boats that come down from the Said, or Upper Egypt, as Boulac is that of the Delta. Here, in the midſt of the Mahometan moſques, the Jews have a ſynagogue, and the Catholics a convent and a church; but the Copts have reſerved to themſelves that which is reckoned by the devout the moſt precious ſpot: this is a grotto, or low chapel, in which, according to tradition, the virgin lived ſome time with the infant Jeſus, when they were obliged to flee into Egypt. This tradition is a ſource of profit to the Copts, who charge fees for admiſſion into this chapel. At Old Cairo are to be ſeen Joſeph's granaries, if this appellation may be given to a large ſpace of ground, ſurrounded by walls 20 feet high, and divided into courts without any roof or covering; in which is depoſited the corn brought from Upper Egypt as the fiſcal duties, and where it becomes the food of a multitude of birds, and the receptacle of their dung. The walls are badly conſtructed; nor has this building any appearance of antiquity, ſo that nothing but the love of the marvellous could have attributed the erection of it to the patriarch Joſeph. Another work of the Arabs, which is remarkable for the boldneſs as well as the beauty of its conſtruction, and the only one worth ſeeing in the ancient city of Cairo, is the aqueduct that conveys the water of the Nile into the caſtle. It is ſupported by 350 narrow and very lofty arcades. The water is raiſed by a chain-pump with four wheels, which is worked by oxen. In front of Old Cairo the Nile leaves, in the middle of its bed, an iſland of about five hundred yards in breadth, where is built the "mekkias," ſignifying Meaſure. See NILOMETER. At the extremity of Maſr-el-Atik, near the water-caſtle, commences the khalig or canal, which traverſes Grand Cairo. See CAIRO.

FOSTER, JAMES, in *Biography*, a celebrated preacher, was born at Exeter in the year 1697, where he was educated; and ſo great was his progreſs, that the maſter of the ſchool boaſted of him as his moſt promiſing pupil; from the grammar ſchool he was ſent to an academy for educating diſſenting miniſters, then under the ſuperintendance of Mr. Joſeph Hallet, where, by his abilities, induſtry, and improvement, he quickly acquired the admiration of his tutor and fellow ſtudents. He commenced public preacher in the year 1718, and was ſoon diſtinguiſhed among his brethren for popular talents. At this period, debates among the diſſenters in the weſt of England ran high reſpecting the doctrine of the trinity and ſubſcription to certain teſts of faith. Mr. Foſter took the liberal ſide of the queſtion: he ſcorned to dogmatize over the creeds of other men, and would not ſuffer the tenets of others to be impoſed on him; a clamour was excited, and he judged it prudent to remove to ſome other ſcene. His firſt ſettlement as miniſter was with a congregation at Milbourne-port, Somerſetſhire, where he remained till the zealots among his own people rendered the ſituation uneaſy, perhaps, even unſafe, and he accordingly removed to the houſe of a brother miniſter in an obſcure retreat under the hills of Mendip in the ſame county. Here he preached to two congregations, who were ſo poor, that, together, they could not raiſe their miniſter 15*l.* *per annum*. Mr. Foſter was, however, content to remain in obſcurity, and in want of the comforts of life, provided he could enjoy the ſatisfaction which aroſe from his integrity. He found abundant reſources in his own mind, and, though without any proſpects of extended uſefulneſs, applied himſelf to the ſtudies of his profeſſion with an almoſt unremitted appplication. In the year 1720 Mr. Foſter publiſhed "An Eſſay on Fundamentals, with a particular regard to the doctrine of the ever-bleſſed Trinity," &c. To this eſſay he ſubjoined a ſermon, entitled "The reſurrection of Chriſt," proved and vindicated againſt the moſt important objections of the ancient Jews, or modern deiſts, and his diſciples ſhewn to be ſufficient witneſſes of the fact. From Aſhwick Mr. Foſter removed to Trowbridge, in Wiltſhire, where he preached to a very ſmall congregation; and during his reſidence at this place he became a convert to adult baptiſm by immerſion, and accordingly ſubmitted to that rite in London as ſoon as an opportunity offered. This ſtep produced no difference between him and his congregation at Trowbridge; ſo ſmall, however, was his income, and, probably diſheartened at the paucity of his attendants, that he entertained ſerious thoughts of quitting the miniſtry, and betaking himſelf to ſome ſecular employment. While deliberating on the future courſe of his life, he unexpectedly met with a patron and friend in Robert Houlſton, eſq. who appointed him his domeſtic chaplain, and treated him with the utmoſt kindneſs and generoſity. In 1724 he was invited to ſucceed Dr. Gale at the baptiſt congregation in Barbican: he accepted the offer, and continued to officiate as their miniſter upwards of twenty years. In 1728 he opened a Sunday evening lecture in the Old Jewry, which he carried on almoſt to his death with an unexampled degree of popularity. Here he was attended by crowds of perſons of all ranks, ſtations, and qualities. In the year 1744 he was choſen

choſen to ſucceed Dr. Hunt at Pinners' hall; and in 1748 the degree of doctor of divinity was conferred upon him by the college of Aberdeen in the handſomeſt way. The college, by means of their principal, ſaid in a letter to Mr. Foſter, "We beg that you will be ſo good as to accept the diploma as a ſmall mark of the veneration we have for you, and of the ſenſe we entertain of the eminent ſervices you have done to the cauſe of liberty, religion, and virtue, by your writings as well as inſtructions." In 1750, Dr. Foſter was afflicted by a violent diſorder, from the effects of which he never compleatly recovered, though he continued to preach till the beginning of the year 1752, when he was attacked by a paralyſis, which was repeated in October, and on the 5th of the following month he died, in the fifty-fifth year of his age. The works of Dr. Foſter, to which the univerſity in their letter referred, are, 1. His treatiſe on "The Uſefulneſs, Truth, and Excellency of the Chriſtian Revelation, &c." in anſwer to a book entitled "Chriſtianity as old as the Creation." 2. Several volumes of ſermons on important and intereſting ſubjects. After this, *viz.* in 1749, Dr. Foſter publiſhed in quarto the firſt volume of his "Diſcourſes on all the Principal Branches of Natural and Social Virtue." The ſecond volume of this work was printed in 1752. Beſides theſe, he publiſhed ſome ſingle ſermons; and "An Account of the behaviour of the late earl of Kilmarnock, after his Sentence and on the Day of his Execution." He had attended this unfortunate nobleman during his impriſonment, and could ſpeak, from his own knowledge, as to the facts ſtated in the publication. On the death of Dr. Foſter, as well as during his life, the moſt unexceptionable teſtimonies were borne to the excellence of his character, and to his great talents as a preacher. The lines by Pope are well known.

"Let modeſt Foſter, if he will, excel
Ten metropolitans in preaching well."

Thoſe taken from the Gentleman's Magazine, and ſuppoſed to have been written by Savage, are equally characteriſtic and more full.

"But ſee th' accompliſhed orator appear,
Refined his language, and his reaſoning clear;
Thou only, Foſter, haſt the pleaſing art,
At once to charm the ear and mend the heart."

Mr. Rider, afterwards maſter of St. Paul's ſchool, and known by ſeveral uſeful publications, ſpeaking of Dr. Foſter, ſays "His voice was naturally ſweet, ſtrong, diſtinct, harmonious, always adapted to his matter, always varied as his method changed, as expreſſive of the ſenſe as the moſt judicious recitative. Monotony was a fault of which he was never guilty. His action, the ſoul of eloquence, was grave, expreſſive, free from diſtortions, animated without being theatrical; in ſhort ſuch as became the pulpit. He reminded us of Paul at Athens, arreſting the attention of his auditors." He uſed no deluſive arts to bribe the paſſions, to play with the imagination, and ſo impoſe on the underſtanding. He had no ambiguities, no diſguiſes; but, whatever he thought an important truth, he delivered with freedom and without reſerve. In private life he was diſtinguiſhed for candour and liberality, integrity and modeſty, great tenderneſs and benevolence of diſpoſition, and unaffected ardent piety. Gen. Biog. Britiſh Biog.

Foster, John, was born at Windſor, and received his grammatical and claſſical education at Eton, where he acquired a decided ſuperiority over his contemporaries. From Eton he went to King's college Cambridge, of which ſociety he became fellow in 1748. He was afterwards an aſſiſtant to Dr. Barnard maſter of Eton ſchool, and in 1765 obtained the ſame office himſelf. But finding his temper and manners ill adapted to the ſituation, he reſigned it, though not till his health had been much injured by the vexations which he had experienced. He was preſented to a canonry of Windſor in 1772, and in the following year, he viſited the German Spa for the recovery of his health. Here he died and was buried in the month of September. He is known to the learned world by "An eſſay on the different nature of accent and quantity, with their uſe and application in the pronunciation of the Engliſh, Latin, and Greek languages; containing an account and explanation of the ancient tones, and a defence of the preſent ſyſtem of Greek accentual marks." To this eſſay was annexed the Greek poem of Muſurus, addreſſed to Leo. X. with an elegant Latin verſion. He printed likewiſe a prize diſſertation pronounced at Cambridge in 1754, with the title of "Enarratio et Comparatio Doctrinarum Moralium Epicuri et Stoicorum."

Foster, *Sir* Michael, an eminent lawyer, was born in 1689, at Marlborough in Wiltſhire, where he received the early parts of his education, and from whence, in 1705, he was removed to Exeter college, Oxford. He purſued his profeſſional ſtudies in the Middle Temple, and was in due time called to the bar. Not meeting with that ſucceſs which he anticipated in the courts of law, he ſettled firſt at Marlborough, and then, having married, he removed to Briſtol, where he practiſed in his profeſſion with much reputation. He was choſen recorder of the city in 1735, and in the following year he was called to the degree of ſerjeant at law. About this period he publiſhed a pamphlet entitled, "An examination of the ſcheme of the church power laid down in the Codex Juris Eccleſ. Anglicani," which was regarded by the friends to the principles of the Britiſh conſtitution, as an important barrier againſt the doctrines contained in biſhop Gibſon's work. The controverſy excited much attention, and Mr. Foſter's work was read and greatly admired by one party, and oppoſed and anſwered by the other. In 1745, by the recommendation of lord chancellor Hardwicke, Mr. Foſter was made one of the judges of the court of king's bench, with the honour of knighthood. In 1762, he publiſhed "A report of ſome proceedings on the commiſſion for the trial of the rebels in the year 1746, in the county of Surrey; and of other crown caſes, to which are added diſcourſes upon a few branches of the crown law." This work is of the very firſt order, and was abundantly ſufficient to perpetuate the name of the author, who is ſtyled by ſir William Blackſtone, "a very great maſter of the crown law." It has been twice reprinted with valuable additions by his nephew, the late Mr. Michael Dodſon. The health of judge Foſter began to decline almoſt immediately on the death of his lady in 1758; but his life was lengthened out till November 7th, 1763. He was beloved in private life and reſpected by all who knew him. As a judge he maintained his ſtation with great credit for legal knowledge and integrity, during a period of eighteen years, which were marked with the deciſion of many points of ſingular importance in civil and criminal law. He was looked up to as one of thoſe judges who beſt ſuſtained that ſpirit of independence and regard to the rights of the ſubject, which it is the boaſt of Engliſh juriſprudence to have ſecured upon the bench, but which are not unfrequently ſhackled in their exertions, by the purſuit of court favour. See the article Dodson: and Gen. Biog.

Foster, Samuel, an Engliſh mathematician, born in North-

Northamptonſhire, was educated at Cambridge, where he took his degree of maſter of arts. In 1636 he was choſen profeſſor of aſtronomy, in Greſham college, which, however, he reſigned at the cloſe of the ſame year; but in 1641, he was re-elected to the ſame office, and retained it during his life. He was one of the inſtitutors of the ſociety, which met to cultivate the new philoſophy and uſeful knowledge, and which it ſhould ſeem, was eſtabliſhed for the ſake of diverting the minds of the thoughtful from the diſputes, which at that period divided the country with reſpect to religion and politics. This was the foundation of the Royal Society, to which the ſcientific world is under the greateſt obligations. Mr. Foſter died at Greſham college, in the year 1652. He was the author of ſeveral mathematical pieces, of which the principal are, "The art of dialling:" "Deſcription of ſundry inſtruments invented or improved by himſelf." His "Uſe of the Quadrant, &c." firſt appeared as an appendix to Gunter's deſcription of the Croſs-ſtaff. The greater part of his works were republiſhed after his death, carefully corrected by his friends Dr. Twyſden and Mr. Edmund Wingate. In the ſame century there were two other Foſters diſtinguiſhed as mathematicians, *viz.* William, a pupil of Oughtred, and author of "The circles of proportion and the horizontal inſtrument:" and Mark Foſter, who publiſhed a treatiſe entitled "An Arithmetical Trigonometry by common arithmetic, without the uſe of Tables, &c." Ward's lives of the profeſſors of Greſham college.

FOSTER, in *Geography*, a townſhip of America, in Providence county, Rhode iſland, containing 2457 inhabitants; 17 miles W. of Providence, and 31 N. W. of Newport.

FOSTER-LAND, a term employed by our *Old Writers* to ſignify the land given or allotted for the finding of food or victuals; as for monks in certain monaſteries or religious houſes.

FOSTERLEAN, anciently ſignified nuptial gifts; much the ſame with what we now call *jointure*.

The word is originally Saxon, and ſignifies *ciborum exhibitio*, that is, a ſtipend which the wife has for her maintenance. "Poſtea ſciendum eſt cui foſterlean pertineat, vadiet hoc Brigdunia, & plegient amici ſui."

FOTHER. See FODDER *of lead*.

FOTHERGILL, JOHN, in *Biography*, an eminent phyſician, was born at Carrend, in the county of York, on the eighth of March 1712, of reſpectable parents, who were members of the ſociety of quakers. He was in his childhood placed under the care of his maternal grandfather, who ſent him at a proper age to the grammar ſchool of Frodſham, in Cheſhire, where he reſided. At this ſchool he continued till his twelfth year, and was then removed to another at Sedberg, in Yorkſhire, where he remained about four years, and obtained a competent knowledge of the Latin language, and ſome acquaintance with the Greek; and although, as he himſelf has been heard to acknowledge, he was not careful enough to improve the latter; yet he continued, after he left theſe ſchools, to cultivate his Latinity, ſo as to read authors in that language very familiarly, and to write in it with ſufficient fluency. But his attention was directed rather to general knowledge, than to the ſtudy of the learned languages, which he regarded little farther than as the vehicles of profitable information. About the year 1728, he was apprenticed to Benjamin Bartlett, a very reputable and intelligent quaker apothecary, at Bradford in Yorkſhire, who had previouſly been the tutor of Dr. Hillary. After the completion of his apprenticeſhip he removed to Edinburgh, where he purſued his ſtudies with diligence, and graduated on the 13th of Auguſt, 1736. He then entered himſelf a phyſician's pupil at St. Thomas's hoſpital in London, the practice of which he attended for two years. After a ſhort excurſion to the continent with a few friends, in the ſpring of 1740, he returned to London, and took up his reſidence in White-hart court, Gracechurch ſtreet, where he continued during the greater part of his life, and where he acquired and eſtabliſhed both his fame and his fortune. His practice for ſome years was confined chiefly to the lower claſs of people, ſo that he has often traverſed the outſkirts of the city from morning till night, and returned home without having taken one fee. In 1746, he was admitted a licentiate of the College of Phyſicians; and in 1748, he publiſhed his "Account of the putrid ſore Throat;" a work, which is ſtill highly eſteemed as an able ſpecimen of medical hiſtory, which has been tranſlated into almoſt every European language, and to which he owed a conſiderable extenſion of his practice. He was now introduced into the firſt families in the metropolis; and was ſeldom employed where he was not ſought for again on ſimilar emergencies.

In 1754, Dr. Fothergill was elected a fellow of the College of Phyſicians at Edinburgh, and in 1763, a ſimilar honour was conferred upon him by the Royal Society of London, to whom he had, ſeveral years before, communicated ſome intereſting papers, which were inſerted in different volumes of their Tranſactions. Theſe were not the only academical honours which his great merits procured for him. He was one of the earlieſt members of the American Philoſophical Society; and in 1776, when a Royal Medical Society was inſtituted at Paris, Dr. Fothergill was one of a ſelect number of foreign phyſicians, whom the ſociety thought proper to rank among their aſſociates.

Dr. Fothergill had very early acquired a taſte for botany, which he indulged in proportion as the profits of his practice increaſed. For this purpoſe he purchaſed an eſtate at Upton, in Eſſex, containing, beſides other lands, between five and ſix acres of garden-ground. In this place, at an expence ſeldom undertaken by an individual, and with an ardour that was viſible in the whole of his conduct, he procured from all parts of the world a great number of the rareſt plants, and protected them in the moſt ample buildings which this or any other country has ſeen. In a word, every plant that ſeemed likely to be uſeful in medicine or manufactures, or was admirable from its beauty or rarity, was to be found in his garden; and his ſuite of hot and green-houſe apartments, of nearly 260 feet in length, contained upwards of 3,400 ſpecies of exotics, and in the open ground were about 3000 other ſpecies of plants and ſhrubs. In compliment to his zeal and abilities the celebrated Linnæus diſtinguiſhed a plant of the claſs Polyandria Digynia by the name of *Fothergilla*. But the exertions of Dr. Fothergill were not confined to botany; he ſtudied the other departments of natural hiſtory, and patronized its ingenious cultivators. He had a very accurate knowledge of conchology, and poſſeſſed the beſt cabinet of ſhells in the kingdom, with the exception of that of the ducheſs of Portland; his collection of ores and minerals was diſtinguiſhed for the rarity, rather than the number of the ſpecimens that compoſed it; his cabinet of inſects was extremely elegant, and it was from his collection of corals that the ingenious Mr. Ellis delineated his ſyſtem. The great botanical work by Miller was begun and finiſhed under the patronage of Dr. Fothergill, to whom it was with great propriety inſcribed. But the dedication was afterwards cancelled, at his expreſs ſolicitation; for although he took pleaſure in encouraging ingenuity, he diſliked to be told of it; and indeed he was averſe to dedications in general, conſidering

ſidering them as a ſpecies of literary pageantry, more productive of envy to the patron, than of advantage to the author.

In the conteſts between the fellows and licentiates of the College of Phyſicians Dr. Fothergill took an active part, and ſubſcribed five hundred pounds towards bringing it to a legal deciſion. But he was not content with exerting his talents for the benefit of ſcience and of his profeſſion: his benevolence prompted him to many other labours. His obſervations on the ſubjects of police, we are told, could they be collected together, would conſtitute an ample and uſeful volume. (See Dr. Lettſom's Life of Dr. F.) He is ſaid to have written nearly an hundred letters in the Gazetteer on the ſubject of the new pavement; and he was inceſſantly communicating uſeful hints for the improvement of this great city. It was he who firſt ſuggeſted the plan of bringing fiſh by land carriage, in order to break a monopoly, which had highly enhanced the price of freſh fiſh in all the markets about London. At the approach of the ſevere winter of 1767, he propoſed a ſcheme, and liberally contributed to raiſe a fund for the purpoſe, of purchaſing fiſh at a wholeſale cheap price, and of diſpoſing of it at a ſmall loſs, till the whole ſubſcription ſhould be expended. The ſociety, who ſupported the meaſure, which was continued till 1770, in the ſame manner purchaſed potatoes in Lancaſhire, and conveyed them by water to the metropolis. But the inſtitution of the ſeminary at Ackworth, in Yorkſhire, of which he was the projector in 1778, and to which he was a liberal benefactor, both during his lifetime and by his will, was one of the moſt important plans which his zeal to promote the welfare of ſociety led him to undertake. Of his kindneſs and bounty to individuals it will be ſufficient to mention one inſtance, in the caſe of his worthy but unfortunate friend, the late Dr. Gowin Knight; who applied to Dr. Fothergill in a moment of pecuniary diſtreſs, and returned with a heart ſet at eaſe by the noble benefaction of a *thouſand guineas*.

Finding his pleaſant retreat at Upton too remote to be often viſited, while engaged in his profeſſion, and yet too much within the ſphere of action to be a refuge from care and importunity, Dr. Fothergill procured a leaſe of Lea-Hall, near Middlewich in Cheſhire, in the ſummer of 1765, to which ſecluded ſpot he afterwards made an annual retreat as long as he lived; commonly leaving London in the month of July, and returning in the beginning of October. This retreat became the more neceſſary, when, in 1767, he removed to Harpur ſtreet, and enlarged the circle of his practice. For the greater part of his life he had enjoyed good health. But in November 1778, he was afflicted with a diſorder, which he apprehended, though without foundation, to be an irregular gout: it terminated in a ſuppreſſion of urine, from which he recovered in about three weeks, and for the ſpace of two years enjoyed his wonted degree of health. But the time was now approaching, when he was to experience that neither temperance nor medical ſkill could exempt him from the final lot of humanity. On the 12th of December 1780, he was again ſeized with a ſuppreſſion of urine, which, notwithſtanding every effort of the experienced phyſicians and ſurgeon, who attended him, terminated his life on the 26th day of the ſame month. On diſſection the diſeaſe appeared to have been occaſioned by a ſcirrhous enlargement of the proſtate gland, which compreſſed the neck of the bladder, ſo as to prevent the introduction of a catheter. His remains were depoſited in the quakers' burial ground at Winchmore-hill, about twelve miles from London.

The perſon of Dr. Fothergill was of a delicate rather than an extenuated make. His features were all expreſſive, and his eye had a peculiar brilliancy. His underſtanding was comprehenſive and quick, and rarely embarraſſed on the moſt ſudden occaſions. There was a charm in his converſation and addreſs that conciliated the regard and confidence of all who employed him, and ſo diſcreet and uniform was his conduct, that he was not apt to forfeit the eſteem which he had once acquired. At his meals he was uncommonly abſtemious, eating ſparingly, and rarely exceeding two glaſſes of wine at dinner or ſupper. By this uniform and ſteady temperance, he preſerved his mind vigorous and active, and his conſtitution equal to all his engagements.

Dr. Fothergill's writings, with the exception of his inaugural theſis "De Emeticorum Uſu" (which is preſerved in Smellie's "Theſaurus"), and his "Account of the putrid ſore-throat," conſiſt principally of papers printed in the Philoſophical Tranſactions of the Royal Society, and in the "Medical Obſervations and Inquiries," a work of which ſix volumes were publiſhed, and which is known and highly eſteemed wherever medical ſcience is ſucceſsfully cultivated. Beſides the numerous eſſays in this excellent collection, to which the name of Dr. Fothergill is prefixed, we learn that he was the author of the three anonymous papers in the fourth volume, which conſtitute the 8th, 10th, and 17th articles. He alſo publiſhed ſeveral little eſſays, on the weather and reigning diſeaſes, on the Simarouba, and other ſubjects, in the Gentleman's Magazine, and other periodical publications, which, however, were written in haſte and not publicly avowed. Theſe works have been collected and reprinted by Dr. Elliott, in 8vo. 1781, and by Dr. Lettſom in 4to in 1784. See Dr. Hird's affectionate tribute, &c. Dr. Elliott's Life of Dr. F.; Dr. Lettſom's Account of Dr. F.; and Dr. Thompſon's Life of Dr. Fothergill; alſo Lond. Med. Journal, vol. iv. p. 176.

FOTHERGILLA, in *Botany*, juſtly ſerves to commemorate the late John Fothergill, M.D. F.R.S. who, though not a writer on Botany, was eminently uſeful to the ſcience, by introducing a great number of new plants, chiefly from the alps of Europe and from America, which he cultivated with ſucceſs in his garden at Upton, and readily communicated to his friends.—Linn. Suppl. 42. Ait. Hort. Kew. v. 2. 241. Schreb. 922. Willd. Sp. Pl. v. 2. 1224. Mart. Mill. Dict. v. 2. Juſſ. 408. Claſs and order, *Polyandria Digynia*. Nat. Ord. *Amentaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, bell-ſhaped, cloſe, ſhort, truncated, permanent. *Cor.* none. *Stam.* Filaments numerous, thread-ſhaped, thickened upwards, much longer than the calyx; anthers minute, erect, quadrangular. *Piſt.* Germens two, combined, ovate; ſtyles two, awl-ſhaped, terminal, the length of the ſtamens; ſtigmas ſimple. *Peric.* Capſules rigid, each of one cell and two valves. *Seeds* ſolitary, bony.

Eſſ. Ch. Calyx inferior, truncated, entire. Corolla none, Germens combined. Capſules of two valves. Seeds ſolitary, bony.

1. F. *alnifolia*. Native of Carolina, and a hardy ſhrub in the Engliſh gardens. There are two varieties, one with blunt leaves figured in John Miller's Icones Plantarum; the other with acute ones, under the name of *F. Gardeni*, Jacq. Ic. Rar. t. 100.—The *leaves* are furniſhed with a few ſhallow ſerratures towards their ends, and are hoary beneath. The *flowers* appear chiefly in May, at the ends of the branches, in the form of white oblong ſpikes or catkins of no great beauty.

FOTHERING, in *Sea Language*, is a peculiar method of endeavouring to ſtop a leak in the bottom of a ſhip while

while ſhe is afloat, either under ſail, or at anchor. It is uſually performed in the following manner: a baſket is filled with aſhes, cinders, and chopped rope-yarns, and looſely covered with a piece of canvas: to this is faſtened a long pole, by which it is plunged repeatedly in the water, as cloſe as poſſible to the place where the leak is conjectured to lie. The oakum or chopped rope-yarns, being thus gradually ſhaken through the twigs, or over the top of the baſket, are frequently ſucked into the hole along with the water, ſo that the leak is choaked, and the entrance of the water prevented. Falconer's Mar. Dict.

FOTHERINGHAY, in *Geography*, a pariſh in the hundred of Willybrook, and county of Northampton, eighty-five miles diſtant from London, connected as it has been with the lives and fates of princes, muſt ever be an intereſting ſpot to the topographer and traveller; as it doubtleſs will be conſpicuous to the lateſt period on the page of hiſtory. Here was formerly a caſtle, probably firſt erected in the time of the Conqueror by Simon St. Liz, ſecond earl of Northampton. It was rebuilt in the reign of Edward III. by Edward Langley, duke of York, who erected the keep in the ſhape of a fetterlock, the emblem or device of the family. By marriage this fortreſs became the property and occaſional reſidence of the Scottiſh kings. In the fourteenth year of king John's reign, David king of Scotland was ſummoned to ſurrender it; and refuſing compliance, the ſheriff was directed by royal mandate to raiſe the poſſe comitatus, and compel him to ſubmiſſion. Edward IV. made this fortreſs his reſidence in the twenty-ſecond year of his reign; when Alexander, king of Scotland, had an audience, and promiſed to do homage and fealty to the crown of England. In the reign of Elizabeth the cuſtody of this caſtle was confided to ſir William Fitzwilliams, at which period it was rendered a ſcene of woe, at the mere idea of which humanity ſhudders, and the mind ſtarts back with horror from the ſanguinary tranſaction. Here Mary Stewart, queen of Scots, was long impriſoned, then tried, condemned, and executed, in the year 1580. Reſpecting the juſtice or injuſtice of the melancholy event much has been written; and while the ingenious Buchanan has uſed all his efforts to detect, and poured forth all his eloquence to emblazon the queen's guilt; a no leſs able writer, Whitaker, has wielded the energies of his genius, and the weapons of his learning, to eſtabliſh her innocence, and demonſtrate her proſecutor's guilt. Camden, who was a cotemporary, and poſſeſſed ample means of arriving at the truth, endeavours to avoid entering into any diſcuſſion upon the point; obſerving, "Let it ever be forgotten if poſſible, but if not, let it ever be wrapped up in ſilence." Fotheringhay, however, notwithſtanding the reſerve of ſome, and the miſrepreſentation of others, notwithſtanding the caſtle is demoliſhed, the walls of the unfortunate princeſs's priſon down, and the hall of judgment no more, will tranſmit the deplorable fact to the lateſt poſterity; and record in its name and ſcite the nefarious tranſaction. The caſtle, from a manuſcript account, and the deſcription given of it by Leland, muſt have been a noble ſtructure, containing numerous apartments, ſecured by ſtrongly fortified walls, with double ditches moated round. But on the acceſſion of James to the crown of England, an order was iſſued for its complete demolition; and nothing at preſent remains except the ſcite, marked out by the moat and part of the agger on which the keep was erected.

At ſome remote period a nunnery had been founded here, on the ſcite of which Edward Langley, duke of York, erected and endowed a ſecular college for a maſter, twelve chaplains, eighteen clerks, and thirteen choriſters; the annual revenues of which, at the diſſolution, amounted, according to Speed, to 489*l.* 15*s.* 9*d.* The conventual is the preſent pariſh church, in which were interred Edward, duke of York, who was ſlain at the battle of Agincourt, in the third year of Henry V.; and Richard Plantagenet, duke of York, who was ſlain at Wakefield, while attempting to obtain acceſſion to the throne on the death of Henry VI. Their ſumptuous monuments having been deſtroyed, two of indifferent workmanſhip were erected at the command of queen Elizabeth: by whoſe munificence alſo a grammar ſchool was erected and endowed.

This village, ſo diſtinguiſhed in hiſtory, was formerly a conſiderable town, and had a weekly market on Wedneſdays, and three annual fairs. At preſent it conſiſts of one ſtreet, containing only 46 houſes and 307 inhabitants.

This was the birth-place of Richard Plantagenet, duke of Glouceſter, afterwards king Richard III.; in whoſe perſon, Fuller obſerves, "Ajax and Ulyſſes met; poſſeſſing eloquence to talk, and valour to fight." He was deformed in body, and by the generality of hiſtorians he has been repreſented as ſtill more deformed in mind. Had he not waded to the throne through the blood of his nephews, Edward V., and Richard, duke of York, whom he is ſaid to have cauſed ſecretly to be murdered in the Tower; he might have appeared to deſerve it; for his ſhort reign was diſtinguiſhed by the enactment of ſeveral excellent laws, and he was not deficient in perſonal courage. Having met Henry, duke of Richmond, who had aſſembled an army againſt him, in Boſworth field, after performing prodigies of valour, the king there loſt both his crown and his life. See Camden's Britannia, and the Beauties of England and Wales.

FOTIPET, a town of Hindooſtan, in Bednore; 5 miles E.N.E. of Bednore.

FOTOQUE, in the *Japaneſe Theology*, the name of an order of deities; the other order being called Camis. From the latter they obtain the bleſſings of this life, and from the former thoſe which relate to a future life.

FOTUS, in *Medicine*, the ſame as fomentation.

FOU, in *Geography*, a town of China, of the ſecond rank, in the province of Chan-ſi; 420 miles S.W. of Peking. N. lat. 26° 5′. E. long. 108° 44′.

FOU-AN, a town of the kingdom of Corea; 35 miles W.N.W. of Cou-fou.

FOUCAULT, Nicholas-Joseph, in *Biography*, was ſon of a ſecretary to the council of ſtate, and was born at Paris in 1643. He was educated for the French bar, at which he afterwards obtained much celebrity, and paſſed through various offices till he became a maſter of requeſts, and chief of the council of madame, ducheſs of Orleans. At the revocation of the edict of Nantes, he exerciſed ſuch prudence in the diſtrict over which he was the intendant, that much of the miſchief was prevented which that arbitrary meaſure was calculated to produce. So grateful are the people, in almoſt all caſes, for favours done them, that in this inſtance a medal was ſtruck in gratitude for the liberality exhibited by Foucault. At the different places in which he ſuſtained any public office, he encouraged the arts and local eſtabliſhments and improvements calculated to benefit the trade of the country. He was the firſt to ſet on foot the conſtruction of new roads, canals, havens, and bridges; and to ſanction, with all his influence, inſtitutions for the promotion of the uſeful arts and ſciences. His own valuable library and cabinet were ever open to thoſe who were able to uſe them. He added much to the ſtock of antiquarian knowledge, by the diſcovery which he made in

1704, of the ancient town of the Viducaſſians, near Caen, of which he laid a particular account before the "Academy of Inſcriptions." He alſo diſcovered a MS. "De Mortibus Perſecutorum," which is generally attributed to Lactantius. Moreri.

FOU-CHAN, in *Geography*, a town of China, of the third rank, in the province of Chang-tong; 25 miles S.E. of Tang-tcheou.

FOUCHENDGE, or FOUSHENGE, a town of Perſia, in the province of Choraſan, taken and plundered in 1380 by Timur Bey, though ſtrongly fortified, 25 miles N. of Herat. N. lat. 34° 50′ E. long. 76° 29′.

FOUCHER, SIMON, in *Biography*, a writer of ſome celebrity, was born at Dijon in the year 1644, where he was educated, afterwards ordained prieſt, and preſented to an honorary canonry. That he might purſue philoſophical ſtudies, to which he was extremely attached, with more freedom and advantage, he removed to Paris, where he acquired the eſteem and friendſhip of many eminent men of the time; but he formed his moſt intimate connection with thoſe who diſtinguiſhed themſelves as advocates for the revival of the academic philoſophy. In the propagation of their ſyſtem he was extremely zealous, and devoted his pen with conſiderable learning in defence of them. He is mentioned by Baillet in terms of high reſpect, who even denominates him "the reſtorer of the academic philoſophy:" and the editors of the "Menagiana" have aſſerted that Menage thought Foucher and Huet were better acquainted with the different ſects of philoſophers than any of their contemporaries. M. Foucher died at Paris in his fifty-third year, and it was ſuppoſed his intenſe application to ſtudy had a great effect in ſhortening his days. He was author of a variety of "Diſſertations," "Criticiſms," "Letters," &c. which form a collection of ſix volumes: alſo of "A Treatiſe on the Wiſdom of the Ancients," publiſhed in one vol. 12mo., intended to ſhew that the principal maxims of their morality are not contrary to the principles enforced by the Chriſtian code: and "A Letter concerning the Morality of Confucius;" and "A Treatiſe on Hygrometers, or Inſtruments for aſcertaining the dryneſs and humidity of the Air." Moreri.

FOUCHS, JOHANN, JOSEPH, a native of Stiria, a province of Germany, in the circle of Auſtria. He appears as an author in 1707, when he publiſhed at Nuremberg a work entitled "Concentum Muſico-inſtrumentale, in 7 partitas diviſum:" and he alſo compoſed an opera, called Eliza, for the birth-day of the empreſs Elizabeth Chriſtina, which was printed at Amſterdam by Le Cane. Soon after this he was appointed firſt maeſtro di cappella to the emperor; but he is beſt known as a learned writer on muſic by his "Gradus ad Parnaſſum ſive manuductio ad compoſitionem muſicæ regularem, methodo novo, ac certa nondum ante tam exacto ordine in lucem edita," written in Latin, and publiſhed in 1725. It is dedicated to the emperor Charles VI., who defrayed the whole expence of the publication. The work is printed in folio, and divided into two books: the firſt is entirely theoretical, and rather a treatiſe on harmonics than practical counterpoint: we have here all the ratios and proportions of muſical intervals, and the arithmetical, harmonical, and geometrical diviſions of the monochord, which may be found in almoſt all elementary books on muſic during the two laſt centuries.

The ſecond book is in dialogue, between a maſter and ſcholar; in which examples are given in notation of the moſt ſimple plain counterpoint, from two to four parts. Then examples of florid counterpoint, and of ligatures or binding notes. After this, the author treats of fugue in 2, 3, and 4 parts. Then of double counterpoint; and laſtly, of variations, modes of the church, various ſubjects of fugue, of taſte, of the eccleſiaſtical ſtyle, a cappella, of the mixed ſtyle, and of recitative. The doctrine in this work is very orthodox, containing no licences, or any thing to which the fathers of the ſcience would object. The leſſons are almoſt all on canto firmo, after the manner of the Neapolitan ſchool.

In 1742 this excellent work was tranſlated into German by Mizlar, and publiſhed at Leipſic, 4to. with notes. The letter-preſs of this edition is well printed; but the plates are engraved in too ſmall a character, and much crowded and confuſed. In 1761 it was tranſlated into Italian, and publiſhed in folio by Manfredi in Carpi. To this verſion is prefixed a recommendatory letter by the celebrated Piccini, in which, with national partiality, and the ſlippancy of a young man, he compliments the author, Fouchs, by ſaying that he was "a German with an Italian underſtanding." Haydn had not then ſurpaſſed all the Italian compoſers of *inſtrumental muſic* in ſcience and invention; nor had the premature genius of Mozart expanded in marvellous maſterpieces of compoſition, both vocal and inſtrumental. Some detached parts of the "Gradus ad Parnaſſum" were publiſhed in England by Welcher about the year 1770, tranſlated by Hoeck; but the entire work has never appeared in our language. The venerable imperial maeſtro di cappella lived to a great age. Quantz tells us (in his own life, written by himſelf) that in the year 1723, he, with Weis, the famous luteniſt, and Grann, the opera compoſer, went to Prague, where moſt of the great muſicians of Europe were aſſembled by order of the emperor Charles VI. to celebrate the feſtival of his being crowned king of Bohemia. Hiſtory does not furniſh a more glorious event for muſic than this ſolemnity, nor a ſimilar inſtance of ſo great a number of eminent profeſſors, of any one art, being collected together.

Upon this occaſion, there was an opera performed in the open air, by a hundred voices, and by two hundred inſtruments. There was not an indifferent ſinger among the principal performers, all were of the firſt claſs. The male parts were filled by Orſini, Domenico, Careſtini, Gaſſati, Coroſini, and Braun, a German *baritono*; the female, by the two ſiſters, Amberville, one of whom was afterwards married to Peroni, a famous player on the violoncello, and the other to Boroſſini, the ſinger.

The opera was called "La Conſtanza e Fortezza," and compoſed by the famous old Fux, imperial chapel-maſter at Vienna. The muſic, which was in the old church ſtyle, was coarſe and dry; but, at the ſame time, grand, and had a better effect, perhaps, with ſo immenſe a band, and in ſuch an immenſe ſpace, than could have been produced by more delicate compoſitions.

FOUCHUN, in *Geography*, a town of China, of the third rank, in the province of Se-tchuen; 30 miles N.W. of Tche-li-leou.

FOUCQUET, NICHOLAS, marquis of Belleiſle, in *Biography*, ſon of Francis Foucquet, viſcount de Vaux, and a counſellor of ſtate, was born in 1615, and brought forwards very early in the departments of law. He was created procureur-general of the parliament of Paris at the early age of thirty-five. By cardinal Mazarin he was made ſuperintendant of the finances, and participated largely in the public plunder, which was carried to an enormous height during the cardinal's adminiſtration. Foucquet is ſaid to have ſpent more than half a million ſterling upon his ſeat of Vaux, where he gave the moſt magnificent entertainments. He was a liberal patron of men of letters, and ac-

quired many friends among them who did not desert him after his disgrace. Foucquet offended the king by attempting to gain the heart of mad. de la Valiere, and he was arrested at Nantes in September 1661. He was committed to prison, and a commission was appointed to try him on various charges, but he defended himself so well, and repelled the attacks of the lawyers so dexterously, that it was full three years before the decision and sentence against him could be pronounced. He was condemned to banishment, which was exchanged for perpetual imprisonment in the citadel of Pignoral. Of the multitudes who had been benefited by his liberality, scarcely any remained faithful to him in his adversity, except some of his literary pensioners. Among these were mademoiselle de Scuderi, La Fontaine, and Pelisson, by the last of whom he was defended in several eloquent memoirs. He bore his change of fortune with firmness, and employed his solitary hours in the composition of various works of piety. He died March 23, 1680, aged 65 years. Moreri.

FOVEA Cordis, the pit of the heart, or rather of the stomach, called also *scrobiculus cordis*.

FOUESNANT, in *Geography*, a town of France, in the department of Finisterre, and chief place of a canton in the district of Quimper; 7 miles S. of Quimper. The town contains 1858, and the canton 5535 inhabitants, on a territory of 155 kiliometres, in 6 communes.

FOU-FONG, a town of China, of the third rank, in the province of Quang-tong; 22 miles E.S.E. of Fong-tsiang.

FOUG, a town of France, in the department of the Meurte; 4 miles W. of Toul.

FOUGATE, Fougasse, or *Fougades*, in the *Art of War*, a little mine, in manner of a well, seldom exceeding ten feet in width, and twelve in depth: dug under some work or post that is likely to be lost; and charged with barrels or sacks of gun-powder, covered with earth. It is frequently placed before the weakest parts of a fortification, as the saliant angles and faces, not defended by a cross-fire, and is set on fire like other mines, with a fauciſſe.

The word is French. M. Huet derives it from *focato*, or *focus, fire*.

FOUGERAI, in *Geography*, a town of France, in the department of the Ille and Vilaine, and chief place of a canton in the district of Rédon; 13 miles E. of Rédon. The town contains 4193, and the canton 4802 inhabitants, on a territory of 120 kiliometres, in 2 communes.

FOUGERES, a town of France, and principal place of a district, in the department of the Ille and Vilaine, containing in its two divisions about 7297 inhabitants, whose chief trade is in leather. The first division contains 3648, and its canton 12,665 inhabitants, on an extent of 165 kiliometres, in 10 communes; and the second division contains 3649, and its canton 14,063 inhabitants, on a territory of 177½ kiliometres, in 9 communes. It is seated on the rivulet Nanson, that falls into the Coesnon, 8 leagues N.E. of Rennes, and 9 S.S.E. of Avranches. It has an abbey and old castle, and was formerly reputed a place of some strength; and is still noted for its four annual fairs.

FOUGHT, in *Biograph.*, a native of Lapland, who, nearly fifty years ago, came to London, and obtained a patent for the sole printing of music, with letter-press types of his own founding, which were very neat, and the first that were used in London. He opened a shop in St. Martin's lane, and published several sets of lessons and sonatas; but by a combination of music-sellers in London, who copied his publications on stamped plates, and undersold him, he was driven out of the kingdom.

Musical types are now very common: but by being long accustomed to stamped notes in pewter plates, the public eye is not pleased with them. The best use to which they are now put is in printing books on the subject of music, where they save the trouble of working small plates of single passages, and examples in notation, into the letter-press.

FOUIN, in *Geography*, a country of Africa, N. of Ardra.

FOU-KEOU, a town of China, of the third rank, in the province of Honan; 30 miles E.N.E. of Hiu.

FOU-KIANG, a town of China, of the third rank, in the province of Quang-tong; 20 miles W.N.W. of Tsin.

FOU-KO, a town of China, of the third rank, in the province of Quang-tong; 65 miles N.N.E. of Kia.

FOUL, in the *Sea Language*, is used when a ship has been long untrimmed, so that grass, weeds, periwinkles, barnacles, or the like, stick or grow to her sides under water. In this state she is said to be foul.

A ship is said to make *foul water*, when, being under sail, she comes into such shoal, or low water, that though her keel doth not touch the ground, yet she comes so near it, that the motion of the water under her raises the mud from the bottom, and so fouls the water.

Foul is also a sea term, importing the running of one ship against another. This happens sometimes by the ungovernable violence of the wind, and sometimes by the carelessness of the people on board; and sometimes happens to ships of the same convoy; sometimes to such as meet accidentally; and sometimes to such as are in port, by means of others coming in. The damages occasioned by running foul, are of the nature of those in which both parties must bear a part; they are usually made half to fall upon the sufferer, and half upon the vessel which did the injury; but in cases where it is evidently the fault of the master of the vessel, he alone is to bear the damage.

Foul *Ground*, of a road, bay, sea-coast, or harbour, signifies that which is rocky, or abounding with shallows, or otherwise dangerous.

Foul *Hause*, denotes that the cables are turned round each other, by the winding or turning about of a ship while she rides at anchor.

Foul *Wind*, expresses that which is unfavourable, or contrary to the course of the ship, in opposition to large or fair.

Foul *Feeding*, in the *Manege*, denotes a voracious appetite, to which some horses are subject, which, though not properly a disease, is the cause of various maladies. It is commonly the effect of some latent distemper, and frequently occasioned by worms irritating the intestines.

Foul feeders will leave their hay to eat their litter, even when it is soaked with their dung and urine, and discover a vitiated as well as a voracious appetite. The best remedy in cases of this kind is to begin with purging, and to dissolve chalk in their water, and afterwards to give them good exercise. The following draught will also serve to blunt their appetites; take a large handful of the roots of marshmallows; cummin seeds, and fenugreek seeds, of each an ounce; liquorice roots sliced, half an ounce; boil them

in three pints of water, till the roots are ſoft and ſlimy; then pour off the decoction, and diſſolve in it an ounce of gum arabic, and add four ounces of linſeed oil. Let the horſe have four handfuls of this mixture every morning faſting, till his appetite abates. Care ſhould alſo be taken to keep the ſtalls as clean as poſſible. Gibſon's Farriery.

Foul *Bay*, in *Geography*, a bay on the N. E. coaſt of the iſland of Barbadoes.—Alſo, a bay on the S. coaſt, near the eaſtern extremity of the iſland of Jamaica. N. lat. 17° 54′. W. long. 75° 56′.—Alſo, a bay on the S. coaſt of the iſland of Java. S. lat. 8° 38′. E. long. 113° 45′.

Foul *Iſland*, a ſmall iſland in the Chineſe ſea, near the coaſt of Cochinchina. N. lat. 11° 37′. E. long. 108° 53′. —Alſo, a ſmall iſland in the bay of Bengal, near the coaſt of Ava. N. lat. 18° 12′. E. long. 94° 11′.

Foul *Iſlands*, a cluſter of ſmall iſlands in the Eaſt Indian ſea, near the N. coaſt of the iſland of Flores. S. lat. 8° 9′. E. long. 121° 22′.

Foul *Point*, a cape on the E. coaſt of Madagaſcar. S. lat. 17° 40′. E. long. 49° 50′. This cape is called by the natives "Voolou-voolou;" and is the place moſt frequented by Europeans. The entrance of the port lies in a northern direction; the breadth of the paſſage is about 50 fathoms, and it is nearly of the ſame depth; it will hold 10 large ſhips, which may be moored all in a line. The riding is ſafe, but between the months of October and June the entrance is ſometimes obſtructed and ſhut up by a bank of quickſand, which diſappears as ſoon as the S. E. winds ſucceed the northern gales and calms. The harbour is formed by coral rocks, which run N.N.E.; and upon theſe are various ſea-plants, moſſes, black corals, madrepores, ſtar-wort, ſea-inſects, and ſhells, which, by the multiplicity of their form, and the brilliancy of their colours, ſerve to decorate the cabinets of the curious. The mouth of the river preſents large beds of delicate and palatable oyſters of peculiar configuration. Ships may be ſupplied with all ſorts of proviſions, which are various and abundant. The villages inhabited by the tribe of "Voolou-voolou" are not very conſiderable; they are fortified with paliſades; moſt of them are erected upon the declivity of hills, and they are delightfully ſhaded by a great number of uſeful trees. The diſtrict of "Voolou-voolou" contains excellent paſture grounds, and a great number of cattle. The river Onglebey, which ſuddenly loſes itſelf in the ſands at the diſtance of 400 fathoms from its mouth, abounds with fiſh and aquatic birds; and canoes row up to a diſtance of more than 20 leagues. It is, however, infeſted with a great number of monſtrous crocodiles, which find a ſecure retreat among the trees that cover its banks.

Foul *Sound*, a ſtrait or paſſage on the weſt of Ireland. It is between Iniſmain and Inniſhere, two of the ſouth iſles of Arran, which lie at the entrance of Galway bay. Beſides a great rock, there is an extenſive ſhoal, which renders this not a good paſſage.

FOULA, one of the Shetland iſlands, which is narrow, high, and rocky, about three miles in length, and affords ſome paſture. Its inhabitants, in number about 150, are almoſt in a ſtate of nature. It has one indifferent landing place. On the W. coaſt are hideous precipices. It is upwards of ſeven leagues W.S.W. from the broadeſt part of the Main-land. Some writers have ſuppoſed this iſland to be the "Ultima Thule" of Tacitus and the ancients. N. lat. 60° 6′. W. long. 2° 17′.

FOULAH, Fouli, or Pholey, a country of Africa, bordering on the river Senegal, and extending about 480 miles from eaſt to weſt; the boundaries from north to ſouth being unknown. This country is populous, and the ſoil fertile, and capable of furniſhing an advantageous commerce, if the inhabitants were induſtrious. Their complexion is generally tawny, though many of them are black; and it is ſuppoſed that they derive their mixed colour, between the true olive and black, from their alliances with the Moors. Although they are remiſs in availing themſelves of the advantages of commerce, they are diligent as farmers and graziers; and raiſe millet, rice, tobacco, cotton, peaſe, roots, and fruits in abundance; nor are they leſs expert in rearing cattle, which is the ſtaple of their traffic with neighbouring countries. Their cattle conſtitute their chief wealth, and accordingly they roam, purſuing a kind of wandering life, from field to field, and from country to country, with large droves of cows, ſheep, goats, and horſes; removing, as the wet and dry ſeaſons require, from the low to the high lands, and continuing no longer in one place than the paſture for their cattle will allow. The inconvenience and labour of this roving life are augmented by the defence they are obliged to provide againſt the depredations of the fierce animals with which the country abounds; as they are moleſted by lions, tigers, and elephants from the land, and crocodiles from the rivers. At night they collect their herds and flocks within a circle of huts and tents in which they live, and where they light fires in order to deter theſe animals from approaching them. The king of the country, called Siratic, though commonly deſtitute of the badges of majeſty, poſſeſſes great authority among his ſubjects, and is as much reſpected by his neighbours as any one on the coaſt. The crown deſcends, not from father to ſon, but from brother to brother, and nephew to nephew. The Foulahs are celebrated by travellers as a people extremely hoſpitable; all perſons, whatever be the country to which they belong, being freely admitted into their huts, and treated with the beſt accommodation they can afford; nor is their humanity leſs worthy of notice than their hoſpitality, for as ſoon as any one of them has the misfortune to fall into ſlavery, all the reſt join their ſtock to redeem him. Their arms conſiſt of bows and arrows, lances, ſwords, daggers, and occaſionally a kind of ſmall fuſee; all which they uſe with a ſingular dexterity, eſpecially in hunting, which is a diverſion to which they are much attached. The game they purſue conſiſts of elephants, lions, tigers, and the fierceſt animals. The teeth of elephants, the ſkins of lions, leopards, and tigers are ſold by them, and the fleſh is dried and ſmoked for uſe and for winter ſtore. The elephants are ſo numerous, that they appear in droves of 200 together, plucking up the ſmall trees, and deſtroying whole fields of corn; ſo that they have recourſe to hunting, not merely as a paſtime, but as the means of ſelf-preſervation.

FOULDAGE. See Faldage.

FOULNESS, in *Geography*, an iſland with a church village, ſeparated by a narrow channel, or arm of the German ocean, from the main land of England, and S.E. part of the county of Eſſex, about 12 miles in circumference, 6 miles E. of Rochford.

Foulness *of Colours*, in *Painting*, is uſed in oppoſition to brightneſs, and denotes a defect of purity. It is ſometimes called *breaking* the colour.

FOULON, or Foullon, John Erard, in *Biography*, was born at Liege, of an ancient and diſtinguiſhed family, in the year 1609: and in 1625 he entered the order of the Jeſuits. He had an excellent underſtanding, and capable of graſping every branch of ſcience. His tutors obſerving that his qualifications were peculiarly adapted to the duties of a preacher, took care to inſtruct him in the requiſites for undertaking the office, and he became celebrated for his

his public ſervices for more than thirty years. He was ſucceſſively appointed rector of the colleges at Huy and Tournay, and died in the latter city in 1668; his death was occaſioned by a peſtilential diſorder which he took by attending on the ſick and the dying. He is known as an author by many theological pieces; by "Commentarii Hiſtorici et Morales ad libros I. and II. Machabæorum, additis liberioribus Excurſibus," in two vols. folio. Alſo by "Hiſtoria Leodienſis, per Epiſcoporum et Principum Seriem digeſta ab origine populi uſque ad Ferdinandi Bavari Tempora," &c. in 3 vols. folio. This work, though not very ably executed, is ſaid to throw much light on the hiſtory of the Low Countries. Moreri.

FOULOU-SOUSOU, in *Geography*, a town of Chineſe Tartary, on the Saghalien; 9 miles N. W. of Telden.

FOULWEATHER, Cape, a cape on the W. coaſt of North America. N. lat. 44° 42'. W. long. 124° 7'.

FOULWIND, Cape, a cape on the N. W. coaſt of Tavai Pœnammoo. S. lat. 41° 55'. W. long. 187° 51'.

FOUMART, a name uſed in ſame parts of England for the pole-cat. See Mustela *Putorius*.

FOU-MING, in *Geography*, a town of China, of the third rank, in the province of Yun-nan; 15 miles N. N. W. of Yun-nan.

FOUNDATION, in *Architecture*, denotes the trenches or excavations dug in the earth by taking away the looſe or ſoft ground, and reducing it to an uniform texture and firm bottom ſo as to reſt an edifice or building with ſecurity, and to prevent fractures after erection.

The ſpecies of ground on which a building may be conſtructed are gravel, ſand, and clay. Gravel is an excellent dry bottom where there are no ſprings. Sand is alſo a very good bottom for houſe-building; but care ſhould be taken to make the foundation ſufficiently deep, and not to make any excavation near it, nor below the level of the bottom, particularly after the erection of the edifice; as ſand partakes in ſome degree of the property of water, a very ſmall force being ſufficient to diſplace the particles, and make them deſcend to the loweſt place; its own gravity is even ſufficient for this purpoſe. Sand is altogether unfit for water-works, without other preparations. Almoſt the whole of the city of Glaſgow is built upon ſand; moſt of the houſes in the principal ſtreet are four ſtories in height, and many of them five. Clay is a firm bed for building, but it is apt to throw damps upwards into the wall. Rock is alſo an excellent bed for the foundation of a building, when it can be eaſily obtained, either by being on the ſurface, or by digging to a depth, ſo as not to occaſion a very conſiderable outlay. It will frequently be a conſiderable ſaving in the conſtruction of the building.

There are many ſituations, however, on which there are occaſions to erect edifices where neither rock nor ground can be found that may be depended on. In order to aſcertain the degree of hardneſs, a lever may be ſo conſtructed as to be moveable round a pin at one end, firmly fixed to an upright ſtandard, and graduated from the centre of motion in the manner of a ſteel-yard, and another ſtandard or upright piece, with a flat bottom fixed at a given diſtance from the fulcrum, with a moveable joint where it connects with the horizontal lever; then a conſtant weight being appended to the arm, and ſlid to and fro until the upright piece with the flat bottom be preſſed into the ground, the diviſion on which the weight falls will ſhew the comparative degree of denſity. The depth to which a foundation ought to be dug might be aſcertained by boring, or by an iron crow.

Palladio ſays that the foundation ought to be one-ſixth of the height of the edifice; but this aſſertion is vague, as a building might reſt as firmly on the ſurface of the ground, as if excavated to any depth, provided that the ſoil is alike ſufficient in both caſes.

If nothing but mud can be obtained, then an artificial bottom muſt be conſtructed of piles and planking. The proportion of the piles may be ſuch that their thickneſs may be one-twelfth part of their length. Their diſtances, and the depth to which they are driven, will depend on the nature of the ſoil; they are ſometimes placed ſo rank as to leave no interſtice; their diſtance ought never to exceed the breadth of the ſtones which are to be laid on them. Tranſverſe pieces of wood, called ſleepers, are faſtened to the tops of the piles, which are levelled for the purpoſe, and then planked over.

In ſome caſes, where the ſoil is not very bad, two or more horizontal rows of timbers are introduced under the ſtone-work, and well faſtened at the angles. This is a good precaution where the maſonry is to be carried up upon narrow piers. Should the ſoil be found firm, except in a few places, which might require to be dug to an immenſe depth, throw arches over the infirm places, obſerving to make the abutments ſufficient.

Forced earth is unfit for a foundation for a conſiderable time.

Foundation is alſo uſed to expreſs the bottom of a wall, conſtructed of greater breadth than the ſuperincumbent parts, in order to reſt the edifice firmly and uniformly, and prevent ſettlements by its greater breadth occaſioning a greater difficulty in penetrating the ground.

The foundation generally conſiſts of one, two, or more courſes, the ſuperior always leſs in breadth than the inferior, and the ſuperior greater than the breadth of the inſiſting wall, with the middle of the courſes, and the middle of the wall ſo regulated as to fall vertically over each other.

The different breadths, from the bottom of the wall to the bed of the building, exceed each other equally in ſucceſſion, and conſequently the projections are alike on both ſides, and to each other. Each courſe which forms the foundation is called a footing, and each projection is called an offset or ſet-off.

The breadth of the foundation, it is evident, muſt always be proportioned to the weight of the ſuperſtructure, and the ſoftneſs of the ground on which it is laid. If the texture of the ground is uniform, and if a wall only is to be erected, the breadth of the foundation will be as the area of the vertical ſection of the wall taken at right angles to the face. Therefore, if the wall is equally thick, the breadth of the foundation will be in the compound ratio of the breadth and height of the inſiſting wall. Thus for example, let a wall 40 feet high and two feet thick have a ſufficient foundation of three feet in thickneſs, what muſt be the breadth of the foundation of a wall 50 feet in height, and $2\frac{1}{4}$ thick upon the like bed of earth; then $2 \times 40 : 2\frac{1}{2} \times 50 :: 3 : 4\frac{11}{16}$ = the anſwer. Again, let us ſuppoſe the bed of the building to vary in texture, and let us ſuppoſe that the former is three degrees of ſoftneſs, and the latter five; in this caſe the breadth of the bottom footing will be in the compound ratio of the height of the wall, its breadth and the degree of ſoftneſs of the ground, the reſt of the data being as in the former example; then $2 \times 40 \times 3 : 2\frac{1}{2} \times 50 \times 5 :: 3 : 7\frac{195}{200}$ = the anſwer. Though a wall is here only ſpoken of, yet the ſame operation will apply to the maſs of the whole fabric, provided that the weight can be aſcertained.

The reader may think the circumſtance rather ſingular, that the foundation of a wall may be thinner than that of the

the ſuperſtructure, but that this may often happen may be eaſily ſhewn, ſince it is the weight only that is in queſtion, and not the magnitude; thus ſuppoſe that a foundation, three feet thick, is ſufficient for a wall two feet thick, and 40 feet high; the very ſame thickneſs of foundation is equally capable of ſupporting a wall four feet thick, and 20 feet high, becauſe the inſiſting weights are alike in both caſes. Therefore the above calculation, leaving out the degree of ſoftneſs of ground, will give the breadth of the foundation of the required wall, equal to the breadth of the inſiſting wall itſelf, when the height of the required wall happens to be equal to the height of the required wall, multiplied by its breadth, and divided by its thickneſs; ſuch would be the caſe in a wall of $26\frac{2}{3}$ feet in height; for $\frac{2 \times 40}{3} = 26\frac{2}{3}$. It is evident, if the height of the wall be leſs than $26\frac{2}{3}$ feet, that the breadth of the foundation will be leſs than that of the wall itſelf. Although this is the caſe with reſpect to the rule, of the principle of which there can be no doubt; yet if the wall itſelf is conſtructed according to reaſon, that is, to proportionate its thickneſs to its height, the ſame thing will not obtain; it is only a prepoſterous thickneſs that occaſions the ſingularity of the circumſtance. The rule only gives the perpendicular preſſure, and ſuppoſe the thickneſs were out of all proportion to the height, it would not be adviſable in any caſe to make the footing leſs than the inſiſting part of the wall, as it would not be ſo able to reſiſt the preſſure of heavy winds.

Other obſervations will be found under the article WALL.

FOUNDATION is alſo uſed figuratively for the eſtabliſhment of a city, empire, or the like.

The Romans reckoned their years from the foundation of Rome, *ab urbe condita*; which we ſometimes expreſs by *ab U. C.* Chronologers make 745 years from the Iſraelites paſſing out of Egypt, to the foundation of Rome.

FOUNDATION alſo denotes a donation, or legacy, either in money, or lands, for the maintenance and ſupport of ſome community, hoſpital, ſchool, lecture, or other work of piety.

Among the order of Auguſtines, there is a foundation for the marrying of poor maids; and another for the furniſhing of truſſes to poor people who have ruptures, or hernias.

The founding and building of a college or hoſpital, is called *foundatio*, *quaſi fundatio*, or *fundamenti locatio*. Co. Lit. 10. The king only can found a college; but there may be a college in reputation founded by others. Dyer, 267. See FOUNDER.

FOUNDAY, in *Metallurgy*, a term uſed by the workers at the iron mines, in many counties of England, for the ſpace of ſix days, in which time they contrive to make a determinate quantity of iron, ſo that they count their work by theſe foundays or weeks.

FOUNDER, he who lays a foundation, or who founds and endows a church, ſchool, religious houſe, or other work of charity and piety.

The founders of churches may preſerve to themſelves the right of patronage, or preſentation to the living. The founder of all corporations, in the ſtricteſt and original ſenſe, is the king alone, for he only can incorporate a ſociety; and in civil incorporations, ſuch as mayor and commonalty, &c. where there are no poſſeſſions or endowments given to the body, there is no other founder but the king; but in eleemoſynary foundations, ſuch as colleges and hoſpitals, where there is an endowment of lands, the law diſtinguiſhes, and makes two ſpecies of foundation; the one *fundatio incipiens*, or the incorporation, in which ſenſe the king is the general founder of all colleges and hoſpitals; the other *fundatio perficiens*, or the dotation of it; in which ſenſe the firſt gift of the revenues is the foundation, and he who gives them is in law the founder; and it is in this laſt ſenſe that we generally call a man the founder of a college or hoſpital (10 Rep. 33.); but if the king and a private perſon join in endowing an eleemoſynary foundation, the king alone ſhall be the founder of it. If it cannot appear by inquiſition, who was the perſon that founded a church or college, it ſhall be intended it was the king; who has power to found a new church, &c. Moor 282.

FOUNDER is alſo an artiſt that melts or caſts metals into various forms, for divers uſes; as guns, bells, ſtatues, bombs, types or printing characters; and other ſmall works, as candleſticks, buckles, &c.

The word in this ſenſe is formed of the French *fondre*, to melt or fuſe. In the Roman law they are called *ſtatuarii*.

From the different productions, or works of the founders, they are differently denominated, as founders of ſmall works; bell-founders; gun-founders; letter-founders; figure caſters, &c. What belongs to each, ſee under FOUNDERY.

FOUNDER, in *Glaſs-making*, is a term appropriated to the green-glaſs houſes, and is the perſon there, who in the ſame office in the white-glaſs-making is called the *conciator*.

FOUNDER's *Furnace*. See FURNACE.

FOUNDERS, *Moulds of*. See MOULDS.

FOUNDERS's *Preſs*. See PRESS.

FOUNDER, in the *Sea Language*. A ſhip is ſaid to founder at ſea, when by an extraordinary leak, or a great ſea breaking in upon her, ſhe is ſo filled with water, that ſhe cannot be freed of it, nor is able to ſwim under it, but ſinks with the weight thereof.

FOUNDERING, in the *Manege*, a diſorder in horſes, whereof there are two kinds, *viz.* in the feet, and in the cheſt.

FOUNDERING *in the Feet*, ariſes from hard riding, ſevere labour, great heats, ſudden colds, &c. which inflame the blood, and, as the farriers term it, melt the greaſe, and make it deſcend downward to the feet, and there ſettle; which cauſes ſuch a numbneſs and pricking in the hoof, that the horſe has no ſenſe of feeling in it, being hardly able to ſtand; or, when he does, ſhaking and trembling as if he had an ague.

A horſe may likewiſe be foundered by wearing ſtraight ſhoes, and by travelling upon hard ground.

It may be known when he is foundered on his fore-feet, and not his hind-feet, by his treading firmly on his hind-feet, and ſparing the other; or his going crouching or crippling on his buttocks.

Sometimes, though rarely, he is foundered in his hind feet, and not his fore; which is known by his ſeeming weak behind; and reſting, as much as poſſible, on the fore-feet.

The general methods of curing this diſtemper are, firſt by paring all the horſe's ſoles ſo thin, that the quick may be ſeen; then bleeding him well at the toes; ſtopping the vein with tallow and reſin; and then having tacked hollow ſhoes on his feet, ſtopping them with bran, tar, and tallow, as boiling hot as may be; which is to be renewed once in two days, for a week together; after which he is to have good exerciſe.

Or, after he is pared thin, and let blood at the toes, his feet are to be ſtopped with cows' dung, kitchen-ſee, tar, and

and foot, boiled together, and poured, boiling hot, into them.

FOUNDERING *in the cheſt or body*, uſually befals a horſe by eating too much provender ſuddenly, when too hot; as alſo by drinking too much upon travelling, when he is hot, and riding him after it; and it denotes a chronic inflammation of thoſe parts in a horſe which are ſituated immediately external to the pleura. Accordingly this diſeaſe, conſiſting in an inflammation of the intercoſtal muſcles, which compoſe the fleſhy parts between the ribs, is called by Gibſon "external pleuriſy." It is known by a ſtiffneſs of the body, ſhoulders, and fore-legs, ſometimes attended with a ſhort dry cough in the beginning, and a ſhrinking when a horſe happens to be handled in thoſe parts.

While recent, it is to be treated as a *pleuriſy* (which ſee), and may be then prevented by bleeding, antimonials, hot-waſhes, and pectoral drinks with nitre. Gibſon alſo adviſes purging, in order to prevent the inflammation extending to the muſcles of the breaſt and ſhoulders, which uſually happens. He objects, however, without ſufficient reaſon, to outward applications; except when any ſwelling appears, with any tendency to break; in which caſe he adviſes to haſten ſuppuration by the common methods. This, it ſhould be recollected, is a chronic diſeaſe; and, like rheumatiſm, admits of bliſtering, ſetons, and the free uſe of external ſtimulants to the cheſt.

Mr. Clark obſerves, that the diſtinction of this diſorder into two kinds is not warranted by any good reaſon; and accordingly he gives the following account of the ſymptoms that occur in the different ſtages of this diſorder, together with the circumſtances that have appeared on diſſecting horſes that have died of it. The founder, he ſays, always proceeds from cold too ſuddenly applied to the body; and whether it be from a current of cold air, or from plunging the body into cold water, when over-heated, the effects are the ſame. The ſymptoms at firſt are theſe; when the horſe begins to cool, he appears very ſtiff and feeble in his fore-quarters, and, when forced to move forwards, he collects his body, as it were, into a heap, and brings his hind feet as far forward under his body as he poſſibly can, in order to remove the preſſure of the weight of his body from the fore-legs and feet: at the ſame time, he ſets his fore-feet to the ground with ſeeming great pain: his fore parts are extremely hot, the legs conſiderably ſwelled, and evidently painful to the animal when touched; a violent fever ſucceeds, which, if not properly treated, terminates in death, or, if the horſe ſurvives the ſhock, in incurable lameneſs. On diſſecting the legs and ſhoulders of thoſe horſes that have died, after an illneſs of a few days, of this diſorder, the blood is generally found extravaſated, the parts having a black appearance, eſpecially between the ſkin and the fleſh. The ſame blackneſs is likewiſe obſerved in the cellular membrane, between the interſtices of the muſcles and tendons; the texture of the veſſels is alſo deſtroyed, and their ſubſtance mortified. Mr. Clark ſtates, that plunging horſes into cold water, when they are over-heated, tends to weaken them; and he alleges this proof of it, communicated by a ſportſman well acquainted with horſes, that, in hunting, when horſes are over-heated, and obliged to go through deep water, eſpecially if they are obliged to ſwim, they ſoon after become faint, jaded, and tired. This is a fact well worthy of notice.

FOUNDERY, or FOUNDRY, the art of melting and caſting all ſorts of metals; particularly braſs, iron, bell-metal, &c. The word is alſo uſed for a place, or work-houſe, furniſhed with furnaces, or forges for this purpoſe. A foundery, in the iron manufacture, is almoſt always connected with the blaſt furnace where the metal is ſmelted from the ore; from this circumſtance we ſo frequently find the ſmelting furnace and its appendages termed a foundery, though in reality the word ſhould be confined to the building for caſting up the metal manufactured at the former; it is there termed the caſting-houſe, (ſee the article BLAST *furnace.*) The caſting-houſe, or foundery, is ſituated on one of the ſides of the furnace, the ſurface of its ground about two feet below the level of the bottom of the hearth of the furnace. The floor of the foundery ſhould be about ten feet deep, with the loamy ſand, as mentioned in the article CASTING, of which the moulds are formed; this is for the convenience of burying large moulds beneath the ſurface, ſo that the metal may be conveyed into them by ſmall channels or ſoughs hollowed out in the ſand. A moſt important circumſtance to be attended to is, that the foundery is well drained of water, as any dampneſs in moulds would produce the fatal exploſions by the ſudden expanſion of the ſteam. When the hot metal is introduced into a wet mould, many ſerious accidents have ariſen from a want of attention to this very neceſſary circumſtance; in ſuch a caſe, the moulds are burſt aſunder, the ground torn up, and the fluid metal thrown in every direction amongſt the workmen, occaſioning as much damage from its projectile force, as from its great heat, to thoſe on whom it falls. Every foundery is furniſhed with a crane, or ſometimes two, placed ſo as to command the whole for the convenience of taking up and removing heavy pieces of caſting from any part of the place. At Buttlerby iron works, Derbyſhire, we noticed an excellent crane for a foundery; the pulley from which the goods are ſuſpended is not fixed to the end of the gib, but ſlided upon it by means of a rack moved by a pinion, which can be turned with eaſe by the workman, ſo as to give the crane any range within its reach; and it can take up weights as well at ſix feet from the centre as at ten, which renders it a moſt uſeful implement in ſuch a ſituation, where the crane is frequently uſed to lower down moulds upon one another in a perpendicular direction, as mentioned in the article CASTING.

The moſt complete founderies are provided with two or more air or reverberating furnaces, (ſee FURNACE,) in which the metal is melted occaſionally, either when the metal contained in the blaſt furnace is not ſufficient, or when the quality of the metal made there is not proper for caſting, owing to its containing too much or too little carbon, and it requires mixing with better or worſe metal to render it fit for the purpoſe.

They have alſo two or three cupolas, or ſmall blaſt furnaces, to melt ſmall quantities of metal, particularly when it is wanted in haſte, as the reverberatories are much longer in filling their charge of metal, though it is in greater quantity; but the latter does not ſo well anſwer the purpoſes of the iron founder, becauſe it would require ſo great a ſtock of flaſks and implements to make moulds to receive a large quantity of metal; for this reaſon they ſeldom employ the reverberatory but for large articles which require the whole charge; ſmaller goods are caſt from the cupolas.

In the foundery of a blaſt furnace, a pit is ſunk at a convenient diſtance from the furnace, and the moulds for pipes, and other ſimilar articles, are placed vertically in it, within reach of the crane: the metal is conveyed by gutters or ſoughs from the furnace, and a ſmall iron trough, filled with ſand, leads the fluid metal into each of the moulds; theſe are a conſiderable improvement on the old method of burying them in the ſand, in the ſaving of labour and time; the flaſks are made of caſt iron for the purpoſe.

It has of late become a practice at our moſt extenſive foun-

founderies, to ſubſtitute ſand for loam caſtings in many caſes where a great number of articles of one kind are to be caſt, ſo that the expence of the flaſks is not an object of importance; where the articles are intricate, the ſand is wetted ſo much to render it ſufficiently adheſive, that it is neceſſary to dry the moulds to avoid the danger of an exploſion: for this purpoſe large ſtoves are uſed, and carriages adapted, on which to convey a great number of moulds into the ſtove at once, and when ſufficiently dry, which generally happens in about half an hour, they are withdrawn, and a new ſet placed on the carriage.

A foundery is generally provided with a boring-mill for forming the internal ſurface of the cylinders caſt for ſteam-engines, &c. (ſee CYLINDER *boring*), and the ſame machinery turns large lathes, for turning heavy mill axes, piſtons, rollers for ſugar-mills, and laminating rollers; the ſame mill gives motion to all theſe, and alſo blows the cupolas, though at a blaſt-furnace theſe are ſupplied by a ſmall pipe from the great blowing-engine for the furnace.

FOUNDERY *of ſmall works, or the manner of caſting in ſand.*—The ſand uſed by the founders, in caſting braſs, &c. is yellowiſh, and pretty ſoft; but, after it has been uſed, it becomes quite black, becauſe of the charcoal-duſt uſed in the moulds. Every time they would uſe this ſand, they work and tew it, ſeveral times over, on a board about a foot ſquare, placed over a kind of trunk, or box, into which it may fall from off the board. This tewing is performed with a roller, or cylinder, about two feet long, and two inches in diameter; and a kind of knife, made of the blade of a ſword: with theſe two inſtruments they alternately roll and cut the ſand; and, at length, turn it down into the box or trough underneath.

Then, taking a wooden board, or table, of a length and breadth proportional to the quantity of things to be caſt; round this they put a frame or ledge; and thus make a ſort of mould. This mould they fill with the ſand before prepared, and moderately moiſtened: which done, they take wooden, or metalline models, or patterns of the things intended to be caſt: apply them on the mould, and preſs them down in the ſand, ſo as to leave their form indented; along the middle of the mould is laid half a little cylinder of braſs, which is to be the maſter-jet, or canal for running the metal; being ſo diſpoſed, as to touch the ledge on one ſide, and only to reach to the laſt pattern on the other: from this are placed ſeveral leſſer jets or branches, reaching to each pattern, whereby the metal is conveyed through the whole frame.

This firſt frame being thus finiſhed, they turn it upſide down, to take out the pattern from the ſand; in order to which, they firſt looſen them a little all round, with a ſmall cutting inſtrument.

After the ſame manner they proceed to work the counterpart, or other half of the mould, with the ſame patterns, in a frame exactly like the former; excepting that it has pins, which, entering holes correſponding thereto in the other, make, when the two are joined together, the two cavities of the pattern fall exactly on each other.

The frame, being thus moulded, is carried to the founder, or melter; who, after enlarging the principal jet, or canal, of the counter-part, with a kind of knife, adding the croſs jets, or canals, to the ſeveral patterns in both, and ſprinkling them over with mill-duſt, ſets them to dry in an oven.

When both parts of the mould are ſufficiently dried, they join them together, by means of the pins; and to prevent their ſtarting, or ſlipping aſide, by the force of the metal, which is to come in flaming hot, through a hole contrived at the maſter-jet, they lock them in a kind of preſs, either with ſcrews; or if the mould be too big for this, with wedges. The moulds, thus put in the preſs, are ranged near the furnace, to be in readineſs to receive the metal as it comes out of the crucible.

While the moulds are thus preparing, the metal is put in fuſion in an earthen crucible, about ten inches high, and four in diameter.

The furnace wherein the fuſion is made is much like the ſmith's forge; having, like that, a chimney, to carry off the ſmoke; a pair of bellows to blow up the fire; and a hearth where the fire is made, and the crucible placed. It is the uſe of this hearth, that chiefly diſtinguiſhes the furnace from the forge.

In the middle thereof is a ſquare cavity, ten or twelve inches wide, which goes to the very bottom: it is divided into two, by an iron grate: the upper partition ſerves to hold the crucible, and the fuel, and the lower to receive the aſhes.

When the fuel, which is to be of dry wood, is pretty well lighted, they put the crucible full of metal in the middle, and cover it with an earthen lid; and, to increaſe the force of the fire, beſides blowing it up with the bellows, they lay a tile over part of the aperture or cavity of the furnace.

The metal firſt put in being brought to a fuſion, they fill the crucible with pieces of braſs beaten in a mortar; to put them in they make uſe of a kind of iron ladle, with a long ſhank at the end thereof, formed into a kind of hollow cylinder, out of which the piece is dropped.

Nothing now remains, but for the founder to take the crucible out of the fire, and carry it in a pair of iron tongs (whoſe feet are bent, the better to embrace the top of the crucible) to the mould; into which he pours the melted metal, through the hole anſwering to the maſter-jet of each mould.

Thus he goes ſucceſſively, from one to another, till his crucible is emptied, or there is not matter enough left for another mould.

Then caſting cold water on the moulds, they take the frames out of the preſſes, and the caſt works out of the ſand: which afterwards they work again, for another caſting. Laſtly, they cut off the jets, or caſts, and ſell or deliver the work to thoſe who beſpoke it, without any farther repairing. See BRASS and CASTING.

FOUNDERY *of ſtatues, great guns, and bells.*—The art of caſting ſtatues in braſs is very ancient; inſomuch that its origin was too remote and obſcure even for the reſearch of Pliny; an author admirably ſkilled at diſcovering the inventors of other arts.

All we can learn for certain is, that it was practiſed, in all its perfection, firſt among the Greeks; and afterwards among the Romans: and that the number of their ſtatues conſecrated to their gods and heroes ſurpaſſed all belief. See STATUE.

The ſingle cities of Athens, Delphos, Rhodes, &c. had each three thouſand ſtatues; and Marcus Scaurus alone, though only ædile, adorned the circus with no leſs than three thouſand ſtatues of braſs, for the time of the Circenſian games. This taſte for ſtatues was finally carried to ſuch a pitch, that it became a proverb, that in Rome the people of braſs were not leſs numerous than the Roman people.

Among us, the caſting of ſtatues was but little known or practiſed before the ſeventeenth century.

As to the *caſting of guns*, it is quite modern; and it were perhaps to be wiſhed, we were as ignorant of it as the ancients.

ancients. All authors agree, that the firſt cannon were caſt in the fourteenth century; though ſome affix the event to the year 1338, and others to 1380. See CANNON and GUNNERY.

The *caſting of bells* is of a middle ſtanding, between the other two. The uſe of bells is certainly very ancient in the weſtern church; and the ſame were likewiſe once uſed in the church of the eaſt. But, at preſent, F. Vanſleb aſſures us, in his ſecond account of Egypt, he had found but one bell in all the eaſtern church, and that in a monaſtery in the Upper Egypt. See BELL.

The matter of theſe large works is rarely any ſimple metal, but commonly a mixture of ſeveral. We ſhall here give the proceſs in the foundery of each.

Method of caſting ſtatues of figures. See BRONZE.

There are three things chiefly required in caſting of ſtatues, buſts, baſſo-relievos, vaſes, and other works of ſculpture: *viz.* the mould, the wax, and ſhell, or coat. The inner mould, or core (thus called from *cœur*, as being in the heart or middle of the ſtatue), is a rude lumpiſh figure, to which is given the attitudes and contours of the ſtatue intended; it is raiſed on an iron grate, ſtrong enough to ſuſtain it; and is ſtrengthened withinſide by ſeveral bars, or ribs of iron.

It may be made at the diſcretion of the workmen; of potters' clay, mixed up with horſe-dung and hair; or of plaſter of Paris, mixed with fine brick-duſt.

The uſe of the core in ſtatues is to ſupport the wax and ſhell, to leſſen the weight, and to ſave metal. In bells it takes up all the inſide, and preſerves the ſpace vacant where the clapper is hung. In great guns it forms the whole chace, from the mouth to the breech: and, in mortars, the chace and chamber. The iron bars and the core are taken out of the braſs figure, through an aperture left in it, which is afterwards ſoldered up: but it is neceſſary to leave ſome of the iron bars of the core that contribute to the ſteadineſs of the projecting parts, within the braſs figure.

The wax is a repreſentation of the intended ſtatue. If it be a piece of ſculpture, the wax muſt be all of the ſculptor's own hand, who uſually faſhions it on the core itſelf; though it may be wrought ſeparately in cavities, moulded, or formed, on a model, and afterwards diſpoſed and arranged on the ribs of iron over the grate, as before, filling the vacant ſpace in the middle with liquid plaſter and brick-duſt; by which means the inner mould, or core, is formed in proportion as the ſculptor carries on the wax.

When the wax (which is to be of the intended thickneſs of the metal) is finiſhed, they fix little waxen tubes perpendicularly to it, from top to bottom; to ſerve, both as jets, for the conveyance of the metal to all parts of the work: and as vent holes, to give paſſage to the air, which would, otherwiſe, occaſion great diſorder, when the hot metal came to encompaſs it. By the weight of the wax uſed herein, is that of the metal adjuſted; ten pounds of this laſt being the proportion to one pound of the former. The work brought thus far, wants nothing but to be covered with its ſhell; which is a kind of coat, or cruſt, laid over the wax: and which, being of a ſoft matter, and even, at firſt, liquid, eaſily takes and preſerves the impreſſion of every part thereof; which it afterwards communicates to the metal, upon its taking the place of the wax, between the ſhell and the core. The matter of this outer mould, or ſhell, is varied according as different layers, or ſtrata are applied. The firſt is a compoſition of clay, and old white crucibles, well ground and ſifted, and mixed up with water, to the conſiſtence of a colour fit for painting: accordingly, they apply it with a pencil, laying it ſeven or eight times over, letting it dry between the intervals. For the ſecond impreſſion, they add horſes' dung and natural earth to the former compoſition. The third impreſſion is only horſes' dung and earth. Laſtly, the ſhell is finiſhed by laying on ſeveral more impreſſions of this laſt matter, made very thick with the hand.

The ſhell, thus finiſhed, is ſecured and ſtrengthened by ſeveral bands, or girts of iron, wound around it at half a foot's diſtance from one another, and faſtened at bottom to the grate under the ſtatue; and at the top to a circle of iron, where they all terminate.

Here it muſt be obſerved, that if the ſtatue be ſo big, that it would not be eaſy to move the moulds, when thus provided, it muſt be wrought on the ſpot where it is to be caſt.

This is performed two ways; in the firſt, a ſquare hole is dug under-ground, much bigger than the mould to be made therein, and its inſides lined with walls of freeſtone, or brick. At the bottom is made a hole, of the ſame materials, with a kind of furnace, having its aperture outwards: in this is a fire to be lighted, to dry the mould; and afterwards, to melt the wax. Over this furnace is placed the grate; and on this the mould, &c. framed as before explained. Laſtly, at one of the edges of the ſquare pit is made another large furnace, to melt the metal, as hereafter mentioned.

In the other way, it is ſufficient to work the mould above-ground: but with the ſame precaution of a furnace, and grate, underneath: when finiſhed, four walls are to be run up round it: and, by the ſide thereof, a maſſive made, for a melting furnace. For the reſt, the method is the ſame in both. The mould being finiſhed, and incloſed between four walls, whether under-ground, or above it, a moderate fire is lighted in the furnace under it, and the hole covered with planks, that the wax may melt gently down, and run out at pipes contrived for the purpoſe, at the foot of the mould; which are afterwards very exactly cloſed with earth, as ſoon as all the wax is carried off.

This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace is augmented till ſuch time as both the bricks and the mould become red-hot; which ordinarily happens in twenty-four hours. Then, the fire being extinguiſhed, and every thing cold again, they take out the bricks, and fill up their place with earth, moiſtened, and a little beaten, to the top of the mould, in order to make it the more firm and ſteady.

Things being in this condition, there remains nothing but to melt the metal, and run it into the mould; this is the office of the furnace above, which is made in manner of an oven, with three apertures; one to put in the wood; another for a vent; and a third to run the metal out at. From this laſt aperture, which is kept very cloſe whilſt the metal is in fuſion, a little tube or canal is laid, whereby the melted metal is conveyed into a large earthen baſon over the mould; into the bottom of which all the big branches of the jets, or caſts, which are to carry the metal into all the parts of the mould, are inſerted.

It muſt be added, that theſe jets are all terminated, or ſtopped with a kind of plugs, which are kept cloſe, that upon opening the furnace the braſs, which guſhes out like a torrent of fire, may not enter any of them till the baſon be full enough of matter to run into them all at once; upon which occaſion they pull out the plugs, which are long iron rods, with a head at one end, capable of filling the whole diameter of each tube. The hole of the furnace

is opened with a long piece of iron, fitted at the end of a pole; and the mould is then filled in an inſtant. The work is now finiſhed, at leaſt ſo much as belongs to the caſting, the reſt being the ſculptor's or carver's buſineſs; who, taking the figure out of the mould and earth with which it is encompaſſed, ſaws off the jets, wherewith it appears covered over; and repairs it, with inſtruments proper to his art; as chiſſels, gravers, punchreons, &c.

The manner of caſting bells.—What has been hitherto ſhewn of the caſting of ſtatues, holds, in proportion, of the caſting of bells; that which is particular in theſe latter is as follows: firſt, then, the metal is different; there being no tin in the metal of ſtatues, but no leſs than a fifth part of tin in that of bells. Secondly, the dimenſions of the core, and the wax of bells, eſpecially if it be a ring of ſeveral bells that is to be caſt, are not left to chance, or the caprice of the workman; but muſt be meaſured, on a kind of ſcale, or diapaſon; which gives the height, aperture, and thickneſs, neceſſary for the ſeveral tones required.

It need not be added, that it is on the wax that the ſeveral mouldings and other ornaments, and inſcriptions, to be repreſented in relievo, on the outſide of the bell, are formed. The clapper, or tongue, is not properly a part of the bell, but is furniſhed from other hands. In Europe, it is uſually of iron, with a large knob at the extreme; and is ſuſpended in the middle of the bell. In China, it is only a huge wooden mallet, ſtruck by force of arm againſt the bell; whence they can have but little of that conſonancy, ſo much admired in ſome of our rings of bells. The Chineſe have an extraordinary way of increaſing the ſound of their bells; *viz.* by leaving a hole under the cannon; which our bell-founders would reckon a defect.

The proportions of our bells differ very much from thoſe of the Chineſe. In our's, the modern proportions are, to make the diameter fifteen times the thickneſs of the brim, and the height twelve times. The parts of a bell are, 1. The ſounding bow, terminated by an inferior circle, which grows thinner and thinner. 2. The brim or that part of a bell whereon the clapper ſtrikes, and which is thicker than the reſt. 3. The outward ſinking of the middle of the bell, or the point under which it grows wider to the brim. 4. The waiſt or furniture, and the part that grows wider and thicker quite to the brim. 5. The upper vaſe, or that part which is above the waiſt. 6. The pallet which ſupports the ſtaple of the clapper within. 7. The bent and hollowed branches of metal uniting with the cannons, to receive the iron keys, whereby the bell is hung up to the beam which is its ſupport and counterpoiſe, when rung out. The buſineſs of bell-foundery is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould. And, 3. The melting of the metal. There are two kinds of proportions, *viz.* the ſimple and the relative; the former are thoſe proportions only that are between the ſeveral parts of a bell to render it ſonorous; the relative proportions eſtabliſh a requiſite harmony between ſeveral bells. The method of forming the profile of a bell, previouſly to its being caſt, in which the proportion of the ſeveral parts may be ſeen, is as follows: the thickneſs of the brim, C 1 (ſee *Plate* XV. *Miſcellan. fig.* 1.) is the foundation of every other meaſure, and is divided into three equal parts. Firſt, draw the line H D, which repreſents the diameter of the bell; biſect it in F and erect the perpendicular F f; let D F and H F be alſo biſected in E and G, and two other perpendiculars, E e, G a; be erected at E and G: G E will be the diameter of the top or upper vaſe, *i. e.* the diameter of the top will be half that of the bell; and it will, therefore, be the diameter of the bell which will ſound an octave to the other. Divide the diameter of the bell or the line H D into fifteen equal parts, and one of theſe will give C 1 the thickneſs of the brim; divide again each of theſe fifteen equal parts into three other equal parts, and then form a ſcale. From this ſcale take twelve of the larger diviſions, or $\frac{2}{15}$ of the whole ſcale in the compaſs, and ſetting one leg in D deſcribe an arc to cut the line E e in N, draw N D, and divide this line into twelve equal parts; at the point 1 erect the perpendicular 1 C = 10, and C 1 will be the thickneſs of the brim = $\frac{1}{15}$ of the diameter: draw the line C D; biſect D N and at the point of biſection 6 erect the perpendicular 6 K = $1\frac{1}{2}$ of the larger diviſions on the ſcale. With an opening of the compaſs equal to twice the length of the ſcale or thirty brims, ſetting one leg in N, deſcribe an arc of a circle, and with the ſame leg in K and the ſame opening deſcribe another arc to interſect the former: on this point of interſection, as a centre, and with a radius equal to thirty brims, deſcribe the arc N K; in 6 K produced take K B = $\frac{1}{3}$ of the larger meaſure of the ſcale or $\frac{1}{3}$ of the brim, and on the ſame centre with the radius $30\frac{1}{3}$ brims deſcribe an arc A B parallel to N K. For the arc B C, take twelve diviſions of the ſcale or twelve brims in the compaſs, find a centre, and from that centre, with this opening, deſcribe the arc B C, in the ſame manner as N K or A B was deſcribed. There are various ways of deſcribing the arc K p; ſome deſcribe it on a centre at the diſtance of nine brims from the points p and K; others, as it is done in the figure, on a centre at the diſtance only of ſeven brims from thoſe points. But it is neceſſary firſt to find the point p, and to determine the rounding of the bell p 1. For this purpoſe, on the point C as a centre and with the radius C 1 deſcribe the arc 1 p n; biſect the part 1, 2 of the line D n, and erecting the perpendicular p m, this perpendicular will cut the arc 1 p n in m, which terminates the rounding 1 p. Some founders make the bendings K a third of a brim lower than the middle of the line D N; others make the part C 1 D more acute, and inſtead of making C 1 perpendicular to D N at 1, draw it $\frac{1}{6}$th of a brim higher, making it ſtill equal to one brim; ſo that the line 1 D is longer than the brim C 1. In order to trace out the top-part N *a*, take in the compaſs eight diviſions of the ſcale or eight brims, and on the points N and D, as centres, deſcribe arcs to interſect each other in 8; on this point 8, with a radius of eight brims, deſcribe the arc N b; this arc will be the exterior curve of the top or crown; on the ſame point 8, as a centre and with a radius equal to $7\frac{2}{3}$ brims, deſcribe the arc A e, and this will be the interior curve of the crown, and its whole thickneſs will be one-third of the brim. As the point 8 does not fall in the axis of the bell, a centre M may be found in the axis by deſcribing, with the interval of eight brims on the centres D and H, arcs which will interſect in M; and this point may be made the centre of the inner and outer curves of the crown, as before. The thickneſs of the cap which ſtrengthens the crown at Q is about one-third of the thickneſs of the brim; and the hollow branches or ears about one-ſixth of the diameter of the bell. The height of the bell is in proportion to its diameter as twelve to fifteen, or in the proportion of the fundamental ſound to its third major; whence it follows that the ſound of a bell is principally compoſed of the ſound of its extremity or brim, as a fundamental, of the ſound of the crown which is an octave to it, and of that of the height which is a third. Encyclopedie, Art. Cloche. See Bell.

The particulars neceſſary for making the mould of a bell are, 1. The earth: the moſt coheſive is the beſt; it muſt be well ground and ſifted, to prevent any chinks. 2. Brick-ſtone; which muſt be uſed for the mine, mould, or core,

and for the furnace. 3. Horſe dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inſcriptions, coats of arms, &c. 5. The tallow equally mixed with the wax, in order to put a ſlight layer of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould.

For making the mould, they have a ſcaffold conſiſting of four boards, ranged upon treſſels. Upon this they carry the earth, groſsly diluted, to mix it with horſe-dung, beating the whole with a large ſpatula.

The compaſſes of conſtruction are the chief inſtrument for making the mould, which conſiſt of two different legs, joined by a third piece. And laſt of all, the founders' ſhelves, on which are the engravings of the letters, cartridges, coats of arms, &c.

They firſt dig a hole, of a ſufficient depth to contain the mould of the bell, together with the caſe, or cannon, under ground; and about ſix inches lower than the terre-plein, where the work is performed. The hole muſt be wide enough for a free paſſage between the mould and walls of the hole; or between one mould and another, when ſeveral bells are to be caſt. At the centre of the hole is a ſtake erected, that is ſtrongly faſtened in the ground. This ſupports an iron-peg, on which the pivot of the ſecond branch of the compaſſes turns. The ſtake is encompaſſed with a ſolid brick-work, perfectly round, about half a foot high, and of the propoſed bell's diameter. This they call a mill-ſtone. The parts of the mould are the core, the model of the bell, and the ſhell. When the outer ſurface of the core is formed, they begin to raiſe the core, which is made of bricks that are laid in courſes of equal height upon a layer of plain earth. At the laying of each brick, they bring near it the branch of the compaſſes, on which the curve of the core is ſhaped, ſo as that there may remain between it and the curve the diſtance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement made of earth and horſe-dung, on which they move the compaſſes of conſtruction, to make it of an even ſmoothneſs every where.

The firſt layer being finiſhed, they put the fire to the core, by filling it half with coals, through an opening that is kept ſhut, during the baking, with a cake of earth, that has been ſeparately baked. The firſt fire conſumes the ſtake, and the fire is left in the core half, or, ſometimes, a whole day: the firſt layer being thoroughly dry, they cover it with a ſecond, third, and fourth; each being ſmoothed by the board of the compaſſes, and thoroughly dried before they proceed to another.

The core being completed, they take the compaſſes to pieces, with intent to cut off the thickneſs of the model, and the compaſſes are immediately put in their place, to begin a ſecond piece of the mould. It conſiſts of a mixture of earth and hair, applied with the hand on the core, in ſeveral cakes that cloſe together. This work is finiſhed by ſeveral layers of a thinner cement of the ſame matter, ſmoothed by the compaſſes, and thoroughly dried, before another is laid on. The laſt layer of the model is a mixture of wax and greaſe ſpread over the whole. After which are applied the inſcriptions, coats of arms, &c. beſmeared with a pencil dipped in a veſſel of wax on a chaffing-diſh: this is done for every letter. Before the ſhell is begun, the compaſſes are taken to pieces, to cut off all the wood that fills the place of the thickneſs to be given to the ſhell.

The firſt layer is the ſame earth with the reſt, ſifted very fine; whilſt it is tempering in water, it is mixed with cow's hair, to make it cohere. The whole being a thin cullis, is gently poured on the model, that ſinks exactly all the ſinuoſities of the figures, &c. and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a ſecond of the ſame matter, but ſomething thicker: when this ſecond layer becomes of ſome conſiſtence, they apply the compaſſes again, and light a fire in the core, ſo as to melt off the wax of the inſcriptions, &c.

After this, they go on with other layers of the ſhell, by means of the compaſſes. Here they add to the cow's hair a quantity of hemp, ſpread upon the layers, and afterwards ſmoothed by the board of the compaſſes. The thickneſs of the ſhell comes to four or five inches lower than the mill-ſtone before obſerved, and ſurrounds it quite cloſe, which prevents the extravaſation of the metal. The wax ſhould be taken out before the melting of the metal.

The ear of the bell requires a ſeparate work, which is done during the drying of the ſeveral incruſtations of the cement. It has ſeven rings, the ſeventh is called the bridge, and unites the others, being a perpendicular ſupport to ſtrengthen the curves. It has an aperture at the top, to admit a large iron peg, bent at the bottom; and this is introduced into two holes in the beam, faſtened with two ſtrong iron keys. There are models made of the rings, with maſſes of beaten earth, that are dried in the fire, in order to have the hollow of them. Theſe rings are gently preſſed upon a layer of earth and cow's hair, one-half of its depth; and then taken out without breaking the mould. This operation is repeated twelve times for twelve half-moulds, that two and two united may make the hollows of the ſix rings: the ſame they do for the hollow of the bridge, and bake them all, to unite them together.

Upon the open place left for the coals to be put in, are placed the rings that conſtitute the ear. They firſt put into this open place the iron ring to ſupport the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickneſs of the core. This cake, after baking, is clapped upon the opening, and ſoldered with a thin mortar ſpread over it, which binds the cover cloſe to the core.

The hollow of the model is filled with an earth, ſufficiently moiſt, to fix on the place, which is ſtrewed, at ſeveral times, upon the cover of the core; and they beat it gently with a peſtle to a proper height; and a workman ſmooths the earth at top with a wooden trowel dipped in water.

Upon this cover, to be taken off afterwards, they aſſemble the hollows of the rings. When every thing is in its proper place, they ſtrengthen the outſide of the hollows with mortar, in order to bind them with the bridge, and keep them ſteady at the bottom, by means of a cake of the ſame mortar which fills up the whole aperture of the ſhell. This they let dry, that it may be removed without breaking. To make room for the metal they pull off the hollows of the rings, through which the metal is to paſs, before it enters into the vacuity of the mould. The ſhell being unloaded of its ear, they range under the mill-ſtone five or ſix pieces of wood, about two feet long, and thick enough to reach almoſt the lower part of the ſhell; between theſe and the mould they drive in wooden wedges with a mallet, to ſhake the ſhell of the model whereon it reſts, ſo as to be pulled up, and got out of the pit.

When this and the wax are removed, they break the model and layer of earth, through which the metal muſt run, from the hollow of the rings, between the bell and the core.

They ſmoke the inſide of the ſhell, by burning ſtraw under it, that helps to ſmooth the ſurface of the bell. Then they put the ſhell in the place, ſo as to leave the ſame interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a maſs of baked cement. After which they put on this maſs of the cap, the rings, and vents, over the ſhell, and ſolder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it ſtrongly all the time, round the mould.

The furnace has a place for the fire, and another for the metal. The fire-place has a large chimney, with a ſpacious aſh-hole: the furnace which contains the metal is vaulted, whoſe bottom is made of earth, rammed down; the reſt is built with brick. It has four apertures; the firſt, through which the flame reverberates; the ſecond is cloſed with a ſtopple, that is opened for the metal to run; the others are to ſeparate the droſs, or ſcoriæ, of the metal by wooden rakes; through theſe laſt apertures paſſes the thick ſmoke. The ground of the furnace is built ſloping, for the metal to run down. See Dict. Commerc. Eng. edit. art. FOUNDERY.

FOUNDERY. *Manner of caſting great guns, or pieces of artillery.*—The caſting of cannons, mortars, and other pieces of artillery, is performed much like that of ſtatues and bells; eſpecially as to what regards the wax, ſhell, and furnaces.

All pieces of artillery are now caſt ſolid, and bored afterwards, by means of a machine invented at Straſburgh, (ſee *Boring of* CANNON,) and much improved by Mr. Verbruggen, head founder at Woolwich. The gun to be bored was at firſt placed in a perpendicular poſition; but the machines uſed for this purpoſe have lately been made to bore horizontally, and much more exactly than thoſe that bore in a vertical ſituation. Whilſt the inſide is bored, the outſide is turned and poliſhed at the ſame time.

As to the metal, it is ſomewhat different from both; as having a mixture of tin, which is not in that of ſtatues; and only having half the quantity of tin that is in bells, *i. e.* at the rate of ten pound of tin to an hundred of copper. The reſpective quantities of different metals that ſhould enter into the compoſition for braſs cannon is not abſolutely decided; the moſt common proportions of the ingredients are the following: *viz.* to 240lb. of metal fit for caſting, they put 68lb. of copper, 25lb. of braſs, and 12lb. of tin. To 4200lb. of metal fit for caſting, the Germans put 3687$\frac{3}{4}\frac{3}{1}$lb. of copper, 204$\frac{1}{4}\frac{3}{1}$lb. of braſs, and 307$\frac{3}{4}\frac{0}{1}$lb. of tin. Others, again, uſe 100lb. of copper, 6lb. of braſs, and 9lb. of tin; and laſtly, others make uſe of 100lb. of copper, 10lb. of braſs, and 15lb. of tin. See CANNON.

A cannon is always ſhaped a little conical, being thickeſt of metal at the breech, where the greateſt effort of the gunpowder is made, and diminiſhing thence to the muzzle; ſo that if the mouth be two inches thick of metal, the breech is ſix. See CANNON.

Its length is meaſured in calibers, *i. e.* in diameters of the muzzle. Six inches at the muzzle require twenty calibers, or ten feet in length; there is always about the ſixth of an inch allowed play for the ball. For the parts, and their reſpective proportions of different ſorts of guns, ſee CANNON and GUN. The method of caſting iron cannon differs very little from that of braſs.

FOUNDERY, *Letter, or the method of caſting printing Letters.*—The invention of printing letters we ſhall ſpeak of under PRINTING and LETTER.

Their difference, kind, &c. have already been explained under the articles CHARACTER, &c.

In the buſineſs of cutting, caſting, &c. letters for printing, the letter-cutter muſt be provided with a vice, hand-vice, hammers and files of all ſorts for watch-makers' uſe; as alſo gravers and ſculpters of all ſorts, and an oil-ſtone, &c. ſuitable and ſizeable to the ſeveral letters to be cut: a flat gauge made of box to hold a rod of ſteel, or the body of a mould, &c. exactly perpendicular to the flat of the uſing-file: a ſliding gauge, whoſe uſe is to meaſure and ſet off diſtances between the ſhoulder and the tooth, and to mark it off from the end, or from the edge of the work; a face-gauge, which is a ſquare notch cut with a file into the edge of a thin plate of ſteel, iron, or braſs, of the thickneſs of a piece of common tin, whoſe uſe is to proportion the face of each ſort of letter, *viz.* long letters, aſcending letters, and ſhort letters. So there muſt be three gauges, and the gauge for the long letters is the length of the whole body ſuppoſed to be divided into forty-two equal parts. The gauge for the aſcending letters, Roman and Italic, are $\frac{5}{7}$, or 30 parts of 42, and 33 parts for the Engliſh face. The gauge for the ſhort letters is $\frac{3}{7}$ or 18 parts of 42 of the whole body for the Roman and Italic, and 22 parts for the Engliſh face.

The Italic and other ſtanding gauges are to meaſure the ſcope of the Italic ſtems, by applying the top and bottom of the gauge to the top and bottom lines of the letters, and the other ſide of the gauge to the ſtem; for when the letter complies with theſe three ſides of the gauge, that letter has its true ſhape.

The next care of the letter-cutter is to prepare good ſteel punches, well-tempered, and quite free from all veins of iron; on the face of which he draws or marks the exact ſhape of the letter, with pen and ink, if the letter be large; or with a ſmooth blunted point of a needle, if it be ſmall; and then with ſizeable and proper ſhaped and pointed gravers and ſculpters, digs or ſculps out the ſteel between the ſtrokes or marks he made on the face of the punch, and leaves the marks ſtanding on the face. Having well ſhaped the inſide ſtrokes of his letter, he deepens the hollows with the ſame tools: for if a letter be not deep in proportion to its width, it will, when uſed at preſs, print black, and be good for nothing. This work is generally regulated by the depth of the counter-punch. Then he works the outſide with proper files till it be fit for the matrice.

But before we proceed to the ſinking and juſtifying of the matrices, we muſt provide a mould to juſtify them by, of which you have a draught in *Plate* XV. *Miſcellany, figs.* 2, 3.

Every mould is compoſed of an upper and an under part. The under part is delineated in *fig.* 2. The upper part is marked *fig.* 3, and is in all reſpects made like the under part, excepting the ſtool behind, and the bow, or ſpring, alſo behind; and excepting a ſmall roundiſh wire between the body and carriage, near the break where the under part hath a ſmall rounding groove made in the body. This wire, or rather half-wire, in the upper part, makes the nick in the ſhank of the letter, when part of it is received into the groove in the under part. Theſe two parts are ſo exactly fitted and gauged into one another (*viz.* the male gauge, marked c in *fig.* 3. into the female marked g in *fig.* 2.) that when the upper part of the mould is properly placed on, and in the under part of the mould, both together, make the entire mould, and may be ſlid backwards for uſe ſo far, till the edge of either of the bodies on the middle of either carriage comes juſt to the edge of the female gauges, cut in each carriage: and they may be ſlid for-

wards

wards ſo far, till the bodies on either carriage touch each other; and the ſliding of theſe two parts of the mould backwards makes the ſhank of the letter thicker, becauſe the bodies in each part ſtand wider aſunder, and the ſliding them forwards makes the ſhank of the letter thinner, becauſe the bodies on each part of the mould ſtand cloſer together.

The parts of the mould are as follow: *viz.*

a The carriage.
b The body.
c The male gauge.
d e The mouth-piece.
f i The regiſter.
g The female gauge.
h The hag.
a a a a The bottom plate.
b b b The wood, on which the bottom plate lies.
c c c The mouth.
d d The throat.
e d d The pallet.
f The nick.
g g The ſtool.
h h The ſpring or bow.

Then the mould muſt be juſtified: and firſt the founder juſtifies the body, by caſting about twenty proofs or ſamples of letters, which are ſet in a compoſing ſtick, with all their nicks towards the right hand; and then by comparing theſe with the pattern letters, ſet up in the ſame manner, he finds the exact meaſure of the body to be caſt. He alſo tries if the two ſides of the body are parallel, or that the body be no bigger at the head than at the foot; by taking half the number of his proofs, and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two ſides may be pronounced parallel. He farther tries whether the two ſides of the thickneſs of the letter be parallel by firſt ſetting his proofs in the compoſing ſtick with their nicks upwards; and then turning one-half with their heads to the feet of the other half: and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two ſides of the thickneſs are parallel.

The mould thus juſtified: the next buſineſs is to prepare the matrices. A matrice is a piece of braſs or copper of about an inch and a half long, and of a thickneſs in proportion to the ſize of the letter it is to contain. In this metal is ſunk the face of the letter intended to be caſt, by ſtriking the letter punch about the depth of an n. After this the ſides and face of the matrice muſt be juſtified and cleared, with files, of all bunchings made by ſinking the punch.

Every thing thus prepared, it is brought to the furnace, which is built of brick upright, with four ſquare ſides, and a ſtone on the top, in which ſtone is a wide round hole for the pan to ſtand in. A foundery of any conſequence has ſeveral of theſe furnaces in it.

As to the metal of which the types are to be caſt, this, in extenſive founderies, is always prepared in large quantities; but caſt into ſmall bars of about twenty pounds weight to be delivered out to the workmen as occaſion requires. In the letter foundery which has been long carried on with reputation, under the direction of Dr. Alexander Wilſon, and ſons, at Glaſgow, we are informed, that a ſtock of metal is made up at two different times of the year, ſufficient to ſerve the caſters at the furnace for ſix months each time. For this purpoſe a large furnace is built under a ſhade, furniſhed with a wheel vent, in order the more equally to heat the ſides of a ſtrong pot of caſt iron, which holds, when full, fifteen hundred weight of the metal. The fire being kindled below, the bars of lead are let ſoftly down into the pot, and their fuſion promoted by throwing in ſome pitch and tallow, which ſoon inflame. An outer chimney, which is built ſo as to project about a foot over the fartheſt lip of the pot, catches hold of the flame by a ſtrong draught, and makes it act very powerfully in melting lead; whilſt it ſerves at the ſame time to convey away all the fumes, &c. from the workmen, to whom this laborious part of the buſineſs is committed. When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients are put in, and ſome more tallow is inflamed, to make the whole incorporate ſooner. The workmen now having mixed the contents of the pot very thoroughly, by ſtirring long with a large iron ladle, next proceed to draw the metal off into the ſmall troughs of caſt iron which are ranged, to the number of fourſcore, upon a level platform, faced with ſtone, built towards the right hand. In the courſe of a day fifteen hundred weight of metal can be eaſily prepared in this manner; and the operation is continued for as many days as are neceſſary to prepare a ſtock of metal, of all the various degrees of hardneſs. After this the whole is diſpoſed into preſſes, according to its quality, to be delivered out occaſionally to the workmen.

The founder muſt be now provided with a ladle, which differs nothing from other iron ladles, but in its ſize. And he is provided always with ladles of ſeveral ſizes, which he uſes according to the ſize of the letter he is to caſt. Before the caſter begins to caſt, he muſt kindle his fire in the furnace to melt the metal in the pan. Therefore he takes the pan out of the hole in the ſtone, and there lays in coals and kindles them; and, when they are well kindled, he ſets the pan in again and puts in metal into it to melt; if it be a ſmall bodied letter he caſts, or a thin letter of great bodies, his metal muſt be very hot; nay ſometimes red-hot, to make the letter come. Then having choſen a ladle that will hold about ſo much as the letter and break is, he lays it at the ſtoking hole, where the flame burſts out, to heat. Then he ties a thin leather, cut with its narrow end againſt the face to the leather groove of the matrice, by whipping a brown thread twice about the leather-groove, and faſtening the thread with a knot. Then he puts both halves of the mould together, and puts the matrice into the matrice-cheek, and places the foot of the matrice on the ſtool of the mould, and the broad end of the leather upon the wood of the upper half of the mould, but not tight up, leſt it might hinder the foot of the matrice from ſinking cloſe down upon the ſtool in a train of work. Then laying a little roſin on the upper-wood of the mould, and having his caſting-ladle hot, he with the bolling ſide of it melts the roſin: and, when it is yet melted, preſſes the broad end of the leather hard down on the wood, and ſo faſtens it to the wood: all this is the preparation.

Now he comes to caſting. Wherefore placing the under half of the mould in his left hand with the hook or hag forward, he clutches the ends of its wood between the lower part of the ball of his thumb and his three hind fingers; then he lays the upper half of the mould upon the under half, ſo that the male gauges may fall into the female gauges, and at the ſame time the foot of the matrice places itſelf upon the ſtool; and, claſping his left hand

hand thumb ſtrong over the upper half of the mould he nimbly catches hold of the bow or ſpring with his right hand fingers at the top of it, and his thumb under it, and places the point of it againſt the middle of the notch in the backſide of the matrice, preſſing it as well forwards towards the mould, as downwards, by the ſhoulder, of the notch cloſe upon the ſtool, while at the ſame time with his hinder fingers, as aforeſaid, he draws the under half of the mould towards the ball of his thumb, and thruſts by the ball of his thumb the upper part towards his fingers, that both the regiſters of the mould may preſs againſt both ſides of the matrice, and his thumb and fingers preſs both halves of the mould cloſe together.

Then he takes the handle of his ladle in his right hand, and with the boll of it gives a ſtroke, two or three, outwards upon the ſurface of the melted metal, to ſcum or clear it from the film or duſt that may ſwim upon it; then takes up the ladle full of metal, and having his mould, as aforeſaid, in his left hand, he a little twiſts the left ſide of his body from the furnace, and brings the geat of his ladle (full of metal) to the mouth of the mould, and twiſts the upper part of his right hand towards him to turn the metal into it, while at the ſame moment of time he jilts the mould in his left hand forwards, to receive the metal with a ſtrong ſhake (as it is called); not only into the bodies of the mould, but while the metal is yet hot running, ſwiftly and ſtrongly, into the very face of the matrice, to receive its perfect form there, as well as in the ſhank.

Then he takes the upper half of the mould off the under half, by placing his right hand thumb on the end of the wood next his left hand thumb, and his two middle-fingers at the other end of the wood; and finding the letter and break lie in the under half of the mould, (as moſt commonly by reaſon of its weight it does,) he throws or toſſes the letter, break and all, upon a ſheet of waſte paper laid for that purpoſe on the bench, juſt a little beyond his left hand, and is then ready to caſt another letter as before; and alſo, the whole number that is to be caſt with that matrice.

A workman will ordinarily caſt about three thouſand of theſe letters in a day.

When the caſters at the furnace have got a ſufficient number of types upon the tables, a ſet of boys come, and nimbly break away the jets from them: the jets are thrown into the pots, and the types are carried away in parcels to other boys, who paſs them ſwiftly under their fingers, defended by leather, upon ſmooth flat ſtones, in order to poliſh their broad-ſides. This is a very dextrous operation, and is a remarkable inſtance of what may be effected by the power of habit and long practice; for theſe boys, in turning up the other ſide of the type, do it ſo quickly by a mere touch of the fingers of the left hand, as not to require the leaſt perceptible intermiſſion in the motion of the right hand upon the ſtone. The types, thus finely ſmoothed and flattened on the broad-ſides, are next carried to another ſet of boys, who ſit at a ſquare table, two on each ſide, and there are ranged up on long rulers, or ſticks, fitted with a ſmall projection, to hinder them from ſliding off backwards. When theſe ſticks are ſo filled, they are placed, two and two, upon a ſet of wooden pins fixed into the wall, near the dreſſer, ſometimes to the amount of a hundred, in order to undergo the finiſhing operations. This workman, who is always the moſt expert and ſkilful in all the different branches carried on at the foundery, begins by taking one of theſe ſticks, and, with a peculiar addreſs, ſlides the whole column of types off upon the dreſſing-ſtick: this is made of well-ſeaſoned mahogany, and furniſhed with two end-pieces of ſteel, a little lower than the body of the types, one of which is moveable, ſo as to approach the other by means of a long ſcrew-pin, inſerted in the end of the ſtick. The types are put into this ſtick with their faces next to the back or projection; and after they are adjuſted to one another ſo as to ſtand even when they are bound up, by ſcrewing home the moveable end-piece. It is here where the great and requiſite accuracy of the moulds comes to be perceived; for in this caſe the whole column, ſo bound up, lies flat and true upon the ſtick, the two extreme types being quite parallel, and the whole has the appearance of one ſolid continuous plate of metal. The leaſt inaccuracy in the exact paralleliſm of the individual type, when multiplied ſo many times, would render it impoſſible to bind them up in this manner, by diſpoſing them to riſe or ſpring from the ſtick by the ſmalleſt preſſure from the ſcrew. Now, when lying ſo conveniently with the narrow edges uppermoſt, which cannot poſſibly be ſmoothed in the manner before mentioned by the ſtones, the workman does this more effectually by ſcraping the ſurface of the column with a thick-edged but ſharp razor, which at every ſtroke brings on a very fine ſmooth ſkin, like to poliſhed ſilver; and thus he proceeds till in about half a minute he comes to the farther end of the ſtick. The other edges of the types are next turned upwards, and poliſhed in the ſame manner. It is whilſt the types thus lie in the dreſſing-ſtick that the operation of bearding or barbing is performed, which is effected by running a plane, faced with ſteel, along the ſhoulder of the body next to the face, which takes more or leſs off the corner, as occaſion may require. Whilſt in the dreſſing-ſtick they are alſo grooved, which is a very material operation. In order to underſtand this, it muſt be remembered, that when the types are firſt broken off from the jets, ſome ſuperfluous metal always remains, which would make them bear very unequally againſt the paper whilſt under the printing-preſs, and effectually mar the impreſſion. That all theſe inequalities may, therefore, be taken away, and that the bearings of every type may be regulated by the ſhoulders imparted to them all alike from the mould, the workman or dreſſer proceeds in the following manner. The types being ſcrewed up in the ſtick, as before mentioned, with the jet-end outermoſt, and projecting beyond the wood about one eighth of an inch, the ſtick is put into an open preſs, ſo as to preſent the jet-end uppermoſt, and then every thing is made faſt by driving a long wedge, which bears upon a ſlip of wood, which lies cloſe to the types the whole length: then a plough or plane is applied, which is ſo conſtructed as to embrace the projecting part of the types betwixt its long ſides, which are made of poliſhed iron. When the plane is thus applied, the ſteel cutter bearing upon that part between the ſhoulders of the types, where the inequalities lie, the dreſſer dextrouſly glides it along, and by this means ſtrips off every irregular part that comes in the way, and ſo makes an uniform groove the whole length, and leaves the two ſhoulders ſtanding; by which means every type becomes preciſely like to another, as to the height againſt paper. The types being now finiſhed, the ſtick is taken out of the preſs, and the whole column replaced upon the other ſtick; and after the whole are ſo dreſſed, he proceeds to pick out the bad letters, previouſly to putting them up into pages and papers. In doing this he takes the ſtick into his left hand, and turning the faces near to the light, he examines them carefully, and whenever an imperfect or damaged letter occurs, he nimbly plucks it out with a ſharp bodkin, which he holds in the right hand for that purpoſe. Thoſe letters which, from their form, project over the body

of

of the type, and which cannot on this account be rubbed on the ſtones, are ſcraped on the broad-ſides with a knife or file, and ſome of the metal next the face pared away with a pen-knife, in order to allow the type to come cloſe to any other. This operation is called kerning.

The excellence of printing types conſiſts not only in the due performance of all the operations above deſcribed, but alſo in the hardneſs of the metal, form, and fine proportion of the character, and in the exact bearing and ranging of the letters in relation to one another.

FOUNDERY, *Military*. Under the ſeveral appropriate heads, we have furniſhed information regarding the ſeveral kinds of foundery neceſſary to the eſtabliſhment of that variety of profeſſions, wherein caſtings of different kinds, whether in metal, wax, plaſter, &c. are deſiderata: we now have to offer a few remarks on ſuch as appertain more particularly to the ſupply of our arſenals.

The caſting of cannon, ſhot, &c. was, until about half a century ago, conſidered an arduous undertaking; and ſo little were the fundamental principles of the art underſtood, that we are aſſured not one in three of the ſhells caſt for the mortar ſervice could be admitted into the ſtores. Such have been the improvements made, that thouſands of articles, which uſed to be from neceſſity made of wrought iron, are now to be had from the founderies at leſs than one-fifth of their former prices; while the material itſelf has been ſo highly perfected, that inſtances have been known of caſt-iron being ſufficiently ſoft to bear the file, and ſufficiently ductile to undergo the hammer. Such, indeed, could not be done but at conſiderable expence; nor does it appear that much good could reſult in general. With reſpect to military apparatus, it is found expedient to have the whole of our cannon, mortars, carronades, ſhot, ſhells, and garriſon gun-carriages, caſt at the ſeveral founderies eſtabliſhed in the vicinity of coal and iron mines; whereby the work is done at comparatively a low expence, and the articles can be conveyed by water to the warren at Woolwich much under the prices at which they could be caſt at the place, to which both the iron and the coals muſt be tranſported.

The French have, ſince the commencement of the revolution, ſhewn what may be effected in this branch of military economy, by a people determined to overcome every difficulty, and to apply their reſources, whether public or private, towards national purpoſes. It is a well aſcertained fact, that in ſeveral of the departments of France, from which the trains of artillery, together with the ſeveral ſtores appertaining to them, had been withdrawn, the people ſupplied their national guards with field-pieces caſt in ſmall temporary founderies, where the furnaces were rarely equal to heating more than from twenty to thirty pounds of bell-metal, &c. of which the ſacred edifices, &c. throughout the country had been ſtripped. By a due combination of the whole, very ſerviceable cannon, and eſpecially howitzers, which ſeem to be a favourite ſpecies of artillery among the French, were thus ſupplied.

Though it muſt be admitted that a foundery ſuited to caſting cannon, of any deſcription, could not be attached to the ordnance department of armies ſerving out of the kingdom, we are inclined to hazard the opinion, that ſmall laboratory furnaces, adequate to the caſting of ſhot and grape, but eſpecially of muſket balls, might be annexed thereto. In ſome inſtances, when the ſtock of grape-ſhot has been expended, it has become neceſſary to make caſe-ſhot of muſket balls, whereby the infantry have been very ill ſupplied with ammunition. If, in ſuch inſtances, portable furnaces, and crucibles, together with proper moulds, have been at hand, (for the whole might be conveyed in a waggon, or perhaps in a cart,) abundance of refuſe iron could have been formed into grape-ſhot; and there would have been no ſcarcity of muſket ammunition.

Nor can we ſee any objection to the ſupply of proper materials for eſtabliſhing founderies, ſuited to caſting field-pieces, being ſhipped with extenſive armaments proceeding on foreign ſervice; ſince the ſpace they would occupy muſt be far leſs than is required for that immenſe quantity of ſtores neceſſarily ſent to places where no foundery exiſts. Hence tonnage, time, and treaſure, are often laviſhly expended. The caſting of ſhot and ſhells, in ſuch ſituations, would generally prove eaſy, and liberate many a tranſport from the conveyance of ſuch dead-weight, as not only precludes the ſupply of other equally neceſſary ſtores, but, in many inſtances, riſks, or even cauſes, a total loſs.

FOUNDLING HOSPITAL. See *Foundling* HOSPITAL.

FOUN-HING, in *Geography*, a town of China, of the ſecond rank, in the province of Fo-kien; 175 miles E.S.E. of Peking. N. lat. 26° 54′. E. long. 119° 49′.

FOUN-IM, a town of China, of the third rank, in the province of Pe-tche-li; 20 miles E. of Young-ping.

FOUNT, or FONT, among *Printers*, &c. a ſet, or quantity, of characters, or letters, of each kind, caſt by a letter-founder, and ſorted.

We ſay, a founder has caſt a fount of pica, of Engliſh, of pearl, &c. meaning that he has caſt a ſet of characters of theſe kinds.

A complete fount does not only include the running letter, but alſo majuſcules, or large and ſmall capitals, ſingle letters, double letters, points, commas, lines, borders, head-pieces, tail-pieces, and numeral characters.

Founts are large or ſmall, according to the demand of the printer, who orders them by the hundred weight, or by ſheets. When the printer orders a fount of five hundred, he means that the fount ſhould weigh five hundred pounds. When he demands a fount of ten ſheets, it is underſtood, that with that fount he ſhall be able to compoſe ten ſheets, or twenty forms, without being obliged to diſtribute. The founder takes his meaſures accordingly: he reckons a hundred and twenty pounds for a ſheet, including the quadrates, &c. or ſixty pounds for a form, which is half a ſheet: not that the ſheet always weighs a hundred and twenty pounds, or the form ſixty pounds; on the contrary, it varies according to the ſize of the form; beſides, it is always ſuppoſed that there are letters left in the caſes.

The letter-founders have a kind of liſt, or tariff, whereby they regulate their founts: the occaſion of which is, that ſome letters being in much more uſe, and oftener repeated, than others, their cells, or caſes, ſhould be better filled and ſtored, than thoſe of the letters which do not return ſo frequently.

Thus the *o*, and *i*, for inſtance, are always in greater quantity than the *k*, or *z*.

This difference will be beſt perceived from a proportional compariſon of thoſe letters with themſelves, or ſome others. Suppoſe a fount of a hundred thouſand characters, which is a common fount: here the *a* ſhould have five thouſand; the *c*, three thouſand; the *e*, eleven thouſand; the *i*, ſix thouſand; the *m*, three thouſand; the *k*, only thirty; and the *x*, *y*, and *z*, not many more. But this is only to be underſtood of the letters of the lower caſe; thoſe of the upper caſe having other proportions, which it would be here too long to inſiſt on.

FOUNTAIN, FONS, in *Philoſophy*, a ſpring, or ſource, of water, riſing out of the ground.

For

For the phenomena, theory, origin, &c. of ſprings, or fountains, ſee SPRING.

Among the ancients, the fountains, or ſources of rivers, were held ſacred, and even worſhipped, as a kind of divinities.

Seneca obſerves as much, in his forty-firſt epiſtle; and Cicero, lib. iii. De Nat. Deor. cap. 20. mentions, that the Roman prieſts, and augurs, uſed, in their prayers and invocations, to call on the names of the Tyber, and other rivers, brooks, and ſprings, about Rome. And the ſeventh inſcription, in p. 94. of Gruter, has *FONTI* DIVINO ET GENIO NVMINIS *FONTIS*.

It was a point of religion, not to diſturb, or make muddy, theſe waters in waſhing or bathing. Tacitus gives an inſtance hereof in Nero, Annal. lib. xiv. cap. 22.

FOUNTAIN, or *Artificial Fountain*, in *Hydraulics*, a machine or contrivance, whereby water is violently ſpouted, or darted up; called alſo a *jet d'eau*. See JET *d'Eau*, FLUID, &c.

There are divers kinds of artificial fountains; ſome founded on the ſpring, or elaſticity, of the air; and others, on the preſſure, or weight, of the water, &c.

The ſtructure of each of theſe, being pretty and curious, and affording a good illuſtration of the doctrine of hydraulics, and pneumatics, ſhall be here explained.

The theory of fountains may be collected from the articles AIR, FLUID, &c. and other particulars relating to their ajutages, and pipes of conduct, &c. may be found under JET *d'Eau*, and *Motion of* WATER.

FOUNTAIN. *Conſtruction of an artificial Fountain, playing by the ſpring, or elaſticity of the air.*—A veſſel, proper for a reſervoir, as A B, *Plate* VI. *Hydraulics*, *fig.* 7. is provided, of metal, glaſs, or the like, ending in a ſmall neck *c*, at the top; through this neck a tube is put *c d*, traverſing the middle of the veſſel, till its lower orifice *d*, nearly, but not abſolutely, reach the bottom of the veſſel; the veſſel being firſt half filled with water. The neck is ſo contrived, as that a ſyringe, or condenſing pipe, may be ſcrewed upon the tube; by means whereof a large quantity of air may be intruded through the tube into the water, out of which it will diſengage itſelf, and emerge into the vacant part of the veſſel, and lie over the ſurface of the water C D.

Now, the water here contained being thus preſſed by the air, which is, *e. gr.* twice as denſe as the external air, and the elaſtic force of air being equal to its gravitating force; the effect will be the ſame, as if the weight of the column of air over the ſurface of the water were double that of the column preſſing in the tube; ſo that the water muſt, of neceſſity, ſpout up, through the tube, when the ſyringe is removed, with a force equal to the exceſs of preſſure of the included, above that of the external air.

FOUNTAIN. *Conſtruction of an artificial Fountain, playing by the preſſure of the water.*—Having the conveniency of a fund, or reſervoir of water, in a place conſiderably higher than that where the fountain is to be (whether that fund hath been placed there by nature, or whether it hath been raiſed for the purpoſe, by a proper engine, as a pump, ſiphon, ſpiral ſcrew, or the like): from the reſervoir lay vertical tubes, for the water to deſcend through; and to theſe vertical tubes, fit other horizontal ones, under ground, to carry the water to the place where the fountain is to play. Laſtly, from theſe horizontal tubes, erect other vertical ones, by way of ajutages, jets, or ſpouts, their altitude being much leſs than that of the tubes whereby the water was carried to the horizontal ones.

Then will the water, by the preſſure of the ſuperincumbent column, be ſpouted up at theſe jets; and that to the height or level of the water in the reſervoir; and this will be the caſe, howſoever any of the tubes be bent or incurvated. For the demonſtration, ſee FLUIDS.

Thus may water be ſpouted to any given height at pleaſure; and the tubes may be ſo proportioned as to yield any given quantity of water, in a given time; or ſeveral tubes, or the ſame fountain, may be made to yield water in any given ratio; or, laſtly, different tubes may project the water to different altitudes. Rules for all which the reader will find among the laws of FLUIDS and JETS *d'Eau*.

Theſe aerial or aquatic fountains may be applied in various manners, ſo as to exhibit various appearances; and, from theſe alone, ariſes the greateſt part of our artificial water-works. An inſtance, or two, will not be unamuſing.

FOUNTAIN *ſpouting the water in various directions.*—Suppoſe the vertical tube, or ſpout, in which the water riſes, to be A B (*Plate* VI. *Hydraulics*, *fig.* 8.) into this fit ſeveral other tubes; ſome horizontal, others oblique; ſome inclining, others reclining, as O P, M N, F L, &c.

Then, as all water retains the direction of the aperture through which it is ſpouted, that iſſuing through A will riſe perpendicularly; and that through L, H, N, P, E, will deſcribe arches of different magnitudes, and tending different ways.

Or thus: ſuppoſe the vertical tube A B, *fig.* 9. through which the water riſes, to be ſtopped at the top, as in A; and, inſtead of pipes, or jets, let it be only perforated with little holes all round, or only round half its ſurface; then will the water ſpin forth, in all directions, through the little apertures, and to a diſtance proportional to the height of the fall of the water.

And hence, if the tube A B be ſuppoſed the height of a man, and be furniſhed with an epiſtomium, or cock, at C, upon opening the cock, the ſpectators will be covered unexpectedly with a ſhower.

It muſt be here obſerved, that the diameters of the apertures by which the water is emitted, muſt be conſiderably leſs than thoſe of the tubes in which the water is brought; leſt the reſiſtance of the air, and other impediments, ſpecified under FLUID and JET *d'Eau*, break the force of the water.

FOUNTAIN *playing by the draught of the breath.*—Suppoſe A B, *fig.* 10. a glaſs, or metalline ſphere, wherein is fitted a tube C D, having a little orifice in C, and reaching almoſt to D, the bottom of the ſphere. If, now, the air be ſucked out of the tube C D, and the orifice C be immediately immerged under cold water, the water will aſcend through the tube into the ſphere.

Thus proceeding, by repeated exſuctions, till the veſſel be above half full of water; and then applying the mouth to C, and blowing air into the tube, upon removing the mouth, the water will ſpout forth.

Or, if the ſphere be put in hot water, the air, being thereby rarefied, will make the water ſpout as before.

This kind of fountain is called *Pila Heronis*, or Hero's ball, from the name of its inventor.

FOUNTAIN, *the ſtream whereof raiſes and plays a braſs ball.*—Provide a hollow braſs ball A, *fig.* 11. made of a thin plate, that its weight may not be too great for the force of the water. Let the tube B C, through which the water riſes, be exactly perpendicular to the horizon.

Then the ball, being laid in the bottom of the cup, or baſon B, will be taken up in the ſtream, and ſuſtained at a conſiderable height, as A, alternately vibrating, or playing up and down.

Hence,

Hence, as the figure of the ball contributes nothing to its reciprocal riſe and fall, any other body, not too heavy, may be ſubſtituted in lieu thereof; *e. gr.* a bird, with its wings ſtretched forth.

But note, that, as it is neceſſary the ball, when on the deſcent, ſhould keep the ſame preciſe perpendicular wherein it roſe (ſince, otherwiſe, it would miſs the ſtream, and fall downright), ſuch a fountain can only be played in a place free from wind.

FOUNTAIN *which ſpouts water in form of a ſhower.*—To the tube wherein the water is to riſe, fit a ſpherical, or lenticular head, A B, *fig.* 12. made of a plate of metal, and perforated at the top with a great number of little holes.

The water riſing with vehemence towards A B, will be there divided into innumerable little threads, and afterwards broke, and diſperſed into the fineſt drops.

FOUNTAIN *which ſpreads the water in form of a table cloth.*—To the tube A B, *fig.* 13. ſolder two ſpherical ſegments, C and D, almoſt touching each other, with a ſcrew E, to contract or amplify the interſtice or chink, at pleaſure.

Others chuſe to make a ſmooth, even cleft, in a ſpherical or lenticular head, fitted upon the tube.

The water ſpouting through this chink or cleft will expand itſelf in manner of a cloth.

FOUNTAINS, *wherein the water ſpouts out of the figures of men, and other animals.*—Since water may be derived, or conveyed, by tubes in any ſituation, and always retains the direction of the aperture, all here required is, to incloſe tubes within the figures of men, or other animals, having their orifices in thoſe parts whence the water is intended to ſpout forth.

From the principles hitherto laid down, it will be very eaſy to deduce whatever relates to the furniture of fountains, and the various forms water may be put into by their means; all depending on the magnitude, figure, and direction, of the ajutages, or apertures.

FOUNTAIN, *which, when it has done ſpouting, may be turned like an hour-glaſs.*—Provide two veſſels, A and B, *Plate* VII. *Hydraulics, fig.* 1. to be ſo much the bigger as the fountain is to play the longer; and placed at ſo much the greater diſtance from each other, as the water is deſired to ſpout the higher. Let C D E be a crooked tube, furniſhed in E with a jet; and G H I another bent tube, furniſhed with a jet in I; K L and G F are to be the other leſſer tubes, open at both ends, and reaching near to the bottom of the veſſels B and A, to which the tubes G H and C D are likewiſe to reach.

If, now, the veſſel A be filled with water, it will deſcend through the tube C D; and will ſpout up through the jet E, by the preſſure of the column of water C D. But unleſs the pipe G F was open at G, to let the air run up to F, and preſs at the top of the ſurface of the water in the cavity A, the water could not run down and ſpout at E. After its fall again, it will ſink through the little tube K L, into the veſſel B, and expel the air through the tube G I. At length, when all the water is emptied out of the veſſel A, by turning the machine upſide down, the veſſel B will be the reſervoir, and make the water ſpout up through the jet I, the pipe K L ſupplying B with air to let the water deſcend in the direction G H I.

Hence, if the veſſels A and B contain juſt as much water as will be ſpouted up in an hour's time, we ſhall have a ſpouting clepſydra or water-clock; which may be graduated, or divided, into quarters, minutes, &c. as ſhewn under CLEPSYDRA.

FOUNTAIN *of Command.*—This depends on the ſame principles with thoſe of the former: C A E, *fig.* 2. is a veſſel of water ſecured againſt the entrance of the air, except through the pipe G F, when the cock C, by which it was filled, is ſhut. There is another pipe E D H B, which goes from the bottom of the water to the jet B in the baſon D B, but this is ſtopped by the cock H. At the loweſt part of the baſon D B there is a ſmall hole at I to let the water of the baſon D B run into the baſon G H under it: there is alſo a ſmall triangular hole, or notch, in the bottom of the pipe F G at G. Turn the cock H, and the fountain will play for ſome time, then ſtop, then play again alternately for ſeveral times together. When thoſe times of playing and ſtopping are known before-hand, you may command the fountain to play or ſtop, whence its name. The cauſe of this phenomenon is as follows: the water coming down the pipe E D H B, would not come out at B, if the air S s, above the water, was not ſupplied as it dilated: now it is ſupplied by the pipe G F, which takes it in at the notch G, and delivers it out at F; but after ſome time the water, which has ſpouted out at B, falling down into the baſon D B, riſes high enough to come above the notch G, which ſtops the paſſage of the air; ſo that the air S s, above the water in the veſſel C A E, wanting a ſupply, cannot ſufficiently preſs, and the fountain ceaſes playing. But when the water of D E has run down into the lower baſon H G, through the hole I, till it falls below the top of the notch G, the air runs up into the upper receptacle, and ſupplies that at S s, and the fountain plays again. This is ſeen a little before-hand, by a ſkin of water on the notch G, before the air finds a paſſage, and then you may command the fountain to play. It is evident, that the hole I muſt be leſs than the hole of the jet, or elſe all the water would run out into the lower baſon, without riſing high enough to ſtop the notch G.

FOUNTAIN *that begins to play upon the lighting of candles, and ceaſes as they go out.*—Provide two cylindrical veſſels, A B and C D, *fig.* 3. connect them by tubes, open at both ends, K L, B E, &c. ſo that the air may deſcend out of the higher into the lower: to the tubes ſolder candleſticks, H, &c. and to the hollow cover of the lower veſſel, C E, fit a little tube, or jet, F G, furniſhed with a cock G, and reaching almoſt to the bottom of the veſſel. In G let there be an aperture, furniſhed with a ſcrew, whereby water may be poured into C D.

Then, upon lighting the candles H, &c. the air in the contiguous tubes becoming rarefied thereby, the water will begin to ſpout through G F.

By the ſame contrivance may a ſtatue be made to ſhed tears upon the preſence of the ſun, or on the lighting of a candle, &c.: all here required being only to lay tubes from the cavity wherein the air is rarefied, to ſome other cavities placed near the eyes full of water.

A fountain may be made by the rarefaction of the air in the following manner: let A B and C D, *fig.* 4. be two pipes fixed to a braſs head C, made to ſcrew into a glaſs veſſel E, which, having a little water in it, is inverted till the pipes are ſcrewed on; then reverting it ſuddenly, ſo as to put A, the lower end of the ſpouting pipe A B, into a jar of water A, and the lower end of the deſcending pipe C D, into a receiving veſſel D, the water will ſpout up from the jar A into the tall glaſs veſſel E, from which it will go down at the mouth C through C D, into the veſſel D, till the water is wholly emptied out of A, making a fountain in E, into D. The reaſon of the play of the fountain is this: the pipe C D, being two feet nine inches long, lets down a column of water which rarefies the air $\frac{1}{12}$th part in

in the veſſel E, where it preſſes againſt the water ſpouting at B with $\frac{1}{12}$th of the force by which the water is puſhed up at the hole A, by the preſſure of the common air on the water in the veſſel A; ſo that the water ſpouts up into E, when the air is rarefied $\frac{1}{12}$, with the difference of the preſſure of the atmoſphere, and the forementioned rarefied air; *i. e.* of 33 to $2\frac{3}{4}$. This would raiſe the water two feet nine inches; but the length of the pipe A, nine inches being deducted, the jet will only riſe two feet. This, ſays Deſaguliers, may be called a ſyphon fountain, where A B is the driving leg, and C D the iſſuing leg.

Fountain *of Hero of Alexandria*, ſo called, becauſe it was contrived by him. In the firſt fountain already deſcribed, the air is compreſſed by a ſyringe; in this, ſee *fig.* 5, the air, being only compreſſed by the concealed fall of water, makes a jet, which, after ſome continuance, is conſidered by the ignorant as a perpetual motion; becauſe they imagine that the ſame water which fell from the jet riſes again. The boxes C E and D Y X, being cloſe, we ſee only the baſon A B W, with a hole at W, into which the water ſpouting at B falls: but that water does not come again; for it runs down through the pipe W X into the box D Y X, from whence it drives out the air, through the aſcending pipe Y Z, into the cavity of the box C E, where, preſſing upon the water that is in it, it forces it out through the ſpouting pipe O B, as long as there is any water in C E; ſo that this whole play is only whilſt the water contained in C E, having ſpouted out, falls down through the pipe W X into the cavity D Y X. The force of the jet is proportional to the height of the pipe W X, or of the boxes C E and D Y above one another; the height of the water, meaſured from the baſon A B W to the ſurface of the water in the lower box D Y X, is always equal to the height meaſured from the top of the jet to the ſurface of the water in the middle cavity at C E. Now, ſince the ſurface C E is always falling, and the water in D Y always riſing; the height of the jet muſt continually decreaſe, till it is ſhorter by the height of the depth of the cavity C E, which is emptying, added to the depth of the cavity D Y which is always filling; and when the jet is fallen ſo low it immediately ceaſes. The air is repreſented by the points in this figure. To prepare this fountain for playing, which ſhould be done unobſerved, pour in water at W, till the cavity D X Y is filled; then invert the fountain, and the water will run from the cavity D X Y into the cavity C E, which may be known to be full, when the water runs out at B held down. Set the fountain up again, and, in order to make it play, pour in about a pint of water into the baſon A B W; and as ſoon as it has filled the pipe W X, it will begin to play, and continue as long as there is any water in C E. You may then pour back the water left in the baſon A B W, into any veſſel, and invert the fountain, which being ſet up right again, will be made to play, by putting back the water poured out into A B W; and ſo on as often as you pleaſe.

The fountain, *fig.* 6. is of the ſame kind; but having double the number of pipes and concealed cavities, it plays as high again. In order to underſtand its ſtructure, ſee *fig.* 7. The baſon is A, the four cavities are B, C, D, and E, from which the water through the pipe f G, ſpouts up to double the height of the fountain, the air at E, which drives it, being doubly condenſed. The water going down the pipe 1 (*e. gr.* three feet long), condenſes the air that goes up into the cavity C through the pipe 2, ſo as to to make it $\frac{1}{10}$ ſtronger than the common air; then the water which falling into the pipe 3 from C to D, is capable, by the height of its fall, of condenſing the air at E, ſo as to make it $\frac{1}{10}$ ſtronger, being puſhed at C by air already condenſed into $\frac{1}{10}$ leſs ſpace, cauſes the air at E to be condenſed twice as much; that is, to be $\frac{1}{5}$ ſtronger than common air; and, therefore, it will make the water at G ſpout out with twice the force, and riſe twice as high as it would do, if the fountain had been of the ſame ſtructure as the former. In playing this fountain, turn it upſide down, and taking out the plugs g, h, fill the two cavities C and E, and, having ſhut the holes again, ſet the fountain upright, and pour ſome water into the baſon A, and the jet will play out at G; but the fountain will begin to play too ſoon; and, therefore, the beſt way is to have a cock in the pipe 3, which, being open, whilſt the cavities C and E are filled, and ſhut again before the fountain is ſet up, will keep the water thrown into the baſon from going down the pipe 1, and that of the cavity C from going down the pipe 3, by which means the fountain will not play before its time, which will be as ſoon as the cock is opened.

Fountain, *Dial, of Deſaguliers*, is contrived to play by the ſpring of the air, increaſed by the heat of the ſun, and ſerves alſo for a dial at the ſame time. G N S, *fig.* 8, is a hollow globe of thin copper, eighteen inches in diameter, ſupported by a ſmall inverted baſon, reſting on a frame A B C, with four legs, between which there is a large baſon of two feet diameter. In the leg C there is a concealed pipe, proceeding from G, the bottom of the inſide of the globe, along H V, and joining an upright pipe u I, for making a jet at I. The ſhort pipe I u, going to the bottom of the baſon, has a valve at u, under the horizontal part H V, and another valve at V above it, and under the cock &. At the north pole N there is a ſcrew for opening a hole, through which the globe is ſupplied with water. When the globe is half filled, let the machine be ſet in a garden, and, as the ſun heats the copper and rarefies the included air, the air will preſs upon the water, which, deſcending through the pipe G C H V, will lift up the valve V, and ſhut the valve u, and the cock being open, ſpout out at I, and continue to do ſo for a long time, if the ſun ſhines, and the ajutage be ſmall. At night, as the air condenſes again by the cold, the outward air, preſſing into the ajutage I, will ſhut the valve N, but by its preſſure on the baſon D u H, puſh up the water, which has been played in the day-time through the valve u, and the pipe u H G into the globe, ſo as to fill it up again to the ſame height which it had at firſt, and the next ſun-ſhine will cauſe the fountain to play again, &c. The uſe of the cock is to keep the fountain from playing till you think proper: a ſmall jet will play ſix or eight hours. If the globe be ſet for the latitude of the place, and rectified before it be fixed, with the hour lines or meridians drawn upon it, the hours marked, and the countries painted upon it, as in the common globe, it will be a good dial; the ſun ſhining upon the ſame places in this globe as it does upon the earth itſelf. Deſaguliér's Exper. Phil. vol. ii. lect. 9. p. 205.

Fountain, with regard to *Architecture*, is an aſſemblage of maſonry, ſculpture, &c. either for the decoration, or conveniency of a city, garden, or the like.

Fountains acquire various denominations, according to their form and ſituation: as,

Fountain, *Arched*, that whoſe baſon and jet are placed perpendicularly under the arch. Such are the fountains of the Colonade, and the triumphal water-arch at Verſailles.

Fountain, *Baſon*, is that with only a ſimple baſon of any figure whatever; in the middle whereof is a jet or ſpout, or perhaps a ſtatue, or even a group of figures.

Such

Such was formerly the fountain in the court of Buckingham-houſe.

Fountain, *Covered*, a kind of pavilion, built of ſtone, either inſulate, and ſquare, or round, or multilateral, or backed; and that either, with a projecture, or indenture, incloſing a reſervoir, and ſpouting or darting forth the water thereof through one or more cocks, in the middle of a ſtreet, ſquare, garden, court, or the like. Such was that in Lincoln's-inn New Square, London.

Fountain, *Cup*, is that which, beſides a baſon, has likewiſe a cup of one ſingle piece of ſtone, or marble, ſupported on a ſhaft or pedeſtal, and receiving a jet, or ſpout, riſing out of the middle thereof.

As the fountain in the court of the Vatican, the cup whereof is of granite, and antique, being brought from the baths of Titus at Rome.

Fountain, *Marine*, that compoſed of aquatic figures, as ſea divinities, naiads, tritons, rivers, dolphins, and other fiſhes, and ſhells. Such is the fountain of the palace of Paleſtrina at Rome, where the ſhell, ſupported by four dolphins, ſerves as a cup, and ſupports a triton, that ſpouts water out of his concha marina.

Fountain, *Naval*, is that made in the form of a veſſel. Such is that of the place D'Eſpagne, at Paris, repreſenting a bark: that at Monte-Cavello, repreſenting a galley: or that before the vineyard Mattei, at Rome, reſembling a boat.

Fountain, *Open*, is any ſpouting fountain with a baſon, cup, or other ornaments, all open; ſuch as are met with frequently in our gardens, and in the vineyards at Rome.

Fountain, *Pyramidal*, that formed of ſeveral baſons, or cups, ranged in ſtories over each other, and diminiſhing all the way, being ſupported by a hollow ſtem, or ſhaft. As the fountain of Monte-Dragone at Freſcati.

Or elſe ſupported by figures, fiſhes, or conſoles; the water whereof, in its fall, makes nets in divers ſtories, and repreſents a kind of water pyramid; as that at the head of the caſcades at Verſailles.

Fountain, *Ruſtic*, is that formed, or enriched, with rock-work, ſhell-work, petrifactions, &c.

Fountain, *Satyric*, is a kind of ruſtic fountain, in the manner of a grotto, adorned with termini, maſcaroons, fauns, ſylvans, bacchantes, and other ſatyrical figures, ſerving for ornaments, as well as jets d'eau.

Fountain, *Spouting*, or *jet d'eau*, is any fountain, whoſe water is darted forth impetuouſly through one or more jets, or ajutages, and returns in form of rains, nets, folds, or the like. See Jet *d'Eau*.

Fountain, *Spring*, a kind of plain ſpout, or ſtream of water, iſſuing out of ſtone, or a hole in a wall, without any decoration. Such is the fountain of Trevi at Rome.

Foutainn, *Statuary*, that which, being opened and inſulated, or even-backed, is adorned with one or more ſtatues, by way of finiſhing or crowning; as the fountain of Latona, at Verſailles; and that at the Shepherd at Caprarola.

There are alſo ſtatues which ſpout forth water at ſome of their parts; or at ſea-ſhells, vaſes, urns, and other attributes of the ſea.

Fountain, *Symbolical*, that where the principal ornaments are the attributes, arms, or cognizance, of the perſon who erected it. Such are the fountain of St. Peter in Montorio, reſembling a caſtle flanked with towers, and donjons, repreſenting the arms of Caſtile; and ſome other fountains at Rome, among which are the fleur-de-lis, and the dove, the bearings of the family of pope Innocent X.

Fountain-*pen*, is a ſort of pen contrived to contain a great quantity of ink, and let it flow, by gentle degrees, ſo as to ſupply the writer a long time without the neceſſity of taking freſh ink.

The fountain-pen, repreſented *Plate* XV. *Miſcellan. fig.* 4. conſiſts of divers pieces, F, G, H, of braſs, ſilver, &c. whereof the middle piece F carries the pen, which is ſcrewed into the inſide of a little pipe; which, again, is ſoldered to another pipe of the ſame bigneſs, as the lid G; in which lid is ſoldered a male ſcrew, for ſcrewing on the cover; as alſo for ſtopping a little hole at the place, and hindering the ink from paſſing through it: at the other end of the piece F is a little pipe, on the outſide whereof the top cover H may be ſcrewed. In the cover there goes a port-craion, to be ſcrewed into the laſt-mentioned pipe, in order to ſtop the end of the pipe into which the ink is to be poured by a funnel.

To uſe the pen, the cover G muſt be taken off, and the pen a little ſhaken, to make the ink run more freely.

FOUNTAINE, *Sir* Andrew, in *Biography*, an Engliſh antiquary, collector, and writer, was born at Norford in the county of Norfolk, and received his education at Chriſt-church college, Oxford, where he early diſtinguiſhed himſelf by his proficiency in Anglo-Saxon literature. Leaving the ſeat of the muſes to reſide on his eſtate, he erected a noble houſe, which became celebrated by the literary characters of the time, whoſe acquaintance the proprietor aſſiduouſly cultivated, and who were frequently entertained, as welcome gueſts, in his hoſpitable manſion. Among others were Swift, Addiſon, and Pope. By the latter ſir Andrew was complimented for his elegant taſte, and his reſidence continued to perpetuate a diſplay of it. Norford-hall was not only the rendezvous of living genius, but a repoſitory of arts and learning. Its owner evinced a love of the fine arts, and exhibited ſpecimens of his own attainments. The admirable deſigns for illuſtrating the Tale of a Tub he drew for Swift, with whom he was very intimate. He made a collection of choice pictures, ancient painted earthen ware, bronzes, ſtatues, coins, and numerous ſpecimens of curious antiquated remains; and ſtocked a large, handſome library with a fine ſelection of rare, valuable books and manuſcripts.

The founder of this repoſitory of the arts was made knight of the Bath by patent, during the reign of George the firſt, in 1726: and in the following year was appointed warden of the mint. He died in 1753. His treatiſe, entitled "Numiſmata Anglo-Saxonica, et Anglo-Danica, breviter illuſtrata," was printed in Hickes's Theſaurus, at Oxford, in 1704. Gen. Biog. Dict. and Blomefield's Hiſtory of Norfolk.

FOU-PIM, in *Geography*, a town of China, in the province of Pe-tche-li; 63 miles W. of Paoting.

FOU-PIN, a town of China, of the third rank, in the province of Quang-tong; 12 miles S.E. of Yao.

FOUQUIERES, James, in *Biography*, a landſcape painter, born at Antwerp in 1580. He ſoon quitted the ſtyle of Brughel, under whom he early in life ſtudied, and reſiding ſome time at Rome and Venice, imbibed a taſte for a more exalted view of nature, and mode of imitating her productions.

He ſtudied the works of Titian, and obtained very much of his grand ſtyle of compoſition and execution, though in the latter he was more ſharp, and had more of

what among artiſts is peculiarly denominated manner of touch, than his prototype, that great maſter of art.

Fouquieres was an excellent painter, and deſervedly gained a great reputation. He painted both in a large and ſmall ſtyle equally well, with a beautiful taſte in arrangement and effect, and with great force. Sometimes his colour is too green to be perfect, but in general it is very rich and pleaſing.

He was engaged and much careſſed at the court of the elector Palatine, and afterwards ſpent ſeveral years of his life in France, where his works met with univerſal approbation, and he was proportionally well paid for his paintings. Unhappily he ſunk at laſt into poverty, and died in the year 1659 in the houſe of an inconſiderable painter named Silvain, who lived in the ſuburbs of Paris.

FOUR Brothers, in *Geography*, four ſmall iſlands in the Eaſt Indian ſea. S. lat. 6° 54′. E. long. 115° 22′.

Four *Corners*, in the *Manege*, or to work upon the four corners, is to divide in imagination the volt or round into four quarters; ſo that, upon each of theſe quarters, the horſe makes a round or two at trot or gallop: and when he has done ſo upon each quarter, he has made the four-corners.

Four, *Cul de four*. See Cul.

Four *Evangeliſts*, in *Geography*. See Evangelists.

Four *Iſlands*, a cluſter of ſmall iſlands in the Pacific ocean, ſo called by lieutenant Shortland. S. lat. 4° 50′. E. long. 155° 36′.

Four *Keys*, ſmall iſlands in the bay of Honduras. N. lat. 17° 12′. W. long. 87° 55′.

Four *Mile Water*, a river of Ireland, which runs into Dunmannus bay, five miles S.W. of Bantry.

Four *Mile Creek*, a river of Kentucky, in America, which runs into the Ohio. N. lat. 36° 50′. W. long. 89° 30′.—Alſo, a river of Virginia, which runs into the Potomack. N. lat. 38° 56′. W. long. 77° 13′.

Four *Saddle Iſland*, an iſland in the Mergui Archipelago, about ſix miles in circumference, ſeparated by Alderſey's ſtraits from the ſouthern extremity of the iſland of St. Suſanna. N. lat. 10° 27′.

FOURCA, a town of Africa, in the kingdom of Hoval; 35 miles W. of Ender.

FOURCES, a town of France, in the department of the Gers; ſix miles W.N.W. of Condom.

FOURCHE, a river of North America, which runs into lake Michigan. N. lat. 44° 31′. W. long. 86° 38′.

FOURCHEE, or Fourchy, in *Heraldry*, denotes a croſs forked at the ends.

Upton rather repreſents it as anchored, the extremities turning in a circular manner to ſharp points; whereas the true croſs fourchee, *i. e.* forked, has its forks compoſed of ſtraight lines, and blunt ends.

FOURCHER, or Fourchir, Fr. an ancient law term, ſignifying a putting off, prolonging, or delaying an action.

As by ſtammering we draw out our ſpeech, not delivering that we have to ſay in ordinary time; ſo by fourching we prolong a ſuit that might be ended in a ſhorter ſpace.

In ſtat. Weſtm. I. cap. 42. we have theſe words: "Coparceners and joint-tenants ſhall be no more fourch, but only ſhall have one eſſoin," &c. And anno 6 Edw. I. cap. 10. it is uſed in the ſame ſenſe: "The defendants ſhall be put to anſwer without fourching," &c. In the Latin it is called *furcare*, and is uſed where a man and his wife do eſſoin ſeverally. "Caveat vir & mulier implacicati, quod ſemper in eſſonio alterius alter compareat, quamdiu furcare poſſint; & cum ultra non poſſint, concurrant coram eſſonio in ſuis locis: alter autem earum tantum unam eſſonium de malo lecti habere poteſt." Hengham Mag. cap. 9.

FOURCHES, in *Geography*, a chain of mountains in Switzerland, at the eaſtern extremity of the Valais, in which the Rhone riſes.

FOURCHETTE. *Fer de* Fourchette. See Fer.

FOURDAN-HOTUN, in *Geography*, a town of Corea, 653 miles E.N.E. of Peking. N. lat. 42° 51′. E. long. 131° 20′.

FOURMILLIER, in *Zoology*, the name given by Buffon to the *myrmecophaga didactyla* of Linnæus, or the little ant-eater; or leſſer yellowiſh *tamandua*; or the white American *coati*. See Myrmecophaga.

FOURMONT, Stephen, in *Biography*, diſtinguiſhed for his knowledge of languages, was born, 1683, in the neighbourhood of Paris. He had the misfortune to be early deprived of his parents, but his uncle placed him at the Mazarin college in Paris, where he quickly acquired a thorough knowledge of the Greek and Latin tongues. While a ſtudent he publiſhed "The roots of the Latin language put into French verſe," which was not only well received by the public, but immediately adopted as a ſchool book in various places of education. In connection with theological and philoſophical ſubjects, he began the ſtudy of the oriental languages. In the college of the Trente-ſois, he formed, in conjunction with the abbé Sevin, a ſociety of young eccleſiaſtics, ardent in literary purſuits, to read privately together the Greek and Latin poets, for which the leaders were expelled. Fourmont removed to the college of Montaigu, where he had the felicity of occupying the ſame apartment in which Eraſmus once lived, a circumſtance which increaſed his ardour for ſtudy. He gave a tranſlation of Aben Ezra's Commentary on Eccleſiaſtes, which increaſed his reputation as an orientaliſt. He was, after this, admitted an advocate, but never practiſed in that profeſſion. He was invited to Spain by the count de Toledo, who procured for him a penſion from the Spaniſh court, though he could not prevail upon Fourmont to leave his country. In 1715 he was appointed Arabic profeſſor in the royal college, and an aſſociate in the academy of inſcriptions and belles lettres; he gave public lectures in the Hebrew language, and put the Hebrew, Syriac, and Arabic roots into French verſe. He beſtowed much labour in attaining a knowledge of the Chineſe language; and engaged in the diſpute concerning Homer and the ancients which then divided the French literati. He was regarded by foreigners as well as by his own countrymen as an oracle in oriental learning, and was elected a member of the London and Berlin royal ſocieties. He died in the year 1745, leaving behind him many works that teſtify to his talents, his induſtry and learning; among theſe are "Reflexions critiques ſur les Hiſtoires des anciens Peuples juſqu'au Tems de Cyrus," in two vols. 4to. "A Chineſe grammar in Latin," folio. Moreri.

FOURNELS, in *Geography*, a town of France, in the department of Lozére, and chief place of a canton in the diſtrict of Marvejols. The place contains 571, and the canton 5932 inhabitants, in a territory of 197½ kiliometres, and 11 communes.

FOURNIER, Peter Simon, in *Biography*, an eminent engraver and letter founder, born at Paris in 1712, excelled in the practice of the typographical art, and illuſtrated it by his writings. He wrote ſeveral treatiſes on the origin and progreſs of his favourite art, which were collected in one volume 8vo. divided into three portions, of which the laſt contained a curious hiſtory of engravers in wood; but his moſt conſiderable production is entitled "Manuel Typo-

Typographique," in two vols. 8vo, deſigned as well for general readers as for the inſtruction of artiſts. He died in 1768; he was a man of great piety, fond of retirement, and extremely induſtrious.

FOURNIS, in *Geography*, a town of the iſland of Samos; two miles N.E. of Carlovaſſi.

FOURNO, a town of Aſiatic Turkey, in Caramania; 104 miles W.S.W. of Satalia.

FOURS, a town of France, in the department of the Niévre, and chief place of a canton in the diſtrict of Nevers. The place contains 80[illegible], and the canton 8222 inhabitants, on a territory of 382½ kiliometres, and in 13 communes.

FOURTEENTH, in *Muſic*, is the replicate or octave of the ſeventh; the major fourteenth has a ratio of $\frac{4}{15} = 1167\,\Sigma + 23\,f + 101\,m$; the greater minor fourteenth of ſome is $= \frac{5}{18} = 1131\,\Sigma + 22\,f + 98\,m$, and the leaſt minor fourteenth $= \frac{9}{32} = 1120\,\Sigma + 22\,f + 97\,m$.

FOURTH, one of the harmonic intervals or concords.

The fourth is the fourth in order of the concords. It conſiſts in the mixture of two ſounds, which are in the ratio of 4 to 3; *i. e.* of ſounds produced by chords, whoſe length are to each other as 4 : 3.

It is called fourth, becauſe containing four terms, or ſounds, between its extremes, and three degrees; or, as being the fourth in the order of the natural ſcale, from the fundamental.

Some modern muſicians have doubted whether the fourth ſhould be received among the number of concords, or not. The ancients expreſsly admitted it as ſuch, and Andreas Papius wrote a treatiſe againſt thoſe moderns who reject it. Merſen. Harm. lib. iv. prop. 8. Wallis, Append. Ptolem. Harm. p. 182. Indeed the ancients always regarded it as a concord of the moſt perfect kind. Its terms were the boundaries of all the tetrachordal ſyſtems; and though ranked as a diſcord by ſeveral moderns in counterpoint, it is ſtill a mathematical conſonance in the diviſion of the monochord; and even in counterpoint, as an inverſion of the fifth $\begin{matrix} C \\ G \end{matrix}$; nor can a common chord in triad be played in its firſt ſtage without a fourth in its compoſition $\begin{matrix} C \\ G \\ E \end{matrix}$. When accompanied by the fifth it is certainly a diſcord, and ſo is the third accompanied by the fourth, the fifth by the ſixth, &c. Dr. Pepuſch and Padre Martini claſs the fourth among perfect concords, and ſo do all theoriſts who have dipt into the muſic of the ancients, or mathematics.

N. B. Examples of the uſe of the fourth, in three and four parts, will be given in notation upon one of the muſic plates.

This is the interval which the ancients called diateſſaron or tetrachord: it is the complement of the fifth, and partakes much of its ſweetneſs of harmony; it conſiſts of five of the half-notes of keyed inſtruments which have 12 ſounds in the octave. It is uſually marked fourth in the works of thoſe who treat of muſical intervals, and it is the largeſt of the three concordant elements: its ratio is $\frac{3}{4} = \frac{3}{2^2}$, and in Mr. Farey's new notation is expreſſed by $254\,\Sigma + 5\,f + 22\,m$: its common logarithm is .8750612,6339, and its binary or Euler's logarithm .415038 (wherein the octave = 1); it is = 23.158110 major commas: it is alſo the ſum of a major, a minor, and a major ſemi-tone, is equal to two tones and a limma, to a minor third and minor tone, a major third and a major ſemi-tone, to a major tone, two limmas, and an apotome, and is a medius ſemi-tone leſs than the tritone. Beſides the above, ſeveral other intervals bear the names of fourth, as

FOURTH, *Flat*, the diminiſhed fourth of Tartini, or dieſis-exceſſive major third; it is leſs than a true fourth by the minor ſemi-tone, and conſiſts of four half-notes; its ratio is $\frac{25}{32}$ $= 218\,\Sigma + 4\,f + 19\,m = \frac{5^2}{2^5}$; its common logarithm is .8927900,3035, and its binary log. = .356143; it contains 19.87198 major commas, and conſiſts of a major third and an enharmonic dieſis, a minor third and a major ſemitone, a major tone and two major ſemi-tones; it is the exceſs of a major third over a minor third and minor fourth, and of an octave over two major thirds; by either of which laſt it may be tuned on an organ.

FOURTH, *Sharp*, the ſuperfluous or greater fourth of ſome, or deficient tritone, is greater than a true fourth by the minor ſemitone, and conſiſts of ſix half-notes; its ratio is $\frac{18}{25} \frac{= 2 \cdot 3^2}{5^2} = 290\,\Sigma + 6\,f + 25\,m$, its common logarithm is .8573324,9643, and its binary log. = .473932; it contains 24.44423 major commas, and conſiſts of a major and two minor tones; it is the difference between three major tones and two major commas, of a tritone and major comma, of a minor third and the ſum of a major third and minor fourth, and of a minor third and major ſixth, whence it may be tuned.

FOURTH, *Greateſt Sharp*, or redundant ſharp fourth, the tritone, falſe fourth, or tritonus of ſome, exceeds a true fourth by the medius ſemi-tone; its ratio is $\frac{32}{45} = \frac{2^5}{3^2 5} = 301\,\Sigma + 6\,f + 26\,m$: its common logarithm is .8519374,6454, and its binary log. .491851; it is 27.44423 major commas: it is equal to two major and one minor tones, to a major third and major tone, to the difference between a fifth and a major ſemi-tone, or three tones and a major comma; it is alſo the difference between a fourth, and two major and one minor third, or between a minor fourth and a fifth and major third, whence it may be tuned.

FOURTH, *Greateſt Sharp*, or double redundant ſharp fourth, the tritonus of the Greek ſcale, or ancient, or redundant, or ſuperfluous tritone of ſome, is larger than a true fourth by the apotome; its ratio is $\frac{512}{729} = \frac{2^9}{3^6} = 312\,\Sigma + 6\,f + 27\,m$; its common logarithm is .8465424,3266, and its binary log. 509772: it is 28.44423 major commas, and conſiſts of three major tones, or of three apotomes and three limmas: it is the difference between a fifth and a limma; between ſix fifths and three octaves, or between three fifths and three fourths, whence it can be tuned.

FOURTH, *Leſſer Flat*, or deficient flat fourth, is leſs than a true fourth by the medius ſemi-tone; its ratio is $\frac{405}{512} = \frac{3^4 5}{2^9}$ $= 207\,\Sigma + 4\,f + 18\,m$: its common logarithm is .8981850,6224, and its binary log. .338224: it is 18.87198 major commas: it is equal to a minor tone and two major ſemi-tones, to a minor third and a limma, to a major third and a minor comma; to a major tone, a major ſemi-tone, and a limma: it is alſo the difference between three 4ths and

and two major and one minor thirds, whence it may be tuned.

Fourth, *Leaſt Flat*, or double deficient flat fourth, is an apotome leſs than a true fourth, its ratio is $\frac{6561}{8192} = \frac{3^8}{2^{13}}$ $= 196\,\Sigma + 4f + 17m$; its common logarithm is .9035800,9412, and its binary log. = .320303; it is 17.87198 major commas; it is equal to a major tone and two limmas, to an apotome and three limmas; it is the difference between a major third and a ſchiſma, alſo between five octaves and eight fifths, or five fourths and three fifths, whence it may be tuned.

Fourth, *Comma-deficient*, the deficient fourth, or the leſſer fourth of Holder, is a comma leſs than a true fourth, as its name imports; its ratio is $\frac{243}{320} = \frac{3^5}{2^7 5} = 243\,\Sigma + 5f + 21m$; its common logarithm is .8804562.9528, and its binary log. = .397117; it is 22.15811 major commas, and conſiſts of two minor tones and a major ſemitone; of a major third and a limma; and is the difference between three fourths and two minor and one major thirds, whence it can be tuned.

Fourth, *Comma-redundant*, the redundant fourth, the greater fourth of Holder, and the ſuperfluous fourth of Galileo, exceeds a true fourth by the major comma; its ratio is $\frac{20}{27} = \frac{2^2 5}{3^3} = 265\,\Sigma + 5f + 23m$; its common logarithm is .8690662.3150, and its binary log. = .432958: it is 24.15811 major commas, and is equal to two major tones, and a major ſemitone, to a minor third and a major tone; it is the difference between two minor and one major thirds and a fourth, alſo between two fifths and a major ſixth, whence it may be tuned.

Fourth, *Diaſchiſma-exceſſive*, exceeds a true fourth by the diaſchiſma, being the reſulting fourth, or that between the *bearing notes*, when eleven ſucceſſive perfect fourths (or 11 fifths) are tuned in an octave: its ratio is $\frac{131072}{177147} = \frac{2^{17}}{3^{11}} = 266\,\Sigma + 5f + 23m$; its common logarithm is .8691761,2437, and its binary log. = .434583; it is 24.24895 major commas, is equal to two major tones and an apotome, to three apotomes and two limmas: it is the difference between a fifth and two limmas, between 11 fifths and ſix octaves, between five octaves and 11 fourths, or between five fifths and ſix fourths; whence it may be tuned.

Fourth, *Extreme diminiſhed*, the enharmonic leſſer third of ſome, is two minor ſemitones ſmaller than a true fourth, and an enharmonic dieſis greater than a minor third; its ratio is $\frac{625}{768} = \frac{5^4}{2^8 3} = 182\,\Sigma + 3f + 16m$: its common logarithm is .9105187,9731, and its binary logarithm .297249; it is 16.58587 major commas, and is equal to three major ſemitones and a major comma, to a major and a minor tone and an enharmonic dieſis: it is the difference between a minor fourth with two major thirds, and two minor thirds, or between a major twelfth and four major thirds, and hence it may be tuned on an organ.

Fourth *Point, Arches of the.* See Arch.

Fourth *Rate.* See Rate.

FOUSSERAT, in *Geography*, a town of France, in the department of the Upper Garonne, and chief place of a canton in the diſtrict of Murat; 29 miles S. W. of Toulouſe. The place contains 2,100. and the canton 7,857 inhabitants, on a territory of 187½ kiliometres, in 18 communes.

FOU-TCHEOU, a city of China, of the firſt rank, in the province of Fo-kien, and one of the moſt conſiderable cities in the province; diſtinguiſhed by the beauty of its ſituation, the trade it carries on, the number of its learned men, and the convenience of its rivers and port; and particularly by the magnificence of its principal bridge, which has more than 100 arches, conſtructed of white ſtone, and ornamented throughout with a double baluſtrade. This city is the reſidence of a viceroy, and has under its juriſdiction nine cities of the third claſs; 870 miles S. of Peking. N. lat. 26° 4′. E. long. 119° 4′.

Fou-tcheou, or *Vou-tcheou*, a city of China, of the firſt rank, in the province of Kiang-ſi, and formerly one of the moſt beautiful cities in China; but ſince the invaſion of the Tartars it has been a heap of ruins, conveying ſtill ſome idea of its ancient magnificence. The air is pure, the people are active and induſtrious, and the adjacent fields well cultivated. Its diſtrict is about 25 leagues in extent; and belonging to it are ſix cities of the third claſs.

FOU-TCHING-Y, a town of China, in the province of Kiang-nan; 17 miles N. E. of Liu-tcheou.

FOU-TCHUEN, a town of China, in the province of Chan-ſi; 35 miles E. N. E. of Ping-lo.

FOU-TSING, a town of China, of the third claſs, in the province of Fo-kien; 17 miles S. S. E. of Fou-tcheou.

FOUX, Cape, a cape on the N. W. coaſt of the iſland of Hiſpaniola. N. lat. 19° 46′. W. long. 74° 14′.

FOU-YANG, a town of China, of the third rank, in the province of Tche-kiang; 31 miles N. N. E. of Yen-tcheou.

FOUYU, a town of the kingdom of Corea; 16 miles N. of Hetſin.

FOWEY, or Fawey, a borough, market, and ſea-port town, in the hundred of Poweter, and county of Cornwall, is ſituated on the weſtern banks of the river Fawey, which here expanding its waters into a ſpacious eſtuary, forms a ſecure harbour, capable of receiving veſſels of a thouſand tons burthen at all ſtates of tide. This is a place of conſiderable antiquity, and made a diſtinguiſhed figure in a maritime and commercial view at ſeveral periods of our hiſtory. Leland informs us, that, ſubſequent to the conqueſt, it belonged to one Caridinham, a perſon celebrated in his day, who beſtowed it on a priory, ſaid to have been founded by him, near Tywardreth, at which time it was a ſmall fiſhing town. It owed its proſperity originally to the wars between the Engliſh and French; afterwards to an extenſive piratical ſyſtem; and at length flouriſhed by the more honourable means of commerce. This place was conſpicuous in the reigns of king Edward the Firſt and Third. In the time of the latter the veſſels of this port, ſailing by Rye and Winchelſea, and refuſing the demanded curteſy to thoſe havens, engaged the armed veſſels ſent to enforce it, which having defeated, the place in future, as a memorial of this event, quartered the arms of thoſe towns with its own armorial inſignia. In the reign of Edward the Fourth, after a peace had been concluded between this country and France, "the *gallants* of Fowey," as they were then termed, ſtill kept their ſhips in a warlike condition, and, in deſpite of the royal mandate to the contrary, carried on hoſtilities againſt the French; for which offence the veſſels belonging to this port were ſeized, and their commanders ſent priſoners to London. This induced the inhabitants to turn their attention from martial to commercial ſpeculations. In return for its devaſtations on the coaſt of France, Fowey received frequent hoſtile viſits from the French. For its defence in the time of Henry the Fourth, two ſquare baſtion forts

forts were erected with port-holes for mounting of cannon, the remains of which ſtand on each ſide the entrance to the harbour. As an additional ſecurity alſo, a large chain extended from fort to fort. Sir Thomas Treffry, in the time of Henry the Sixth, embattled and fortified his houſe, and erected a ſtrong additional tower, and thus converted it into a formidable caſtellated manſion. This, called *place*, though in a dilapidated ſtate, is worthy of notice from its antiquity, ſtyle of architecture, and ornamental ſculpture. During the civil wars this and the adjacent towns were occupied by the parliamentarians, under the command of the earl of Eſſex, where he was ſo hard preſſed, and ſurrounded by the king's troops, as to be driven to the diſgraceful expedient of abandoning the army to its fate, while he, the lord Roberts, and a few other officers made their eſcape, by embarking in a ſmall veſſel at Fowey, which conveyed them to Plymouth.

The houſes of the preſent town are in general conſtructed of ſtone, and extend for about a mile along the ſide of the river; but the ſtreets are ſo inconveniently narrow and irregular, that ſcarcely carriages of any deſcription can paſs through them. The church is a handſome edifice with a tower at the weſt end, decorated with many carved ornaments, and ſtrengthened by buttreſſes at the angles, terminating in purfled pinnacles. The roof is embelliſhed with angels carved in wood, ſuſtaining armorial ſhields, and various other devices; and ſome of the pews are ornamented in a ſimilar manner.

The market houſe is large and ſpacious, over which a neat town hall was erected a few years ago, at the expence of Philip Raſhleigh, and lord viſcount Valletort, at that time the parliamentary repreſentatives of the borough. The charitable eſtabliſhments are two free ſchools, an almſhouſe for eight decayed widows, and an excellent poor-houſe. Fowey is governed by a corporation, conſiſting of a mayor, eight aldermen, a recorder, and two aſſiſtants; of which the mayor and aldermen are juſtices of the peace. It is a feudal tenure, held under the prince of Wales as part of his duchy of Cornwall, and firſt ſent two members to parliament, the fourteenth year of Edward the Third, but the following year the privilege was diſcontinued, and the franchiſe not reſtored till the thirteenth of Elizabeth. The right of election, twice conteſted in one ſeſſions, appears to reſide in the prince's tenants, admitted to fealty and homage, and in all the inhabitants who pay ſcot and lot. Here are a well ſupplied weekly market on Saturdays, and three annual fairs. According to the returns made under the population act in 1801, the number of houſes was 213, containing 1155 inhabitants.

Fowey, by a late traveller, has properly been denominated "a colony of fiſhermen;" for moſt perſons here are either directly or remotely connected with the *pilchard* fiſhery, in which concern many veſſels belonging to the town are uſually employed. At the ſeaſon when the annual ſhoal of pilchards is expected, a number of watchmen, called *huers*, are ſtationed on the neighbouring rocks, to obſerve and give notice to the fiſhermen of the courſe and direction taken by the fiſh: ſmall ſail-boats are alſo diſpoſed of along the coaſt for the ſame purpoſe. It is eſtimated, that, on an average every ſeaſon, upwards of 28,000 hogſheads of fiſh are caught and brought into this port. The refuſe of the ſalt and broken fiſh are generally ſold for agricultural purpoſes, at about half a guinea per cart load. During other parts of the year, numerous trawl-boats are occupied in taking divers kinds of white fiſh, and ſome of the inhabitants find employ in the tin mines of the vicinity. The harbour is now defended by two ſmall batteries, recently erected, and St. Catherine's fort, built by the townſmen in the reign of Henry the Eighth, which is ſituated on the ſummit of a magnificent pile of rocks, that bound one ſide of the river. Theſe rocks are compoſed of a hard blueiſh ſlate, containing veins of a ſubſtance, which, from the greaſineſs to the touch, is denominated by mineralogiſts *fat quartz*. Thoſe on the Polruan ſide are extremely rude and bold, and, with the ruins of a chapel, form highly pictureſque ſcenery. See Leland's Itinerary. Polwhele's Hiſtory of Cornwall. Beauties of England and Wales.

FOWL, in a general ſenſe, is of equal import with bird.

Fowl is, in a more peculiar manner, underſtood of poultry, or the larger ſort of birds, both domeſtic and wild, either bred up, or hunted, for the table.

Such as turkies, geeſe, cocks, hens, and ducks, both wild and tame, pheaſants, partridges, pigeons, ſnipes, &c. See Poultry.

Though birds of this ſort can only afford profit under particular circumſtances, and in ſituations that are adapted to them, the farm yard cannot be ſaid to be properly ſtocked unleſs they are found in it. They are beſides, in many caſes, extremely convenient in affording eggs and feathers, as well as in the young brood. They are generally the moſt profitable on farms of the arable kind, where grain muſt be unavoidably ſcattered, and near large market towns, where they can be readily diſpoſed of at good prices. In chooſing ſtock of this ſort, young hens are to be preferred where eggs are wanted, and old ones, where chickens are the chief objects of the farmer. Some ſorts of hens are much better layers and breeders than others, which ſhould always, of courſe, be choſen. They may be ſet from two years old to five, with moſt advantage, and from the beginning of February to near Michaelmas. They ſit about three weeks in general, and ſhould be well ſupplied with meat, water, and ſand, during the time, that they may not leave their eggs too long, in ſeeking them. One male bird is ſufficient for ten or twelve females.

Breeding and laying fowls ſhould be kept well, but not by any means ſo as to be fat. They may be fed with any ſort of grain or ſeeds; but where their food is buck-wheat, hemp, canary, or other ſeeds of a ſimilar kind, they are ſaid to lay the beſt. Animal ſubſtances are likewiſe aſſerted to make them lay earlier than uſual.

In fattening fowls, the common food is moſtly ſome ſort of grain, or barley meal moiſtened with milk; but ſome prefer wheat flour mixed with ſteamed potatoes, and others buck-wheat ground into flour and made into a ſort of paſte with milk. They require to be carefully and regularly fed during the time they are fattening.

It is neceſſary, in order to derive the greateſt poſſible profit from fowls, to have a proper houſe, and ſmall incloſure ſet apart for their reception, contiguous to the farm yard, into which they ſhould conſtantly have free acceſs. They ſhould in addition be regularly fed once or twice in the day in the houſe, and kept ſufficiently warm during the ſevere weather in the winter ſeaſon.

Turkeys require care at the time of their hatching, and while the brood is young, but are afterwards equally hardy with the common fowl. See Turkey and Poultry.

Geeſe and ducks are fowls of the water kind, which require but little care where they have large ponds or other waters to feed and ſwim upon. They will however require to be fed in the ſevere winter months with ſome ſort of grain, or other kinds of food. Geeſe and ducks that are ſome years old are the beſt for breeding from, and one male bird is ſufficient for ſeveral females.

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The lighteſt coloured geeſe are the beſt, and thoſe that begin to lay the ſooneſt; as they have a chance of hatching twice in one year. They begin to lay in the ſpring, and lay twelve or ſixteen eggs. Green geeſe are begun to be fattened at a month old, and will be fattened in a month more. Old geeſe are chiefly fattened at ſix months old, in or after the harveſt. A wild gooſe, if red-footed and hairy, is old; but if white-footed, and not hairy, ſhe is young. See Goose and Poultry.

When the eggs are ſet under a hen, or other fowl, it is adviſeable to mark the upper ſides thereof: and when ſhe goes to feed, to note whether ſhe minds to turn them upſide down or not; if ſhe neglect that office it may be done for her.

The *Sea-fowls*, which come on ſhore in immenſe numbers to rooſt in the north iſlands of Scotland, ſet their watches and centinels at diſtant poſts, to give them notice of any danger; on the leaſt alarm from theſe, the whole body riſes, but without ſuch notice they are not to be alarmed by almoſt any thing. The people of the country know this; and when they go out to take them, they employ all their art to take the centinels without noiſe; this they ſometimes ſucceed in, and when they do, they often afterwards catch three hundred of the others, or more, in one night. Phil. Tranſ. N° 233.

The laying of theſe ſea-birds is leſs certain as to time than might be imagined. They can occaſionally defer it; and as they uſually lay in a rainy ſeaſon, if the rain does not come on at the uſual time, they will defer it ſome weeks; and if the April moon goes far in May, that alſo has been obſerved to hinder them from laying ten or twelve days longer than ordinary. See Bird.

Water-fowl may be taken in great abundance by nets properly managed. The net for this purpoſe ſhould be always made of the ſmalleſt and ſtrongeſt packthread that can be got. The meſhes may be large, but the nets ſhould be lined on both ſides with other ſmaller nets, every meſh of which is to be about an inch and a half ſquare each way, that as the fowl ſtrike either through them or againſt them, the ſmaller may paſs through the great meſhes, and ſo ſtraighten and entangle the fowl.

Theſe nets are to be pitched for every evening flight of fowl, about an hour before ſun-ſet, ſtaking them on each ſide of the river, about half a foot within the water, the lower ſide of the net being ſo plummed, that it may ſink ſo far and no farther; place the upper ſide of the net ſlantwiſe, ſhoaling againſt the water, but not touching it by near two feet; and let the ſtrings, which ſupport this upper ſide of the net, be faſtened to ſmall yielding ſticks ſet in the bank; theſe, as the fowl ſtrikes, will give the net liberty to play, and to entangle them. Several of theſe nets ſhould be placed at once over different parts of the river, at about twelve ſcore fathom diſtance one from another: and if any fowl come that way, the ſportſman will have a ſhare of them. It is a good method, when the nets are ſet, to go to places ſufficiently diſtant from them with a gun, to frighten them toward the places where the nets are; and wherever any of the fowl are ſtarted from, it may not be amiſs to plant ſome nets alſo there, to take them as they return. The nets are to be left thus placed all night, and in the morning the ſportſman is to go and ſee what is caught; he ſhould viſit the river firſt, and take up what are caught there, and frightening the reſt away to the other places where his nets are, he is next to viſit them, and take what are there ſecured.

The Ceyloneſe have great plenty of water-fowl wild on their iſland, and have a very remarkable way of catching them, which is this: the fowler enters a lake or other water which has a good bottom, and is not very deep; he puts an earthen pot upon his head, in which there are bored holes, through which he can ſee; he keeps himſelf ſo bent down in the water, that only the pot is above the ſurface; in this manner he enters the place where the wild fowl are in cluſters, and they think it is only ſome floating block. He then takes ſome one by the legs, and gently draws it under water, and wrings its neck till he has killed it; then putting it into his bag, which is faſtened about his middle, he takes hold of another in the ſame manner, and ſo on, till he has got as many as he can carry off, and then he goes back in the ſame manner in which he came, not diſturbing the reſt of the birds, who never miſs their companions, but only ſuppoſe that they dive down for their diverſion, when the fowler pulls them under. In places where this has been practiſed ſo long or ſo careleſsly, that the birds are ſhy, the fowler uſes a gun; but this he does in the following manner: he makes a ſcreen of about five feet high, and three feet wide, which he carries in one hand ſtraight between himſelf and his game, and in the other hand his gun. The birds are not alarmed at what appears only a buſh; for this ſcreen is always covered with branches of trees freſh cut down, and full of leaves, ſo that the ſportſman behind advances as near as he pleaſes, and then putting the gun through ſome crevice of the ſcreen, he fires. See Decoy. See alſo Bird-*Catching*.

Fowl *Dung*, the dung of all ſorts of domeſtic birds, which is ſaid to be excellent as a top-dreſſing, when ſown over young corn crops by the hand. See Top-*dreſſing*.

Fowl *Manure*, that ſort which is afforded by fowls, See Manure.

Fowl, *Wild, driving of*. See Driving.

FOWLER, Edward, in *Biography*, was born in the year 1632, at Weſterleigh, in Glouceſterſhire, of which place his father was miniſter, till he was ejected by the act of uniformity. Having been well grounded in the elementary parts of learning, he obtained the appointment of one of the clerks to Corpus Chriſti college, in the univerſity of Oxford. In 1653 he was choſen one of the chaplains of the inſtitution, and ſoon after took his degree of bachelor of arts. At Trinity college, Cambridge, he took the degree of maſter of arts, and was incorporated in the ſame degree at Oxford, in the year 1656. He was preſented about this period with the rectory of Northill, in Bedfordſhire, but as he had been educated in Preſbyterian principles, he ſcrupled, at firſt, to comply with the terms of conformity, eſtabliſhed at the reſtoration of Charles II.; his views being, however, changed, he was admitted a clergyman of the church of England, to which he ſteadily adhered to the end of his life. In the year 1673 he was introduced by archbiſhop Sheldon to the living of All-hallows, Bread-ſtreet, London: and ſoon after he was preſented with a prebend in the cathedral church of Glouceſter; and with the vicarage of St. Giles's, Cripplegate. In 1681 he accumulated the degrees of bachelor and doctor of divinity in the univerſity of Oxford. Dr. Fowler poſſeſſed a mind much too liberal for the times in which he lived. He was proſecuted and ſuſpended by the inſtruments of James II.'s tyranny, under pretence of having tranſgreſſed the canons of the church. He was not to be intimidated by the infliction of illegal puniſhments: he ſtill reſiſted the unconſtitutional attempts of king James to extend the regal prerogative by aſſuming a power to diſpenſe with the exiſting laws; and was the ſecond perſon who, in 1688, ſigned a reſolution entered into by the London clergy, not to read the king's new declaration for liberty of conſcience. This reſolution

was

was taken in oppoſition to the king's aſſumption of a diſpenſing power, which tended to the ſubverſion of the conſtitution, and to inveſt him with arbitrary authority. The clergy in this cauſe were ſupported by all the conſiſtent friends of liberty among the diſſenters, and in the eſtabliſhment. When the new government was ſettled, Dr. Fowler's learning and zeal were not forgotten: he was in 1691 nominated to the ſee of Glouceſter, in which ſituation he remained, diſcharging with exemplary aſſiduity the duties of his biſhopric until he was diſabled by his growing infirmities. He died at Chelſea, near London, in 1714, in the eighty-ſecond year of his age. He had been a great writer, but his works being chiefly of the controverſial kind, it would be of little uſe to enumerate them here, ſince almoſt all the ſubjects then in diſpute have long ſince been laid at reſt. One of the principal of the biſhop's works, and which reflects much credit on his underſtanding and memory, was entitled, "The Deſign of Chriſtianity, or a plain demonſtration and improvement of this propoſition, *viz.* that the enduing men with inward, real righteouſneſs, or true holineſs, was the ultimate end of our Saviour's coming into the world, and is the great intendment of his bleſſed goſpel." Biog. Brit.

Fowler, Thomas, was born at York on the 22d of January, 1736, and, after having gone through a courſe of claſſical and medical education, he engaged in the practice of pharmacy, in his native city, in the year 1760. In 1774, however, he relinquiſhed this branch of practice, in order to apply himſelf more cloſely to the ſtudy of medical ſcience; and for this purpoſe he went to Edinburgh, where he graduated in 1778. He then ſettled at Stafford, and was ſoon after elected phyſician to the infirmary at that place, where he practiſed with conſiderable reputation and ſucceſs until the year 1791, when he returned to his native city. Here he met with the moſt flattering encouragement in the exerciſe of his profeſſion: but his ardent attention to his profeſſional duties and ſtudies was conſiderably interrupted, in July 1793, by an attack of a painful, anomalous diſeaſe of the cheſt, which he deſcribed as "fits of ſpaſmodic aſthma, attended with moſt of the painful ſymptoms of the angina pectoris." After conſulting many eminent phyſicians, and trying a variety of medicines, with partial and tranſient relief, for two years, he was agreeably ſurpriſed by a ſpontaneous and gradual decline of the ſymptoms, and was at length totally free from them. Notwithſtanding the check to his exertions which he received from this complaint, his profeſſional emoluments and reputation continued to increaſe; and in 1796 he was appointed, without ſolicitation, and even without his knowledge, phyſician to the lunatic aſylum, near York, called the "Retreat," eſtabliſhed by the ſociety of quakers, for the relief of the inſane members of their community. He was a member of the medical ſocieties of Edinburgh, of the medical ſociety of London, and of the Briſtol medical ſociety; in the latter of which he was propoſed by a gentleman to whom he was perſonally unknown, (Dr. Fox,) and who informed him of his election in an epiſtle highly flattering to his literary and profeſſional attainments. Dr. Fowler continued his uſeful career, active in every duty that benevolence could dictate, or friendſhip demand, and, in the exerciſe of his profeſſion, an example of generoſity, unwearied diligence and humanity, until the year 1801, when he died, on July 22d, while upon a viſit to ſome friends in London.

He was attached to the ſtudy of medicine with almoſt enthuſiaſtic partiality, and ſtudiouſly cultivated as a ſcience, what he induſtriouſly practiſed as a duty. He exemplified the method recommended by lord Bacon for the improvement of medicine, perhaps more than any of his predeceſſors or contemporaries; and ſome idea of his indefatigable labours may be conceived, when we mention, that he left in manuſcript the hiſtory of more than ſix thouſand caſes, which fell under his own inſpection and treatment. From this ſtore of experimental knowledge he publiſhed ſeveral works. The firſt of theſe was entitled, "Medical Reports on the Effects of Tobacco," which was publiſhed in the year 1785; and in the year following his ſecond treatiſe appeared, under the title of "Medical Reports on the Effects of Arſenic." Theſe uſeful works tended, in a conſiderable degree, to remove the fears and prejudices of practitioners with regard to theſe violent, but, under proper regulation, important and moſt beneficial agents, and to inſtruct the profeſſion in the means of rendering them ſafe and manageable as remedies; and accordingly they are now, more eſpecially the latter, in daily and familiar uſe, and rank among the valuable articles of the materia medica. Even during the two years, in which his literary exertions were conſiderably impeded by the painful diſeaſe under which he laboured, he was actively employed, in the intervals of eaſe, in arranging from his notes materials for other works upon the ſame plan; and in 1795 he dedicated to the medical profeſſors of Edinburgh a volume of "Medical Reports on the acute and chronic Rheumatiſm." Had his uſeful life been prolonged, he would have purſued ſtill farther this plan of inductive experience, after the Baconian ſyſtem, and have contributed to the farther advancement of his favourite ſcience. He was, beſides, the author of ſeveral papers, printed in different volumes of the Medical Commentaries, and Annals of Medicine, edited by Drs. Duncan of Edinburgh. See Ann. of Med. for 1801.

FOWLING, the act or art of catching birds with nets, birdlime, decoys, and other devices; as alſo of breeding up the ſame.

Fowling is alſo uſed for the purſuing and taking of birds with hawks, falcons, and other birds of prey; more properly called falconry and hawking.

Fowling-*piece*, a portable fire-arm for the ſhooting of birds. Of fowling pieces, thoſe are reputed the beſt, which have the longeſt barrel, *viz.* from $5\frac{1}{2}$ feet to 6, with a moderate bore; though for different occaſions they ſhould be of different ſorts and ſizes: but in all it is eſſential the barrel be well poliſhed, and ſmooth within, and the bore of an uniform bigneſs, from one end to another; which may be proved by thruſting in a piece of wood, cut exactly to the bore of the muzzle, down to the touch-hole; for if this goes down without ſtoppage, you may conclude that the bore is good. The bridge-pan ſhould be a little above the touch-hole, and ought to have a notch to let down a little powder, which will prevent the piece from recoiling. The locks ſhould be accurately filed, and their ſprings be neither too ſtrong nor too weak. The hammer ought to be well hardened, and pliable, ſo as to go down to the pan with a quick motion.

The following obſervations on the manufacture and perfection of a fowling-piece are extracted from the "Pantologia." In forming the gun-barrel, the workmen begin by heating and hammering out a bar of iron into the form of a flat ruler, thinner at the end intended for the muzzle, and thicker at that for the breech; the length, breadth, and thickneſs of the whole plate being regulated by the intended length, diameter, and weight of the barrel. This oblong plate is then, by repeated heating and hammering, turned round a cylindrical rod of tempered iron, called a mandril, whoſe diameter is conſiderably leſs than the intended bore of the barrel. The edges of the plate are made to overlap each

other about half an inch, and are welded together by heating the tube in lengths of two or three inches at a time, and hammering it, with very briſk but moderate ſtrokes, upon an anvil which has a number of ſemi-circular furrows in it, adapted to the various ſize of the barrels. The heat required for welding is the bright white heat, which immediately precedes fuſion, and at which the particles of the metal unite and blend ſo intimately with each other, that, when properly managed, not a trace is left of their former ſeparation. Every time the barrel is withdrawn from the forge, the workman ſtrikes the end of it once or twice gently againſt the anvil in an horizontal direction: this operation, called by the Engliſh artiſts "jumping," and by the French "eſtoquer," ſerves to conſolidate the particles of the metal more perfectly, and to obliterate any appearance of a ſeam in the barrel. The mandril is then introduced into the bore or cavity; and the barrel, being placed in one of the furrows or moulds of the anvil, is hammered very briſkly by two perſons beſides the forger, who all the while keeps turning the barrel round in the mould, ſo that every point of the heated portion may come equally under the action of the hammers. Theſe heatings and hammerings are repeated until the whole of the barrel has undergone the ſame operation, and all its parts are rendered as perfectly continuous as if it had been bored out of a ſolid piece.

The imperfections to which a gun-barrel is liable in forging are of three kinds, *viz.* the chink, the crack, and the flaw. The chink is a ſolution of continuity, running lengthways of the barrel; the crack is a ſolution of continuity, more irregular in its form than the chink, and running in a tranſverſe direction, or acroſs the barrel; the flaw is a ſmall plate or ſcale, which adheres to the barrel by a narrow baſe, from which it ſpreads out as the head of a nail does from its ſhank; and, when ſeparated, leaves a pit or hollow in the metal. The chink and flaw are of much greater importance with regard to the ſoundneſs of the barrel than the crack, as the effort of the powder is exerted upon the circumference, and not upon the length of the barrel. The flaw is much more frequent than the chink. Theſe defects, within the barrel, are of a material diſadvantage, by affording a lodgement to moiſture and foulneſs that corrode the iron, and thus continually enlarge the excavation until the barrel burſts, or becomes dangerous to uſe.

The barrel, when forged, is either finiſhed in the common manner, or made to undergo the operation of twiſting, which is a proceſs employed in thoſe barrels that are intended to be of a ſuperior quality and price to others. This operation conſiſts in heating the barrel, in portions of a few inches at a time, to a high degree of red heat; when one end of it is ſcrewed into a vice, and into the other is introduced a ſquare piece of iron with a handle like an augre; and by means of theſe, the fibres of the heated portion are twiſted in a ſpiral direction, that is found to reſiſt the efforts of the powder much better than a longitudinal one.

It is a circumſtance of conſiderable importance with reſpect to the excellence of a barrel, that it ſhould be forged as nearly as poſſible to its weight when finiſhed, ſo that very little may be taken away in the boring and filing: for, as the outer ſurface, by having undergone the action of the hammer more immediately than any other part, is rendered the moſt compact and pure, we ſhould be careful to remove as little of it as poſſible. Such is alſo the caſe, though in a leſs degree, with regard to that portion of the middle of the barrel which is to be cut out by the boring inſtrument.

Piſtol-barrels are forged in one piece, and are cut aſunder at the muzzles after they have been bored; by which there is not only a ſaving of iron and of labour, but a certainty of the calibre being perfectly the ſame in both.

The next operation conſiſts in giving to the barrel its proper calibre; this is termed boring. The boring bit is a rod of iron, ſomewhat longer than the barrel; one end being made to fit the ſocket of the crank, and the other being furniſhed with a cylindrical plug of tempered ſteel, about 1½ inch in length, and having its ſurface cut in the manner of a perpetual ſcrew, the threads being flat, about ¼ of an inch in breadth, and running with very little obliquity. This form gives the bit a very ſtrong hold of the metal; and the threads, being ſharp at the edges, ſcoop out and remove every roughneſs and inequality from the inſide of the barrel, and render the cavity ſmooth and equal throughout. A number of bits, each a little larger than the preceding one, are afterwards ſucceſſively paſſed through the barrel in the ſame way, until it has acquired the intended calibre. The equality of the bore is of great moment; and it may be tried with tolerable accuracy, by means of a plug of lead, caſt on a rod of iron or wood; or even by a muſket-ball, filed ſo as to fit the bore exactly, and puſhed through the barrel by the ram-rod; care being taken not to uſe an iron ram-rod, or much force, leſt the ball be flattened, and an artificial difficulty created.

The gun-ſmiths afterwards poliſh the barrel; and it is then in a condition to receive its proper form and proportions externally, by means of the file. To do this with accuracy, four flat ſides or faces are firſt formed; then eight, then ſixteen, and ſo on, until it is made quite round; except the reinforced part, which, in moſt of the modern work, is left with eight ſides.

It is abſolutely neceſſary to the ſoundneſs of a barrel, that it ſhould be of an equal thickneſs on every ſide; or, in the language of the workmen, a barrel ought to be perfectly upright. To accompliſh this, the gun-ſmiths employ an inſtrument which they call a "compaſs," conſiſting of an iron rod bent ſo as to form two parallel branches, about an inch diſtant from each other. One of theſe branches is introduced into the barrel, and kept cloſely applied to the ſide by means of one or more ſprings with which it is furniſhed; the other branch deſcends parallel to this, on the outſide, and has ſeveral ſcrews paſſing through it with their points directed to the barrel. By ſcrewing theſe until their points touch the ſurface of the barrel, and then turning the inſtrument round within the bore, it is ſeen where the metal is too thick, and how much it muſt be reduced in order to render every part of the barrel perfectly equal throughout its circumference. To form the ſcrew in the breech-end of the barrel, the firſt tool employed is a plug of tempered ſteel, ſomewhat conical, and having upon its ſurface the threads of a male ſcrew. This tool, which is termed a "ſcrew-tap," being introduced into the barrel, is turned from left to right, and back again, until it has marked out the three or four firſt threads of the ſcrew; another leſs conical tap is then introduced; and when this has carried on the impreſſion of the ſcrew as far as it is intended to go, a third tap is employed, which is nearly cylindrical, and ſcarcely differs from the plug of the breech which is intended to fill the ſcrew thus formed in the barrel. The breech-plug has its ſcrew formed by means of a ſcrew-plate made of tempered ſteel, and has ſeveral female ſcrews correſponding with the taps employed to form that in the barrel. A plug of ſeven or eight threads is ſufficiently long; and the threads ought to be neat and ſharp, ſo as to fill completely the turns made in the barrel by the tap. The breech-plug is afterwards caſe-hardened, or, has its ſurface

converted into ſteel, by being covered over with ſhavings of horn, or parings of horſe-hoof, and kept red-hot in the fire for ſome time, after which it is plunged into water.

The laſt operation is that of colouring the barrel, previouſly to which it is poliſhed with fine emery and oil, until it preſents to the eye, through its whole length, and in whatever direction it is obſerved, a perfectly ſmooth, equal, ſplendid ſurface. Inſtead of blueing the barrels by expoſing them to a degree of heat, which produced an elegant blue tinge, which was formerly done, they are now browned, as it is termed. To do this, the barrel is rubbed over with aqua fortis, or ſpirits of ſalt, diluted with water, and laid by until a complete coat of ruſt is formed upon it; a little oil is then applied; and the ſurface, being rubbed dry, is poliſhed by means of a hard bruſh and bees' wax.

Barrels intended for a double-barrelled piece, after having been dreſſed to their proper thickneſs, which is generally leſs than for ſingle barrels, are filed flat on the ſides that are to join each other, ſo that they may fit cloſe together. Two correſponding notches are then made at the muzzle and breech of each barrel; and into theſe are fitted two ſmall pieces of iron, to hold them more ſtrongly together. The barrels being united by tinning the parts which touch, the ribs are fitted in, and made faſt by the ſame means. Theſe ribs are the triangular pieces of iron which are placed between the barrels, running on the upper and under ſides their whole length, and ſerving to hold them more firmly together. The under rib is a late improvement, and is found more effectually to prevent the barrels from warping. When the barrels are thus joined, they are poliſhed and coloured in the manner already deſcribed.

The twiſted barrels are deſervedly commended for their ſuperior elegance and ſtrength, as well as for the accuracy with which they throw their ball or ſhot. The iron employed in them is formed of old horſe-ſhoe nails, originally made from the ſofteſt and tougheſt iron, which is farther purified by the numerous heatings and hammerings by which it is reduced firſt into a bar, and then into nails. About 28 pounds of theſe ſtubs, purchaſed at about 10*s. per cwt.*, are required to make a ſingle barrel of the ordinary ſize. A hoop of iron, about an inch broad, and ſix or ſeven inches in diameter, is placed perpendicularly; and the ſtubs, previouſly waſhed, are neatly piled in it, with their heads outermoſt on each ſide, until the hoop is quite filled and wedged tight with them; the whole reſembling a rough circular cake of iron. This is put into the fire until it has acquired a white heat; when it is hammered, either by the ſtrength of the arm, or by the force of machinery, until it becomes one maſs of ſolid iron; the hoop is then removed, and the heatings and hammerings repeated, until the iron, by being thus wrought and kneaded, is freed from all impurity, and rendered very tough and cloſe in the grain: the workman then draws it out into pieces of about 24 inches in length, half an inch or more in breadth, and half an inch in thickneſs. Theſe pieces, however, are of different thickneſs, according to the propoſed thickneſs of the barrel, and that part of it which the piece was intended to form. One of theſe pieces, being heated red-hot for five or ſix inches, is turned like a cork-ſcrew, without any other tools beſides the anvil and hammer. The remaining portions are treated in the ſame manner, until the whole piece is turned into a ſpiral, forming a tube whoſe diameter correſponds with that of the intended barrel. Four of theſe are generally ſufficient to form a barrel of the ordinary length, which is from 32 to 38 inches, and the two which form the breech or reinforced part are conſiderably thicker than thoſe which conſtitute the fore-part, or muzzle of the barrel. The workman firſt welds one of theſe tubes to a part of an old barrel, which ſerves as a handle. He then proceeds to unite the turns of the ſpiral to each other, by heating the tube two or three inches at a time, to a bright white heat, and ſtriking the end of it ſeveral times againſt the anvil in a horizontal direction, and with conſiderable force; this is termed jumping by the barrel; and the heats given for this purpoſe are called jumping-heats. A mandril is then introduced into the cavity; and the heated portion is hammered ſlightly, to flatten the ridges or bars raiſed by the jumping at the place where the ſpirals are joined. As ſoon as one piece is jumped its whole length, another is welded to it, and treated in the ſame manner, until the four pieces are united; when the part of the old barrel, being no longer neceſſary, is cut off. The welding of the turns of the ſpiral is performed in the manner already deſcribed, and is repeated three times. The barrel is afterwards finiſhed in the ſame mode as the common one.

Stub iron is alſo wrought into plain barrels; which, as they require much leſs labour, are only half the price of the twiſted ones.

The "canons or rubans," or ribbon barrels of the French, very much reſemble the Engliſh twiſted barrels. The proceſs by which they are formed is much more operoſe than that above deſcribed, without poſſeſſing any ſuperior advantage.

It is obſerved, as the reſult of various experiments with barrels of 28, 30, 32, 34, 36, 38, and 40 inches in length, that the difference of 10 inches in the lengh of the barrel, which ſeems to be more than ſportſmen require, produces no ſenſible difference in the range of the piece; and, therefore, that every one may pleaſe himſelf in the length of his barrel, without detriment or advantage to the range. (See RANGE.) The circumſtance, it is ſaid, of a duck-gun killing at a greater diſtance than a fowling-piece, is not owing to its length, but to its greater weight and thickneſs, allowing the charge of powder to be doubled, trebled, or even quadrupled; which cannot be done in a fowling-piece, though ſtrongly reinforced. Duck-guns are generally bent a little upwards near the muzzle, which, as the gunſmiths ſay, makes them throw their ſhot further than if they were perfectly ſtraight. To obtain from a piece of the ordinary length the ſame effects as from a duck-gun, nothing more, perhaps, is neceſſary, than to have the barrel ſufficiently ſtrong to admit of the charge being doubled or trebled as required, and the whole piece heavy enough to render the recoil ſupportable. It is further obſerved, that an increaſe of the powder above the charge generally uſed, does not produce a proportional increaſe of range in the ball or ſhot: thus, a double charge of powder will not throw the ball or ſhot to twice the diſtance, nor a treble charge to three times the diſtance, of the ſingle charge. This is owing to the great reſiſtance given by the air to the motion of the ball or ſhot, which is proved to be four-fold if the velocity be doubled, and nine-fold when it is trebled by an increaſe of powder; for the reſiſtance of the air is not proportional to the velocity itſelf, but only to the ſquare of the velocity. (See GUNNERY and RESISTANCE.) So great is the change in opinion of late, with regard to the proper length of gun-barrels, that many gunſmiths will now tell us, that ſhort barrels carry farther than long ones; and the reaſon they give for it is, the greater friction of the ball or ſhot in paſſing through a long barrel, by which their velocity is retarded and their force diminiſhed. If the barrel is ſo long that the additional impulſe which the ball or ſhot is continually receiving in its paſſage

becomes leſs than the friction between them and the ſides of the calibre, then, indeed, the barrel, by being ſhortened, will ſhoot with greater force; but as the length of the barrel required to produce this effect is vaſtly greater than can ever be employed for any purpoſe, the objection does not hold. It ſeems clear, that a piece may be made ſo long, that it will not throw a ball with ſo great velocity as one that is conſiderably ſhorter; and the reaſon of this decreaſe of velocity may be, that in very long pieces the increaſe of the counter-preſſure of the external air in the cylinder, may greatly exceed the force of the powder, and that the elaſtic fluid generated by the exploſion of the powder is conſtantly eſcaping whilſt the ball paſſes along the cylinder, which it not only does at the touch-hole, but alſo between the ball and the ſides of the barrel; and hence may be inferred the neceſſity of touch-holes which do not prime of themſelves, and of wadding that ſtops the barrel hermetically. The following opinion is given by the ingenious writer of the article to which we have referred with regard to the length of barrel that is beſt calculated for general uſe. The barrels which are found to anſwer beſt for every purpoſe are from thirty-two to thirty-eight inches; and whether we conſult the appearance of the piece, its lightneſs, or the eaſe with which it is managed, we believe, (he ſays,) that a barrel not exceeding the one, or below the other, of theſe numbers, is the moſt eligible. We know that many of the gunſmiths pique themſelves on the proportion they give to the different parts of their fowling-pieces, and thence deduce a ſuperiority over their contemporaries in favour of their own. To us it appears that the beauty of thoſe proportions is more attended to than any good reaſon why they are made ſo rather than otherwiſe. For other particulars ſee PROVING *of Guns*, RANGE, RECOIL, and RIFLE.

In ſhooting, obſerve to do it with the wind, if poſſible, and rather ſide-ways, or behind the fowl, than full in their faces. Obſerve alſo to chuſe the moſt convenient ſhelter, as a hedge, bank, or tree. If you have not ſhelter enough, you muſt creep upon your hands and knees, or uſe a ſtalking-horſe. Let your dogs be under good command. See DOG, SETTING-*Dog*, and SPANIEL.

FOX, RICHARD, in *Biography*, a celebrated Engliſh ſtateſman and prelate, was deſcended from parents in mean circumſtances, and born at Ropeſley, near Grantham, in Lincolnſhire, about the end of the reign of Henry VI. Having paſſed through the introductory ſteps of learning, he was ſent to Magdalen college, Oxford, where he acquired diſtinguiſhed reputation by the progreſs he made in his ſtudies. The plague, then not unfrequent in England, broke out in Oxford, which forced Mr. Fox to finiſh his education at Pembroke Hall, Cambridge, and from thence he went to Paris to ſtudy canon law and theology. In this city he obtained the notice and friendſhip of Dr. Morton, biſhop of Ely, who had been driven from his native ſoil by the perſecutions of the infamous Richard III. It was by the means of this prelate that Fox, who had been created doctor, was introduced to Henry, earl of Richmond, who was at that time projecting a ſcheme to dethrone Richard. Dr. Fox entered into his views, was admitted into his moſt ſecret counſels, and undertook and accompliſhed that part of the plan which was entruſted to him. After Henry had gained the crown of England as the reſult of the victory of Boſworth-field, he appointed Dr. Fox one of his privy councillors, and, next to Dr. Morton, admitted him to the greateſt ſhare of his confidence and familiarity. Beſides other inſtances of preferment, he was nominated in 1486-7 biſhop of Exeter; appointed keeper of the privy ſeal; made principal ſecretary of ſtate, and maſter of St. Croſſe, near Wincheſter. From this time, notwithſtanding his high ſtation in the church, Dr. Fox was conſtantly engaged by his ſovereign, either in the management of public affairs at home, or on important foreign embaſſies. In 1491 he was tranſlated from Exeter to the biſhopric of Bath and Wells; whence he was afterwards removed to Durham in 1494. He was now ſent on an embaſſy to James IV. of Scotland to terminate ſome differences reſpecting the fiſheries of the river Eſk; but with all his ability and addreſs he was unable to effect the purpoſe. War was commenced by James, who invaded England, but by the exertions of the biſhop he was driven back to his own country. Shortly after Henry appointed biſhop Fox his ambaſſador to the court of Scotland, where he ſigned a ſeven-years truce between the two kingdoms. Henry now made overtures for a marriage between the king of Scotland and his own daughter Margaret, and Dr. Fox was ſent to negociate the important buſineſs, which was concluded in the beginning of the year 1501-2. During this negociation he was choſen chancellor of the univerſity of Cambridge; and about the ſame time tranſlated to the vacant ſee of Wincheſter. Here he ſpent the remainder of his days in great affluence and proſperity, unleſs when ſtate affairs required his attendance at court, or he was engaged in conducting negociations of moment with foreign powers. During the reign of Henry VII. no important affair was undertaken without his advice and ſanction, but when Henry VIII. ſucceeded to the crown, the influence of biſhop Fox began to decline, and that of Thomas Howard, earl of Surrey, to prevail. To ſupplant his rival the biſhop introduced Wolſey, one of his chaplains, to court, who ſpeedily ſucceeded in wholly engroſſing the favour of the king. No ſooner did he find himſelf ſecure of the royal attachment, than he ſeized the ſole adminiſtration of public affairs, and found means of driving from court all who could give him any jealouſy or uneaſineſs, by dividing with him the monarch's eſteem. Biſhop Fox, though not wholly neglected, was mortified and chagrined at ſeeing his own intereſts completely undermined by Wolſey, whom he had been the means of raiſing to power, and receiving from him inſults and mortifications which his ſpirit could not brook, retired to his dioceſe in diſcontent and diſguſt. Here he did not live for himſelf alone, but was ever projecting ſome plans that might be beneficial to poſterity. He founded Corpus Chriſti college, Oxford, and eſtabliſhed ſchools at Taunton, where he had a manor, as biſhop of Wincheſter, and at Grantham, near his native place. Towards the cloſe of life he had the misfortune to loſe his ſight, of which circumſtance Wolſey, then a cardinal, wiſhed to take advantage, by perſuading him to reſign his biſhopric, and to receive, in its ſtead, a penſion from the crown. Fox, indignant at the propoſal, ordered the perſon ſent to him on the buſineſs to tell his maſter, "that though he was blind, and was not able to diſtinguiſh white from black, yet he could diſcern between true and falſe, right and wrong: and plainly ſaw, without eyes, the malice of that ungrateful man, which he did not ſee before. That it behoved the cardinal not be ſo blinded with ambition as not to foreſee his own end." The biſhop died in the year 1528, at a very advanced age, leaving behind him a character very eminent for political ſagacity, and the ability and addreſs with which he conducted the moſt important and difficult ſtate negociations of his time. He has been regarded as a patron of learned men, and is certainly entitled to gratitude on account of the uſeful inſtitutions which he founded for the encouragement of literature and ſcience. One letter is preſerved in Strype's Memorials, which he wrote on the ſubject of the cardinal's intended general

neral viſitation and reformation of the Engliſh clergy. That day, he ſays, he wiſhed as ardently to ſee, as Simeon did to behold the Meſſiah; and he adds, that for three years paſt, almoſt all his ſtudies, labours, thoughts, and cares, had been directed to that object within his own particular juriſdiction. Biog. Brit.

Fox, Edward, likewiſe a prelate and ſtateſman, was born at Durſley, in Glouceſterſhire; educated at Eton, and purſued his more advanced ſtudies at King's college, Cambridge, to which he was admitted in the year 1512. He was ſoon found to poſſeſs great talents, and to be eminently qualified for ſtations of activity and confidence. In the year 1528 he was elected provoſt of his college, and retained that poſt to the time of his death: in the ſame year Wolſey appointed him, jointly with Gardiner, afterwards the biſhop of Wincheſter, embaſſador to Rome to obtain the conſent of pope Clement VII. for the divorce of Henry VIII. from his queen Catherine of Arragon. After his return he was appointed to embaſſies both in France and Germany; and having accompliſhed theſe to the ſatisfaction of his maſter, he was ſent to Cambridge with Gardiner, and, notwithſtanding the oppoſition they met with, they obtained the univerſity's determination, that "the king's marriage was againſt the law of God." From this time he was in high favour, and received as a remuneration for his ſervices valuable preferments in the church, and in 1535 he was promoted to the biſhopric of Hereford. In the ſame year he was ſent to the proteſtant princes then aſſembled at Smalkalde, whom he exhorted to unite in point of doctrine with the church of England. After three months' negociation nothing was effected, and the biſhop returned to England in 1536, and having enjoyed his biſhopric ſomewhat leſs than three years, he died at London in the year 1538. As an author he left behind him a treatiſe "De vera differentia regiæ Poteſtatis et eccleſiaſticæ, et quæ ſit ipſa veritas utriuſque," 1534, which was afterwards tranſlated into Engliſh by Henry lord Stafford. He wrote "Annotations upon the Mantuan poet." There is alſo extant an "Oration" of his, and a joint letter from him and Gardiner, concerning their proceedings at Cambridge. This is among the collection of records at the end of the firſt volume of Burnet's hiſtory of the Reformation. He was a man of great talents and learning, an excellent preacher, but choſe rather to devote himſelf to the buſineſs of a ſtateſman than to the duties of the clerical character. He was a ſecret well wiſher to the reformation, and contributed privately, by his influence and advice, to the furtherance of the meaſures by which it was ultimately effected. Biog. Brit.

Fox, John, was born at Boſton, Lincolnſhire, of reſpectable parents, in the year 1517. At ſixteen years of age he was entered at Brazen-noſe college, Oxford; in the year 1538, he took his firſt degree, and, on account of his extraordinary proficiency, he was, in 1543, elected a fellow of Magdalen college, and proceeded M. A. Early in life he diſcovered a turn for poetry, and wrote ſeveral Latin comedies; of which one, entitled, "De Chriſto triumphante," was publiſhed at London and at Baſil, and tranſlated by Richard Day, ſon of the famous printer, in the reign of queen Elizabeth. Fox had a ſtill ſtronger predilection for divinity than for poetry, and ſtudied with the utmoſt fervour and aſſiduity, till he had made himſelf maſter of all the controverſies that then agitated the Chriſtian world, and to diſcover from his own inquiries what was truth. For this purpoſe he had, when he was thirty years of age, read over all the Greek and Latin fathers, the ſchoolmen, the decrees of councils and conſiſtories; and had acquired an accurate knowledge of the Hebrew language. In the courſe of his inquiries, he became ſatisfied of the errors of popery; and being reſolved to follow truth wherever ſhe might lead him, he abſtained from the eſtabliſhed worſhip of the country. His enemies, ſuſpecting the fact, charged him with hereſy, for which he was tried, and found guilty. He was expelled the houſe, and told that he might conſider it a mark of great clemency and particular favour towards him, that the puniſhment did not extend to take away his life. By this event, Mr. Fox loſt the favour of his friends, who were alarmed at being ſuppoſed to countenance and protect a perſon convicted of ſo great a crime. His father-in-law, alſo, who was entruſted with the care of his property, took advantage of his ſituation to withhold from him his paternal eſtate; thinking, no doubt, that as he was become obnoxious to the penalties of the law himſelf, he would find it difficult to maintain his rights, ſhould he appeal to the courts for that purpoſe. Mr. Fox was now on the verge of great diſtreſs, when he unexpectedly met with a friend in ſir Thomas Lucy of Warwickſhire, who appointed him tutor to his children. In the houſe of this gentleman he continued till his pupils were grown up, during which time he had married the daughter of a citizen of Coventry. A few years before the death of Henry VIII. he went to London; but not being able to meet with employment, he was again reduced to extreme diſtreſs, and in danger of periſhing through want. From an unknown perſon, who had ſeen him ſitting one day in St. Paul's cathedral, bent down under his diſtreſſes, he received relief; and in a very ſhort time afterwards he was ſo fortunate as to be taken into the ducheſs of Richmond's family, to educate the children of her brother, the famous Henry Howard, earl of Surrey, who were entruſted to her care, when their father was ſent to the Tower by Henry VIII. In this noble family he continued to reſide during the remainder of Henry's reign, through the whole of that of Edward, and part of that of Mary; being protected in the latter period by the duke of Norfolk, who had been one of his pupils. He is ſaid, by Anthony Wood, to have been reſtored to his fellowſhip in Magdalen college, under the reign of Edward VI., and to have been the firſt perſon who preached the reformed doctrines at Ryegate. The bloody-minded Gardiner was thirſting after the life of this excellent man; and it was with the utmoſt difficulty that he eſcaped the ſnares laid for him by that cruel prelate, who had iſſued warrants for apprehending him and his wife. At length they reached the continent in ſafety, and took up their reſidence at Baſil. Here he gained a ſubſiſtence, by correcting the preſs for Oporinus, a celebrated printer; and here he formed the deſign of his "Acts and Monuments of the Church." He had, ſome time before this, publiſhed at Straſburgh, "Commentarii Rerum in Eccleſia geſtarum, maximarumque per totam Europam Perſecutionum a Wicleví Temporibus ad hanc uſque Ætatem Deſcriptarum," in one book; to which he now added five others, and they were all printed at Baſil, in 1559, in folio. In Germany, Mr. Fox joined the other Engliſh exiles in publicly uſing the liturgy adopted by the French and Genevan reformed churches, in preference to that ordered by king Edward. On the acceſſion of queen Elizabeth, Mr. Fox returned to his native country, where he was kindly received by his former pupil, the duke of Norfolk, who maintained him at his houſe as long as he lived, and ſettled a penſion upon him at his death. By the intereſt of Cecil, he had formerly obtained a prebend in the church of Saliſbury: ſo high did he now ſtand with people in power and rank, that he might have had any preferment; but he choſe to decline farther

elevation,

elevation, becauſe he could not conſcientiouſly ſubſcribe to the articles enforced by the eccleſiaſtical commiſſions, and becauſe he alſo diſapproved of ſome of the ceremonies of the church. To give countenance to conformity, Mr. Fox was called on by archbiſhop Parker to ſubſcribe. He attended, according to the ſummons; but, in reply to the command, he took from his pocket a Greek Teſtament, and ſaid, "To this will I ſubſcribe." And on another occaſion, when he was required to ſubſcribe to the canons, he refuſed, ſaying, "I have nothing in the church ſave a prebend at Saliſbury, and much good may it do you, if you will take it from me." He was, however, too highly reſpected by the biſhops, moſt of whom had been his fellow-exiles, to be further moleſted; and he was allowed to retain his prebend till his death. In 1564, he addreſſed a Latin panegyric to the queen, upon her indulgence to certain divines, who ſcrupled ſtrict conformity, and yet were ſuffered to hold their livings, and retain their dignity in the church. This moderation was not always the characteriſtic of the queen. In 1575, a furious perſecution was commenced againſt the baptiſts. A number of them were apprehended in a private houſe, where they were aſſembled for worſhip, and afterwards tried for hereſy. Eleven were condemned to die; and of theſe nine were baniſhed, and two ſentenced to the flames. Mr. Fox underſtood too well the nature of Chriſtian liberty, and the principles of toleration, not to feel moſt acutely for the victims about to be ſacrificed at the ſhrine of prejudice and intolerance. He wrote a Latin letter to the queen, in which he expoſed the cruelty and iniquity of puniſhing with death perſons guilty of error, or obſtinacy of judgment; and ſhewed how inconſiſtent ſuch conduct was with the benevolent ſpirit and pure precepts of the goſpel. His interceſſion was without effect; for though Elizabeth had ſo high a reſpect for Fox as conſtantly to denominate him "Father," yet in this inſtance ſhe reſolved to ſhew no mercy, as it was falſely called, unleſs the unfortunate men ſhould recant. Mr. Fox, as we have ſeen, would accept of no higher preferment; nevertheleſs he was frequently engaged as a preacher, and never omitted an opportunity of exerting his talents, where he thought he could promote the real intereſts of religion. His piety and zeal were ardent and animated; his moral conduct ever correſponded with his principles, and was irreproachable. He was modeſt, humble, obliging, and remarkable for his humanity and kindneſs to the poor. He died in his 70th year, on the 18th of April, 1587, generally eſteemed and lamented by all who knew him. He was author of many pieces, beſides thoſe which have been already noticed: their titles, with their ſeveral dates, are given in the Biographia Britannica. We may here refer to his "Tables of Grammar," which were at firſt recommended by eight lords of the privy council, but which were ſoon laid aſide on account of their brevity; being, it is ſaid, as much too ſhort for general uſe, as king Henry VIII.'s grammar was too long. "The four Evangeliſts, in the old Saxon tongue, with the Engliſh verſion added to it." But the grand work of this good man is his "Hiſtory of the Acts and Monuments of the Church," generally known by the title of "Fox's Book of Martyrs." This, as we have ſeen, was begun at Baſil; but the greater part of it was written after the author's return from exile to his native land, where he had acceſs to ample authorities, and could avail himſelf of the teſtimonies of living witneſſes. He was eleven years in completing the great undertaking, and, according to Whitgift, he "very diligently and faithfully laboured in this matter, and ſearched out the truth of it as learnedly as any man has done." Camden gives the following teſtimony to Mr. Fox, and his "Acts and Monuments:" "Ex eruditorum numero obiit Johannes Foxus Oxonienſis, qui eccleſiaſticam Angliæ hiſtoriam, ſive martyrologiam, indefeſſo veritatis ſtudio, primum Latinè, poſtea Anglicè auctius, magna cum laude contexuit." The "Acts and Monuments" were firſt publiſhed in one thick volume, folio, in the year 1563; but in 1583, a fourth edition of it was printed at London, in two volumes, folio; and in the middle of the following century it came out in three volumes. The ninth edition of this work appeared in 1684, in three volumes, folio, with copper-plate cuts, inſtead of the wooden ones which had been interwoven with the former impreſſions. In queen Elizabeth's time, an order was made that this book ſhould be placed in the common halls of the archbiſhops, and of all biſhops, deans, archdeacons, heads of colleges, &c. It was, indeed, ſo highly valued by proteſtants in general, that it was not unuſual to have it kept in churches. We have ſeen a copy in a country church, faſtened by chains in ſome conſpicuous place, for the benefit of thoſe who reſorted to the place for the purpoſes of devotion and information. The papiſts, as was natural, did all in their power to ruin the credit of the work, and injure the reputation of the author; and ſome proteſtants have taken every opportunity to undervalue and depreciate it, aſſerting that the facts are deſignedly miſrepreſented. Such a charge led to a ſtrict examination of the merits of the performance; and it was acknowledged by Burnet and Strype to be a faithful record of the events that took place, not indeed without defects, not wholly without error, but free from every imputation of deſigned miſrepreſentation: and, to the honour of the author, he was ever ready to correct ſuch miſtakes as were pointed out to him. This ſubject is diſcuſſed with candour and ability in the Biographica Britannica, to which the reader is referred.

Fox, George, founder of the ſociety of friends, commonly called quakers, was born at Drayton, in Leiceſterſhire, in 1624. His father was a weaver, much reſpected by his neighbours for his piety and virtues; and he ſeems to have taken great pains in educating his ſon in the principles of piety and virtue. He was, at a proper age, apprenticed to a dealer in wool and grazier, and was a good deal employed in keeping ſheep: an occupation that afforded him opportunities for contemplation and reflection. When he was about nineteen years of age, he experienced much trouble and anxiety on obſerving the intemperance of ſome perſons, profeſſing to be religious, with whom he had gone to an inn for refreſhment; and on the following night he was perſuaded that a divine communication was made to him, urging him to forſake all, to ſeparate himſelf from the old and the young, and devote his life to the duties of religion. Satisfied with the divine command, he renounced ſociety, quitted his relations, dreſſed himſelf in a leathern doublet, and wandered about from place to place. At length he reached the metropolis, when his friends interfered, and beſought him to return and ſettle in ſome regular employment. He returned, but did not remain with them many months; determining to embrace an itinerant mode of life. He faſted much and often, walked abroad in retired places, with no other companion but the bible, and ſometimes ſat in the hollow of a tree for a day together, and walked in the fields by night, as if in a ſtate of deep melancholy. He occaſionally attended upon public teachers, but did not derive that benefit from them that he looked for: and hearing, as he ſuppoſed, a voice exclaiming, "There is one, even Chriſt Jeſus, that can ſpeak to thy condition," he forſook the uſual outward means of religion; contending that as God did not dwell in temples made with hands, ſo

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the people ſhould receive the *inward* divine teaching of the Lord, and take that for their rule of life. About the year 1648, he felt himſelf called upon to propagate the opinions which he had embraced, and commenced public teacher in Mancheſter, and ſome of the neighbouring towns and villages, inſiſting on the certainty and efficacy of experiencing the coming of Chriſt in the heart, as a light to diſcover error, and the knowledge of one's duty. He now made more extenſive journies, and travelled through the counties of Derby, Leiceſter, and Northampton, addreſſing the people in the market-places, and inveighing ſtrongly againſt injuſtice, drunkenneſs, and the other prevalent vices of the age. About this time he apprehended that the Lord had forbidden him to take off his hat to any one; and required him to ſpeak to the people in the language of *thou* and *thee*; that he muſt not bend his knee to earthly authorities, and that he muſt, on no account, take an oath. His peculiarities expoſed him to much cruel treatment, and his zeal frequently was the cauſe of impriſonment and the moſt inhuman uſage. At Nottingham, while the miniſter was exhorting the people to try all doctrines, opinions, and religions, by the holy ſcriptures, Fox ſtood up, and exclaimed, "Oh no! it is not the ſcriptures, but the holy ſpirit, by which opinions and religions are to be tried; for it was the ſpirit that led 30 people into all truth, and gave them the knowledge of it." Such an interruption was not likely to be endured; he was not only turned out of the church, but thrown into priſon, where he was detained during the pleaſure of the magiſtrates. At Manſfield, on a ſimilar occaſion, he was impriſoned, thrown into the ſtocks, and afterwards expoſed to the madneſs of an infuriated mob, ſo that he ſcarcely eſcaped with his life. At Derby he was committed to priſon for ſix months, under the pretence of having uttered divers blaſphemous opinions; and at the expiration of the term, refuſing to enliſt as a common ſoldier, he was ordered into the dungeon, and confined for another term of ſix months. At Derby, the followers of Fox were firſt denominated "quakers," as a term of reproach, either on account of the trembling accent uſed in the delivery of their ſpeeches, or, becauſe, when brought before the higher powers, they exhorted the magiſtrates and other perſons preſent "to tremble at the name of the Lord." At Lancaſter, Carliſle, and other places, Fox met with ſimilar uſage, and in 1655 he was ſent priſoner to Cromwell, who contented himſelf with obtaining a written promiſe that he would not take up arms againſt him or the exiſting government; and having diſcuſſed various topics with mildneſs and candour, he ordered him to be ſet at liberty. Fox probably now felt himſelf bold in the cauſe, recommenced his miniſterial labours at London, and ſpent ſome time in vindicating his principles by means of the preſs, and in anſwering the books circulated againſt the ſociety which he had founded, and which began to attract public notice in many parts of the kingdom. Notwithſtanding the moderation of Cromwell towards Fox, he was perpetually ſubject to abuſe and inſult, and was frequently impriſoned and hardly uſed by magiſtrates in the country whither he felt himſelf bound to travel: and more than once he was obliged to ſolicit the interference of the Protector, to free him from the perſecutions of ſubordinate officers. Once he wrote to Cromwell, ſoliciting his attention to the ſufferings of his friends; and on hearing a rumour that he was about to aſſume the title of king, Fox ſolicited an audience, and remonſtrated with him very freely upon the meaſure, as what muſt bring ſhame and ruin on himſelf and his poſterity. He alſo addreſſed a paper to the heads and governors of the nation, on occaſion of a faſt appointed on account of the perſecutions of the Proteſtants abroad; in which he embraced the opportunity that ſuch appointment offered, of holding up, in proper colours, the impropriety and iniquity of perſecution at home. The hiſtory of Fox, for ſeveral years previouſly to 1666, conſiſts of details of his miſſions, and accounts of his repeated impriſonments. In this laſt-mentioned year he was liberated by order of the king, and he immediately ſet about forming the people who had embraced his doctrines into a compact and united body: monthly meetings were eſtabliſhed, and other means adopted to provide for the various exigences to which they might be liable.

About the year 1669 he married Margaret, the widow of judge Fell, at whoſe houſe he had been entertained in his progreſs through Lancaſhire. The ceremony, on this occaſion, was according to that ſimple form which is practiſed to this day among the people of his perſuaſion. He only acquainted their common friends of their intention; and having received their approbation, they took each other in marriage, by mutual public declarations to that intent, at a meeting appointed for the purpoſe at Briſtol. After this Mr. Fox ſailed for America, where he ſpent two years in making proſelytes, and in confirming the faith and practice of thoſe who had already joined in his cauſe. Soon after his return to England he was taken into cuſtody, and thrown into Worceſter gaol, under the ridiculous charge of having "held a meeting from all parts of the nation, for terrifying the king's ſubjects." During his impriſonment he was ſeized with an alarming illneſs, which rendered his recovery very doubtful. His wife went to London to ſolicit his releaſe of the king, who was willing to grant it by means of a pardon. Fox, however, rejected the mode, as he conceived a pardon implied guilt: he choſe rather to ſtand a trial, by which he was honourably acquitted, though not till he had ſuffered more than a year's very ſevere confinement. He next went to Holland, and on his return, a ſuit was inſtituted againſt him for refuſing to pay tithes; his opponents were ſucceſsful, and he was obliged to ſubmit to the conſequences. In 1684, Fox again viſited the continent, and upon his return he found his health and ſpirits too much impaired by inceſſant fatigues, and almoſt perpetual perſecutions, to contend any more with his enemies, he accordingly lived more retired; and in 1690 he died, in the ſixty-ſeventh year of his age; having, however, performed the duties of a preacher, till within a few days of his deceaſe. His writings, excluſive of a few ſeparate pieces, which were not printed a ſecond time, were collected in 3 vols. folio: the firſt contains his "Journal;" the ſecond a collection of his "Epiſtles;" the third, his "Doctrinal Pieces." Fox was a man of good natural talents, and thoroughly converſant in the ſcriptures. The inceſſant zeal which he exhibited through life, affords abundant evidence of his piety, ſincerity, and purity of intention; and his ſufferings bear teſtimony to his fortitude, patience, and reſignation to the Divine will. William Penn, ſpeaking of him, ſays, that "he had an extraordinary gift in opening the ſcriptures, but that, above all, he excelled in prayer. The reverence and ſolemnity of his addreſs and behaviour, and the ferventneſs and fullneſs of his words, often ſtruck ſtrangers with admiration." He alſo mentions, in terms of high commendation, his meekneſs, humility, and moderation; and he adds that he was civil beyond all forms of breeding; in his behaviour very temperate, eating little, and ſleeping leſs, though a bulky perſon. Toulmin's edit. of Neal's hiſt. of Puritans. Gen. Biog.

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Fox, Charles James, one of the moſt eminent ſtateſmen that ever lived, was third ſon of Henry Fox, afterwards lord Holland, by lady Georgiana Carolina Lennox, eldeſt daughter to Charles, ſecond duke of Richmond, and was born January 13, 1749. Being intended for public life, he was ſent firſt to Weſtminſter-ſchool, and afterwards to Eton, when that ſeminary had attained a high degree of celebrity, under the direction of Dr. Bernard, the provoſt. Here Mr. Fox was not only diſtinguiſhed with regard to claſſical attainments; but he was obſerved to be equally ardent in the purſuit of amuſements and pleaſures. Dr. Newcombe, the late learned primate of Ireland, was his private tutor, and, to the laſt hour of his life, is ſaid to have thought more highly of the honour of having been inſtrumental in educating ſo great a ſtateſman as Mr. Fox, than of any other circumſtance in his life. His pupil obtained a decided ſuperiority in every claſs which he joined. As his father hoped to introduce him early into public life, and was anxious to form him for a man of buſineſs, he had always encouraged him to think and to ſpeak freely; hence he acquired the habit of a ready elocution. In every enterprize at ſchool, which required an orator, he was generally ſelected, and nothing can better ſhew the ſtrength of his mind, and of his conſtitution, than, that by turns, literature and diſſipation appeared to engroſs his whole attention, and yet that the apparent preference of the one was not allowed to interfere with the other. He was never ſatisfied with mediocrity in any purſuit; whatever he regarded as deſerving his attention, he followed with ardour. At Eton he formed his early friendſhips with many of the moſt eminent characters of the age, ſome of whom foreſaw in their contemporary all the ſeeds of future greatneſs, and of that renown for which he will be celebrated in every ſucceeding period of Britiſh and European hiſtory. It was not merely the riſing ſuperiority of talents by which he was diſtinguiſhed from his ſchool-fellows: the kindneſs of his heart, and the mildneſs of his manners were equally conſpicuous. He demonſtrated, by the moſt deciſive traits of character, his attachment to the finer ſenſibilities of humanity, by always eſpouſing, if it could be done with propriety, the weakeſt ſide, in thoſe conteſts which occaſionally diſturb the ſociety of young people He was frequently called upon to preſide as judge in diſputes, and when he ſaw any one borne down by partiality and prejudice, he exerted his youthful eloquence in favour of the ſide of juſtice. From Eton he went to Oxford, where he entered himſelf at Hertford college, and is ſaid to have ſtudied more than ten hours a day during the whole term. The uniformity of a college life did not long agree with the ardour of his mind, and after ſome time he ſet out on the uſual tour of Europe. No young man was ever better qualified to derive inſtruction from thoſe ſcenes which are ever preſented to the mind of the traveller; and though he did not refrain from indulging in the diſſipations, over which his rank and fortune gave him the command, yet he did not fail to acquire that intimate knowledge of the world and of human nature, which fitted him for the moſt exalted rank in the ſtate, and prepared his mind for the reception of thoſe enlarged principles by which, with the exception of the firſt year or two of his political life, he was diſtinguiſhed, as the zealous and ſteady friend to the liberties and happineſs of the people; by which he was, as it were, habitually the advocate of the oppreſſed, whoſe cauſe he pleaded with a force and eloquence unknown in modern times. An unfortunate attachment to the gaming table, which can never be paſſed over in ſilence, nor ſpoken of without becoming cenſure, was the principal error of Mr. Fox's youth. Before he was eighteen years of age he had laviſhed away large ſums of money, and had contracted very heavy debts. His father, being apprized of theſe exceſſes, urged his favourite ſon to return home; he complied, though with ſome degree of reluctance. From the faſcinating theatre of diſſipation and pleaſure, he was tranſplanted into that of oratory and politics; if the former had been more attractive, and apparently more accordant to his mind and habits, the latter was more important and honourable, and that on which he was deſtined to act a part that can never be forgotten, and never ſufficiently applauded. Lord Holland, well knowing the lively and impetuous diſpoſition of his ſon, foreſaw that a ſeat in parliament would be likely to detach him from a courſe which threatened irreparable injury to his conſtitution, and ruin to his fortune; he, accordingly, in the election of 1768, when his ſon was but nineteen years old, procured him the return for the borough of Midhurſt, which was then under the patronage of his lordſhip, but which at preſent is under that of lord Carrington. By the laws of England, a perſon under age is not deemed competent to judge for himſelf, much leſs to make laws to govern others; and on this account our youthful ſenator was ineligible to a ſeat in the houſe of commons. The circumſtance ſeems to have been wholly overlooked by the ſpeaker, and by that "committee of privileges," which is appointed by every parliament as the conſervator of the rights of the commons of Great Britain. Such an overſight can ſcarcely be accounted for; his attachments were ſuppoſed, from the conduct of his father, to be favourable to the exiſting miniſtry, whoſe power and influence were, every day, attacked by an oppoſition as formidable for rank and talents as ever exiſted in the country. It is probable, yet we own there are no particular facts to bear us out, if the ſuppoſition be denied, that the conciliating manners, which, it is acknowledged on all hands, attracted the admiration, and even challenged the good will and affection of every perſon who knew him, prevented any meaſures from being taken to diſpoſſeſs him of his ſeat in parliament.

In the debates and proceedings of parliament, which we have carefully collated, from that period to the deceaſe of Mr. Fox, we do not find that he took any part in the diſcuſſions till the 10th of January 1770, when he was within three days of attaining the full age, required by cuſtom and by law, to entitle him to give his opinion in the houſe. Whether he had voted before this period, we have no means of aſcertaining, becauſe it ſhould ſeem that even now he defended the meaſures of the adminiſtration, whoſe names, in the diviſions of the houſe, are rarely mentioned, though it has ever been the cuſtom to record the names of thoſe who dare, in bad times, to ſtand in a minority, and to ſhare in the obloquy which weak and vulgar minds are apt to attach to the conduct of men who are ſeeking their country's welfare at the expence of their own eaſe and advancement in life. On the ninth of January 1770, there had been a warm debate of more than twelve hours in the houſe on his majeſty's ſpeech, which referred, among other topics, to the diſcontents exiſting about the meaſures of the Middleſex election: an amendment was moved "That the houſe would take into conſideration the cauſes of the unhappy diſcontents that prevailed in every part of his majeſty's dominions." On this, which was ſuppoſed as intended to annul the former reſolutions of the houſe, debates ran very high; the oppoſition held language which was deemed encroaching on the privilege of the houſe, and the reſpect due to it.

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The oppoſition divided 138 to 254, and their names are given in the "Proceedings of Parliament," vol. v. p. 205—6. On the following day, when the addreſs was reported, previouſly to its being delivered to his majeſty, a ſimilar diſcuſſion took place, when the leaders of oppoſition took a moſt diſtinguiſhed part. Sir George Saville diſtinctly aſſerted, that "the houſe of commons had betrayed the rights of the people:" upon this he was called to order, and threatened to be ſent to the Tower; but another member, friendly to miniſters, endeavoured to ſoften matters, and to aſſume that the honourable baronet had ſpoken in the hurry of anger; which ſir George denied, and ſaid he would always uſe the ſame language when the ſame ſubject was diſcuſſed: and he added at another period of the debate, that he was as cool as he could be; "bring me," ſaid he, "to teſt, and I the matter will re-word, which madneſs would gambol from; therefore, ſtanding in my place, as member for the county of York, I do declare, that this houſe of commons has betrayed the rights of the nation." On this, Mr. Fox replied in a very ſhort ſpeech, "That the licence gentlemen had taken in their language yeſterday and to-day, ſeemed as if the old decent freedom of debate was at an end, and that they were endeavouring to eſtabliſh new forms." He then explained away much of the force of the addreſs and of his majeſty's ſpeech, which gave Mr. Burke the opportunity of ſaying, by way of a cloſe to the diſcuſſion, "that it was not what we meant, but how the people out of doors would take it; however, he was glad to hear that the houſe meant nothing by their addreſs." Theſe facts are introduced to ſhew that Mr. Fox began his parliamentary career by defending and juſtifying the meaſures of lord North's adminiſtration; yet he was never that violent party-man, on this ſide, ſuch as he has been repreſented: he ſeems to have taken no lead whatever, and no part in many of the weighty diſcuſſions agitated at this period. The reporters of the parliamentary debates for that ſeſſion did not look to him as a man of much conſequence in the ſcale; for in mentioning a motion made by Mr. Welbore Ellis, and which was ſeconded by Mr. Fox, they only ſay "Mr. C. Fox ſeconded the motion in a lively, academical manner, of ſtating and taking off arguments uſed in favour of the bill;" while to every other ſpeaker on the occaſion, many of whoſe names have long ſince been buried in everlaſting oblivion, they have aſſigned comparatively large portions of their work to diſplay the arguments. Early in the next ſeſſion of parliament we find him juſtifying the conduct of miniſters: ſtill he is only repreſented as "diſplaying great ingenuity, in endeavouring to confound the reaſonings of his opponent, and moving the previous queſtion." But on a ſubſequent day, December 6, when Mr. Serjeant Glynn moved "That a committee be appointed to inquire into the adminiſtration of criminal juſtice, and the proceedings of the judges of Weſtminſter-hall, particularly in caſes relating to the liberty of the preſs, and the conſtitutional power and duty of juries," Mr. Fox ſpoke decidedly againſt the motion; as he did on ſome other occaſions, for which, no doubt, he was in after-life aſhamed. On the 27th of February 1771, on a diſcuſſion of the *nullum tempus* act, as it referred to the claims of ſir James Lowther, Mr. Fox burſt forth in a ſtrain of manly eloquence, "I take ſhame to myſelf," ſays he, "that I have not riſen ſooner to declare my ſentiments on this important queſtion; for I think it diſgraceful in any man to ſit ſilent on ſuch an occaſion, who ever had the uſe or faculty of ſpeaking in this houſe: but, ſir, my ſilence was owing to my aſtoniſhment; I was amazed! I was confounded! for though I ſaw this bill at firſt in the ſame light in which I now behold it, yet I endeavoured to perſuade myſelf that I muſt rather be miſtaken, than that any thing ſo bad, ſo violent, ſo lawleſs, ſo monſtrous, could be advanced by ſuch men as thoſe who propoſed this bill. But I could not long remain undecided; I ſoon beheld the propoſition in all its naked, genuine deformity: then, ſir, as I was firſt ſtruck dumb with aſtoniſhment, I was ſeized with horror and indignation. Who, ſir, that has a conſcience to revere juſtice, a ſenſe of liberty, or a regard for the conſtitution, can liſten, without feeling an honeſt zeal to defeat a propoſition which, at one blow, deſtroys our conſtitution, our liberty, and our laws! Gentlemen are loud in their clamours againſt miniſterial influence. I avow the ſyſtematic ſupport of that miniſter in all his meaſures, who has my good opinion and confidence; but that miniſter ſhall never have my aſſiſtance and ſupport, who ſhall dare to propoſe what theſe gentlemen, who are ſo proud of their oppoſition to miniſters, now propoſe." After this open and unreſerved avowal in favour of the courſe purſued by lord North, it was to be expected he would not be long unnoticed; accordingly, we find him in a very ſhort time advanced to a ſeat at the admiralty board, which he occupied a few months only, when, from cauſes not diſtinctly known, he reſigned his office; but towards the end of the year 1772, or early in the following year, he was appointed one of the lords of the treaſury. On this occaſion he was violently aſſailed as a placeman, bound to vote for every meaſure that the miniſter might propoſe; he denied the charge, avowing himſelf a free man, and that he would never ſupport the meaſures of government longer than while he believed they were calculated to promote the welfare of the Britiſh empire; and opportunities were not wanting in which he exerciſed this right. Of theſe, not the leaſt memorable occurred during the debate on the bill brought into the houſe of commons by that excellent man ſir William Meredith, to give relief from ſubſcription to the thirty-nine articles. On this occaſion Mr. Fox voted againſt the miniſter, and delivered an admirable ſpeech in favour of religious liberty; and to the principles which he then avowed, he firmly and uniformly adhered to the laſt hour of his life. Mr. Fox was no longer in high favour with the miniſter, but he ſtill gave him his general ſupport and vote, though he had a mind ſuperior to go all the lengths of a party-man: he muſt at all times think for himſelf, and ſometimes, as we have ſeen, he claimed to act according to his own judgment, which is ill reliſhed by a man whoſe motto muſt be "aut Cæſar aut nullus." Mr. Fox's immediate removal from the treaſury was not owing to any oppoſition to lord North's meaſures, but to a difference of opinion as to the beſt mode of carrying them into effect. The miſunderſtanding aroſe reſpecting the committal of Mr. H. S. Woodfall, the printer of the Public Advertiſer, who had been brought to the bar of the houſe for inſerting a letter ſuppoſed to have been written by the Rev. J. Horne, now J. Horne Tooke, in which moſt unjuſtifiable liberties had been taken with the character of the ſpeaker, ſir Fletcher Norton. Mr. Woodfall having given up the author, and thrown himſelf on the mercy of the houſe, it was moved by Mr. Herbert that he ſhould be committed to the cuſtody of the ſerjeant at arms. Mr. Fox, at that period a great ſtickler for the privileges of the houſe, avowed that the puniſhment was not ſufficiently ſevere, and moved "that he be committed to Newgate, as the only proper place to which offenders ſhould be ſent; though hints," he ſaid, "had been thrown out that the ſheriffs would not admit him." To this lord North replied, that he was very ſorry (he undoubtedly meant *angry*) that hints had been thrown out of what the ſheriffs would do; he hoped there were no perſons who would diſpute the power of that houſe;

houſe; he therefore moved that the printer be committed to the Gate-houſe, as he thought it imprudent to force themſelves into a conteſt with the city. Mr. Herbert carried his motion in oppoſition to the others, by a majority of 152 to 68, to the great diſpleaſure of lord North, who aſſerted that it was entirely owing to the interference of Mr. Fox that he was left in a minority.

It was on the occaſion of Mr. Horne's examination and triumph on this ſubject, that colonel Barré ſeized the opportunity of widening the breach between the miniſters, by ſarcaſtically jeering the premier with want of ſucceſs in the buſineſs; "At the firſt commencement of this buſineſs," ſaid the colonel, "I augured that it would end ill, and I laſt night felt inconceivable pain for the noble lord; his troops were no more prepared to defend than to fight for him. I know ſome little matter about the arrangement of troops, but in my life I never ſaw a body of regulars cut ſo wretched a figure! The noble lord has been charged with what I never ſhould have ſuſpected him guilty of, a precipitancy. I hope he will take his ſpirited friend's advice (Mr. Fox) and learn a little caution. Advice, whether coming from a grey or a green head, if good, ſhould be followed." And again, "We have heard a deal of ſound law; I wiſh we had a little more ſound ſenſe from the other ſide of the houſe. I have every thing to hope from the noble lord; he is at preſent moſt happily ſituated, for if he wants law, he has but to look at the left (to Mr. Wedderburne); if he ſtand in need of common ſenſe, his ſpirited friend on the right (Mr. Fox) can abundantly ſupply him."

This was on the 17th of February 1774, and in two days afterwards, while he was actually engaged in converſation with his lordſhip on other ſubjects in the houſe of commons, he received the following laconic, and, as he deemed it, contemptuous epiſtle, by the hands of one of the meſſengers of the houſe.

"His majeſty has thought proper to order a new commiſſion of treaſury to be made out, in which I do not ſee your name.

North."

Mr. Fox in a ſhort time entered avowedly the liſts of oppoſition to the miniſter. Sometimes, indeed, when the privileges of the houſe were concerned, he voted with the majority, yet he never failed to make him feel the power of his eloquence, and at length raiſed ſuch a force againſt him as to ſubvert his power, and almoſt to bring him to condign puniſhment. Mr. Fox had never given his voice for the coercive meaſures that were at this period adopted with regard to America; on this ſubject he was always conſiſtent, always the friend of liberty, and of the rights of our tranſatlantic brethren. To the firm ſtand which he now took may be aſcribed the foundation of that reputation which has been ſo beneficial to his country, and which has immortalized his name. He commenced his oppoſition in the midſt of circumſtances which enabled him to foreſee and foretel the impending calamities of the public, and that with an inſtantaneous deciſion which excited in his hearers a confidence in the reſolutions of his enlightened mind. For ſome years the adminiſtration had been rendered an object of popular jealouſy, owing to the uniform excluſion of the whig intereſt from any ſhare in the government: the influence of the crown had increaſed, and had been perpetually ſet in competition with the intereſts of the people. A number of oppreſſive ſtatutes, enacted againſt the intereſts, and contrary to the conſent of the colonies in America, had alienated the affections of their inhabitants, and juſt apprehenſions were excited of a civil war which was likely to endanger the ſafety of the whole empire. Notwithſtanding a majority in parliament was for coercive meaſures againſt the Americans, deſpondency ſpread itſelf over the country, and the public credit, as was evident from the ſtate of the funds, began rapidly to decline. In this ſtate of things, Mr. Fox joined the oppoſition, among whom were a Burke, a Camden, a Barré, and a Dunning, and at their head ſtood the virtuous and enlightened marquis of Rockingham. Mr. Fox now began to take the foremoſt rank among the ſpeakers of the houſe: his vaſt and comprehenſive mind ſoared beyond all his contemporaries; it embraced, as it were, intuitively, all ſubjects, and the habit of profound reflection had given him a degree of preſcience which ſeemed almoſt ſupernatural. His deep penetration, and his knowledge of cauſes and effects, were indeed greatly beyond that of any other man of the age: he viewed things in their diſtant relations and their remote conſequences. The experience, the fatal experience of an American and French revolution, has ſhewn that there was ſcarcely any great political meaſure which he reprobated that was not ultimately found miſchievous in its operations; and hardly any line of conduct which he adviſed, that time did not prove to be that which ought to have been purſued. "But his remonſtrances, his exhortations and ſuggeſtions, like the predictions of Caſſandra, to which they were often compared, were neglected and deſpiſed till the time in which they might have been executed had glided away." Thus, early in the year 1774, he oppoſed the introduction of the Boſton Port bill, and apologized for the conduct of the coloniſts; and on this and other occaſions he arraigned the proceedings of the miniſter in bold and energetic language: on the motion to repeal the tea act, April 17, he averred that this and other ſimilar bills had been brought in with the view to irritate, and declare war in America, "which," ſays he, looking to the treaſury-bench, "if you perſiſt in, I am clearly of opinion you will effect, or force it into open rebellion." It was now that the miniſter began to calculate the loſs he had ſuſtained, and the oppoſition to eſtimate the ſtrength it had acquired. The reflecting part of the nation were animated, and openly rejoiced to behold, in the perſon of a youthful ſenator, whom they had heretofore looked on as an enemy, a firm, intrepid advocate of the rights of the oppreſſed. On the 22d of June the parliament was diſſolved; one of its laſt, or rather its laſt act, was the Quebec bill, which was oppoſed by Mr. Fox, and which was ſaid in the houſe to contain, among others equally abſurd, the following propoſitions, *viz.* "That a ſtate of ſlavery is better than a ſtate of freedom:—that the popiſh religion was more congenial to the principles of Chriſtianity than the proteſtant:—that juries are unneceſſary, and therefore to be diſuſed:—that French laws are preferable to Engliſh; and that the conſtitution, which our anceſtors had preſerved with ſo much wiſdom, and eſtabliſhed at the expence of ſo much blood and treaſure, is to be deſtroyed." The act was however paſſed, and the parliament diſſolved; and upon the aſſembling of a new parliament Mr. Fox appeared in his place, as member for the ſame borough of Midhurſt, pledging himſelf to uſe every effort in bringing the miniſter to anſwer for the miſchief occaſioned by his incapacity. It was on this occaſion that colonel Barré characterized the late parliament as having "began their political life with a violation of the ſacred right of election in the caſe of Middleſex: they had died, he ſaid, in the act of popery, when they eſtabliſhed the Roman catholic religion in Canada, and they had left a rebellion in America as a legacy."

During the interval between the two parliaments, *viz.*

in July 1774, lord Holland died, bequeathing Mr. Fox, who by the death of his brother Henry was now a ſecond ſon, large property, and conſiderable eſtates in the Iſle of Thanet. At Kingſgate he had left him a houſe, built in imitation of Cicero's Formian villa on the coaſt of Baiæ. Mr. Fox, who had never been an economiſt, ſoon diſſipated the property bequeathed him by his father, and ſold Mr. Jenkinſon, the late lord Liverpool, a ſinecure place which had been obtained for him. Forlorn as his ſituation now was, and brought on by his own extravagance, or by his inclination for gaming, his mind did not bend under the calamity; it ſeemed to rebound from the fall, and inſtead of ſinking in deſpair, to have actually riſen into celebrity and even independence. Without following him ſtep by ſtep in his illuſtrious career, we may obſerve generally, that he ſpoke and voted during the whole conteſt in direct oppoſition to a criminal ſyſtem, which, as it had been fondly and fallaciouſly prognoſticated, was to produce the unconditional ſubmiſſion of the colonies, and lay them proſtrate at the feet of the mother country. At length all the evils that had been foreſeen were realized. America declared herſelf independent: France joined in the conteſt: the capture of Burgoyne and Cornwallis proclaimed the triumphs of liberty, and a new conflagration lighted in Europe, by the fire-brands that had been ſcattered by the Britiſh miniſtry in another hemiſphere, waſted the ſtrength and exhauſted the reſources of England.

At the general election in 1780, the family borough of Midhurſt having fallen into different hands, Mr. Fox, conſcious of his own powers, became candidate for the city of Weſtminſter, in which, after a violent conteſt, he ſucceeded, though oppoſed by the formidable intereſt of the Newcaſtle family, and by the whole influence of the crown. Being now the repreſentative of a great city, he appeared in parliament in a more dignified capacity, and acquired a conſiderable increaſe of conſequence to his political character. In himſelf he was ſtill the ſame: he now neceſſarily lived and acted in the boſom of his conſtituents: his eaſineſs of acceſs, his pleaſant, ſocial ſpirit, his friendly diſpoſition and conciliating manners, which appeared in all he ſaid, and the good temper which predominated in all he did, were qualities that rendered him the friend and acquaintance, as well as the repreſentative, of thoſe who ſent him into parliament: his ſuperior talents, and their powerful and frequent application to popular purpoſes, made him beſt known among political men, and gave him a juſt claim to the title ſo long applied to him, of "The man of the people."

The ſubjects of debate in the new parliament afforded the oppoſition fine opportunities for the diſplay of their eloquence: they had ever been diſtinguiſhed for integrity and talent, and now they became formidable by an increaſe of numbers. Miniſters were aſſailed in the houſe by arguments which they could neither repel nor contradict, and from without they were overwhelmed by the clamours of an indignant people; till at length lord North and his adherents, confounded, overwhelmed, and almoſt driven to deſpair, were obliged to reſign, and it was hoped that they would have been made really reſponſible for all the miſchiefs and bloodſhed that had occurred during their calamitous adminiſtration. The Rockingham party, however, contented themſelves with the defeat of their opponents. Mr. Fox obtained the office of ſecretary of ſtate for foreign affairs, and the marquis was nominated the firſt lord of the treaſury. The expectation of the nation was now raiſed to the higheſt pitch: with this party, they hoped to ſee an end to national calamity, and the intereſts of the country ſupported and maintained in all quarters of the globe. Much indeed was performed by them conſidering the ſhortneſs of their adminiſtration. Though they had ſucceeded to an empty exchequer, and a general and moſt calamitous war, yet they reſolved to free the people from ſome of their numerous grievances. Contractors, thoſe dead weights in the ſcale of corruption, were excluded by act of parliament from the houſe of commons: cuſtom and exciſe officers were diſqualified from voting at elections: all the arbitrary proceedings with reſpect to the Middleſex election were reſcinded; while a reform bill aboliſhed a number of uſeleſs offices. A more generous policy was adopted in regard to Ireland: a general peace was meditated, and America, which could not be reſtored, was at leaſt to be conciliated. In the midſt of theſe promiſing appearances, the marquis of Rockingham, who was the ſupport of the new adminiſtration, ſuddenly died, an event which afflicted the nation, and divided the friends of liberty. The council board was inſtantly torn in pieces by political ſchiſms: a diſpute, as had been foreſeen, immediately took place reſpecting the perſon who ſhould ſucceed as firſt lord of the treaſury. The candidates were lord Shelburne, afterwards marquis of Landſdowne, and the late duke of Portland; the former ſuppoſed to have the ear of the king, and a majority in the cabinet, was immediately entruſted with the reins of government, and Mr. Fox retired in diſguſt, declaring that "he had determined never to connive at plans in private, which he could not publicly avow." He now reſumed his ſtation in oppoſition, and joined the very man whoſe conduct he had for a ſeries of years deprecated as the moſt deſtructive to the intereſts of his country, and moſt baneful to the happineſs of mankind: while his former colleague, the earl of Shelburne, was buſied in concluding a peace with France, Spain, Holland, and the united ſtates of America. This nobleman, though by no means deficient in political wiſdom, had omitted to take thoſe ſteps which preceding miniſters had ever adopted to ſecure ſafety. A confederacy was formed againſt him by the union of the friends of Mr. Fox and lord North, known by the name of "The coalition," which proved in the event as impolitic, as it was odious to the great maſs of the people. It anſwered, however, the temporary purpoſe of thoſe who adopted it, by enabling them to ſupplant their rivals, and to ſeize upon their places. Their ſucceſs was, however, ephemeral; they had a majority in the houſe of commons, but the people at large were decidedly hoſtile to an union which appeared to them to be bottomed on ambition only, and deſtitute of any common public principle. It was aſſerted, with too much appearance of truth, that they agreed in no one great meaſure calculated for the benefit of the country, and the nation ſeemed to unite againſt them as one man. Their conduct in the cabinet led the ſovereign to uſe a watchful and even jealous eye upon their acts; and the famous India bill proved the rock on which they finally ſplit, and on account of which they forfeited their places. Mr. Fox had now to contend for the government of the empire with William Pitt, a ſtripling ſcarcely arrived at the age of manhood, but who nevertheleſs ſucceeded to the poſt of premier, and maintained the ſituation for more than twenty years.

The tide of popularity had ſet in ſo ſtrongly againſt Mr. Fox, that at the general election many of his moſt active friends and partizans loſt their ſeats in the houſe of commons, and he himſelf was forced into a long and expenſive conteſt for the city of Weſtminſter. He had, as we have ſeen, been originally returned for that place by the voice of the inhabitants, in oppoſition to the influence of the crown

united to that of ſome of the leading families. Now, though ſupported by the Portland and Devonſhire intereſts, he had to maintain a ſevere and very dubious ſtruggle, but after the lapſe of forty-ſeven days he appeared, at the cloſe of the poll, to have a majority of 236 votes in his favour. A ſcrutiny was demanded and obtained by his adverſary, by which Mr. Fox would have been excluded for a time from the houſe of commons, had he not been returned by the intereſt of ſir Thomas Dundas for ſome Scotch boroughs. At length his triumph was complete, the houſe of commons, after the ſcrutiny had continued from May to the following March, ordered the high bailiff to make his return, when the majority for Mr. Fox was 231, he having at this period loſt only five by the inveſtigation. At this election 12,301 electors polled, of whom 6126 gave their votes for Mr. Fox. A proſecution was commenced againſt the high bailiff; and a verdict was obtained, with 2000*l.* damages. From this period to his death, a long ſpace of twenty-five years, Mr. Fox had been gradually riſing in the eſtimation of his fellow citizens. He took an active and leading part in the proſecution of Mr. Haſtings, a meaſure that ſeemed abſolutely neceſſary to clear the honour of the nation, and to prove to the inhabitants of India, that in England they would ſtill find avengers of their wrongs. Mr. Fox had ever ſhewn himſelf a friend to peace, as well from the true principles of humanity, as to promote the intereſts of his country; and on two great occaſions his overbearing eloquence proved of the laſt importance to the nation; once when his rival, Mr. Pitt, at the inſtigation of the court of Berlin, wiſhed to wage an unprofitable war with Ruſſia, relative to the poſſeſſion of Oczakow; the other, when he urged a conteſt with Spain. And it is now a matter of aſtoniſhment, that a miniſter who derived all his credit from the management of the finances, laboured to impoveriſh the nation by two ridiculous but bloody conflicts, one of which had for its object the preſervation of the Turkiſh frontier, and the other a participation in the trade of cat-ſkins.

In the year 1788, Mr. Fox, diſguſted or wearied with public buſineſs, repaired to the continent, and after ſpending a few days with Gibbon the hiſtorian, at Lauſanne, entered the claſſic regions of Italy; ſcarcely had he time to look about him, when a meſſenger from the prince of Wales arrived, deſiring his immediate attendance in forming an adminiſtration, which the king's alarming and ſingular illneſs rendered neceſſary. Mr. Fox returned, but on the firſt day of his appearing in the houſe, he ſtarted an abſtract queſtion upon the ſubject of the prince's *right* to the regency, which cauſed very violent and protracted diſcuſſions, till at length his majeſty was reſtored to the poſſeſſion of his health, and a regency rendered unneceſſary. On this ſubject his rival contrived to take his ſtand on conſtitutional ground, which cauſed the oppoſition, with their leader, to loſe rather than gain popularity by the meaſure.

No ſooner had the French nation evinced a ſincere deſire to ſhake off the yoke of abſolute power, than Mr. Fox hailed the auſpicious dawn of riſing liberty. At firſt the two great rival chiefs, who agreed in nothing elſe, united cordially in this cauſe, and while one preſaged a long peace, the extinction of the national debt, and the proſperity of the empire; the other gloried in beholding a mighty people reſcued from the moſt oppreſſive ſervitude, and at the ſame time augured the happieſt reſults in favour of the human race. At length however, they became oppoſed to each other, and the moſt ſerious conflicts were the reſult of their diſcuſſions. Mr. Fox experienced the dereliction of many of his aſſociates, among others of Mr. Burke, the man from whoſe lips he had firſt imbibed the principles of freedom.

This was a circumſtance that affected him more than any other through life; he had ſeen his plans for the public good diſappointed; he had been deſerted by a crowd of political adherents; a thouſand times his heart and his motives had been ſlandered, ſtill he had abundant reſources in himſelf to bear up againſt the tide ſetting in againſt him. No oppoſition, no injuries could excite in him the ſpirit of revenge, or the principles of acrimony; even "when his friend, on whom he hung with almoſt idolatrous regard, broke from him in the paroxyſm of political madneſs, and with furious cruelty explored, in his attack on him, every avenue to pain, far from repelling enmity with enmity, he diſcovered his ſenſibilities of wrong only with tears, and he ſubſequently wept with a pertinacity of affection almoſt without example, over the ſepulchre of that very man, who had unrelentingly ſpurned all his offers of reconciliation, and who, with reference to him, had expired in the bitterneſs of reſentment."

War was commenced; to this, in every ſtage, Mr. Fox gave his decided negative, but Mr. Pitt, who was ſuppoſed to engage in it, at firſt, with reluctance, left no means untried to carry his meaſures with a high hand. Titles, offices, and honours were diſtributed with the utmoſt profuſion, the oppoſition benches were nearly deſerted, and his political rival, the ſubject of this memoir, was left almoſt alone to contend againſt a hoſt of foes. Conſcious of his integrity, and of the juſtice of the great principles on which he was acting, and at the ſame time ſeeing that his oppoſition was almoſt without effect, he determined to ſecede from parliament, and had evinced a wiſh to retire altogether from public buſineſs. But the entreaties of his friends, and the occurrence of new and ſingular events, prevented the meaſure. He again took his place in parliament at the head of an oppoſition, feeble in point of numbers, but formidable in reſpect to talents and abilities.

At length, after eighteen years, Mr. Pitt retired from office, and was ſucceeded by Mr. Addington, now viſcount Sidmouth, who concluded the peace of Amiens, and who on this occaſion received the ſupport of Mr. Fox and his friends. When a renewal of the conteſt was meditated, he expreſſed himſelf hoſtile to the meaſure, avowing that he thought the continuance of peace was infinitely deſirable, and that the preſervation of national honour was the only legitimate cauſe of war. In ſtrict conſiſtency, therefore, with this notion, when the royal meſſage was brought down to the houſe declaratory of hoſtilities, Mr. Fox expreſſed his opinion both againſt the war as unneceſſary, and againſt the criſis at which it took place, as impolitic. This meaſure ſoon proved fatal to Mr. Addington's adminiſtration, and the reins of government having dropped from his hands, were immediately ſeized by Mr. Pitt. Mr. Fox now joined lord Grenville, and it was ſuppoſed an extended adminiſtration would have been formed, in which theſe gentlemen and their friends would have made a part. While however Mr. Pitt expreſſed his readineſs, and even his anxious wiſh to comply with what was ſuppoſed the deſire of the country, he, at the ſame time, hinted that inſurmountable obſtacles had occurred in a *certain quarter*. Scarcely had the diſcuſſions on this ſubject ſubſided, when Mr. Pitt, who had long been ill, ſickened and died. A vote of parliament for a public funeral, and the payment of his debts at the expence of the nation, added to his ſudden fate, and univerſally acknowledged talents, all tended to render his memory reſpected. His aſſociates, after a ſhort trial, gave way for the introduction of Mr. Fox once more into office. He re-

ſumed his ſituation as ſecretary of ſtate for the foreign department which he had ſurrendered twenty-two years before. It could not be his wiſh, at this period of his life, to embark on ſo hazardous a voyage, yet at the call of his ſovereign and his country he was willing to ſpend the remains of life in their ſervice. Aware that he had but a ſhort ſpace before him, he declared he ſhould die contented and happy if he could but previouſly obtain peace, an honourable peace for Britain; remove all legal diſabilities ariſing out of religion in order to unite more cloſely the intereſts of Ireland with thoſe of England; and laſtly, obtain a complete abolition of the ſlave trade. Every eye was now directed towards him, and every mind anticipated the good effects of the meaſures that they fondly hoped would, by his influence, be adopted. It was, however, a moſt unfortunate circumſtance, that his colleague, lord Grenville, already an auditor of the exchequer, inſiſted on being alſo firſt lord of the treaſury, offices which had heretofore been incompatible. Mr. Fox, to promote the union, ſo deſirable in the cabinet, vindicated their compatibility, but loſt much credit for his good nature, in the country; nor was his ſecond act better reliſhed, *viz.* of inviting the lord chief juſtice of the king's bench to a ſeat in the cabinet; theſe were regarded as unconſtitutional meaſures, and violent clamours were raiſed againſt him, as introducing precedents moſt fatal to the liberties of the country. The preliminaries being now arranged, one of his firſt acts was a meaſure for the reſtriction of the ſlave trade, and by his means a ſolemn reſolution was voted by the ſenate, and carried up to the ſovereign, on the juſtice and policy, the duty and neceſſity, of the total abolition of this abominable traffic. He declared, in one of the debates on this buſineſs, on behalf of himſelf and ſuch of his colleagues as had voted with him on the ſubject when out of office, that they felt the total abolition of the ſlave trade as a ſtep involving the deareſt intereſts of humanity, and as one which, however unfortunate they might be in other reſpects, ſhould they be ſucceſsful in effecting it, would entail more true glory upon their adminiſtration, and more honour upon their country, than any other tranſaction in which they could be engaged. Scarcely had he commenced his career of public and official buſineſs, in which his country and the world would have been benefitted, before the powers of his body ſunk exhauſted by the too vigorous exertions of his mind; and the immenſe preſſure of public concerns broke down a conſtitution which had previouſly indicated ſymptoms of decay, and in a few months deprived his country of the moſt enlightened and patriotic ſtateſman which this, or any other nation could boaſt, before the mighty ſchemes revolving in his breaſt could be matured and developed, and almoſt before any one of his wiſe and ſalutary plans could be carried into effect. Had he lived but a year, or even a few months longer, he might probably have reſtored peace to a diſtracted world; he might, had he not been thwarted and oppoſed by his colleagues, ſome of whom could not poſſibly enter into his feelings, nor comprehend the grand motives of his actions, have reſtored the conſtitution of Britain to its ancient ſplendour, by an annihilation of the diſgraceful traffic in the repreſentation, and by expunging from the ſtatute book thoſe modern acts which diſfigure and diſgrace it. He died Sept. 13, 1806, without pain and almoſt without a ſtruggle, in the 58th year of his age. It happened to few men, if to any, to leave ſo many ſorrowing friends; his deceaſe was the ſubject of univerſal lamentation, and the general regret which took place when the event was announced, and which followed him to his grave by the myriads who aſſembled to teſtify their reſpect to his memory, ſpoke more powerfully of the merits and claims of Mr. Fox than language could deſcribe. Nevertheleſs the pulpit and preſs were made uſe of by the clergy of all denominations, and by perſons of different, and even oppoſite political parties, to illuſtrate his virtues and celebrate his well earned fame. Many of the characters drawn of this great man have been collected in a volume by one of the moſt learned men of the age, who aſſumes the title of "Philopatris Varvicenſis." Of this work we have already made much uſe in the courſe of the foregoing article, and to ſeveral parts of it we ſhall be ſtill more indebted for the following delineation of Mr. Fox's character.

"To an extraordinary natural capacity, improved and embelliſhed by a liberal education, and to a quickneſs of apprehenſion which inſtantly ſeized every object that was preſented to it, and which with incredible facility developed the moſt intricate problems, this great man added a memory richly ſtored with the treaſures of ſcience and literature, and well fraught with hiſtorical and political knowledge. He was profoundly verſed in the hiſtory and the conſtitution of his country. He perfectly underſtood its external relations, its connection with foreign powers, its political and commercial intereſts, its financial reſources, its military and naval ſtrength. He was well acquainted with the hiſtory, the ſtrength, the policy, the ſeparate and relative intereſts and views of thoſe ſtates which once conſtituted what has not been improperly called the great republic of Europe; and upon the juſt equipoiſe of the political power and influence of which the liberty, ſafety, and proſperity of the whole was ſuppoſed to depend. And, in a word, he was ignorant of nothing which was neceſſary to conſtitute the conſummate ſtateſman. To this was added an extent of views, a comprehenſion of mind, and an energy of character peculiarly his own. All theſe were combined with a philanthropy, which originated in a natural goodneſs of heart, improved and extended by hiſtorical knowledge, and perſonal obſervation, of the ineſtimable bleſſings which reſult from civil liberty, and from a wiſe adminiſtration of government, and of the miſeries which accrue to mankind from unjuſt wars, from tyranny and perſecution; and confirmed by generous exertions in defence of the injured, inſulted, and oppreſſed: ſo that what was originally nothing more than a natural bias of the mind, became by degrees a moral principle, and grew up into a fixed habit of univerſal, active, and diſintereſted benevolence. His eloquence, that divine eloquence, which aſtoniſhed and captivated the world, conſiſted, not in pomp of diction nor in melody of ſound; not merely in a happy ſelection of expreſſions, though the beſt and the moſt appropriate which the language could ſupply ſpontaneouſly offered themſelves to his uſe; not in dazzling the fancy with brilliant imagery; not in bewildering the underſtanding with plauſible ſophiſtry; not in flattering the prejudice of his hearers, nor in exciting falſe hopes or groundleſs terrors to render them blindly ſubſervient to party purpoſes:—to ſuch unworthy artifices his manly ſpirit diſdained to ſtoop. His eloquence was of a nobler kind. Plain, nervous, energetic, vehement: it ſimplified what was complicate, it unravelled what was entangled, it caſt light upon what was obſcure, and through the underſtanding it forced its way to the heart. It came home to the ſenſe and feelings of the hearer; and by a ſecret, irreſiſtible charm, it extorted the aſſent of thoſe who were moſt unwilling to be convinced. And to crown all, this aſtoniſhing eloquence was uniformly exerted in the cauſe of liberty and juſtice, in defence of the oppreſſed and perſecuted, and in vindicating the rights, the freedom, and the happineſs of mankind.

"Never,

"Never, during the whole of his long parliamentary life, was his voice lifted up to juſtify oppreſſion or perſecution: never did the injured or oppreſſed appeal to the Britiſh ſenate, that he did not exert his noble eloquence on their behalf. He made the cauſe of all that were wronged his own; and, even where he failed, through the perverſeneſs of the times, of procuring juſtice for them, he in a meaſure compenſated their ſufferings, by lending his great talents to their cauſe, and by drawing towards it the ſympathy of mankind. In him, the moſt diſcordant ſects, and the moſt diſtant provinces, found an ever ready defender and a generous patron. He pleaded (and with what ſtrength of argument, what rich variety of illuſtration, what dignity of ſentiment, what majeſty of diction!) for the equitable privileges of the Roman Catholic and the Proteſtant diſſenter; and he contended, with an eloquence alternately indignant and pathetic, for the rights of the haraſſed Iriſh, the oppreſſed Hindoos, and the ſuffering Africans.

"The various opinions which Mr. Fox delivered, during the long courſe and diverſified conflicts of his public life, contain a treaſure of political philoſophy, which no ſtateſman can ſtudy without becoming more benevolent and more wiſe. The notions which he uttered were not taken up at random, and again laid down without conſideration, as intereſt or paſſion might impel. Such may be, and ſuch are, the fluctuations of thoſe who venture on the ſea of politics, without ſagacity to direct their way, or honeſty to keep them ſteady in their courſe. The axioms which Mr. Fox embraced as the pole-ſtar of his political conduct, and which he inculcated as the beſt means of promoting the happineſs of nations, were deduced from a profound and comprehenſive ſurvey of human affairs, from an intimate acquaintance with human nature, and from an enlightened view of the end for which government was eſtabliſhed. His political ſentiments, originating in principles which are as immutable as the attributes of the deity, from which they are derived, were not ſubject to any vicious defection or capricious fluctuations. Though Mr. Fox was no formal religioniſt, yet the eſſence of religion, which centres in charity, was the predominant ſenſation of his heart. If religion conſiſt in doing to others as we would that they ſhould do to us; if it have any connection with a holy endeavour to preſerve peace on earth, and good will among men, (and what Chriſtian will deny this?) then we will venture to ſay, that Mr. Fox, who never made any ſhew of religion, was, in fact, one of the moſt religious men of the age. The great object of his political life was to prevent the havock of war, and to preſerve the world in peace. His exertions were indeed ineffectual, but they were unintermitted; and if he who ſaves the life of one man deſerves a civic crown, what recompence muſt be due to him who laboured, with ſo much conſtancy and zeal, to reſcue millions from an untimely grave? If peace, ſince the commencement of the Chriſtian era, ever had a ſteady, a diſintereſted advocate, it was in Mr. Fox. Peace was his conſtant aim, his ardent hope, his living counſel, and his dying prayer."

Mr. Fox muſt now be conſidered as an author. While at Eton, his compoſitions were highly diſtinguiſhed, ſome of which are in print; as one compoſed in or about the year 1761, beginning, "Vocat ultimus labor;" another, "I, fugias, celeri volitans per nubila curſu," written in 1764; and his "Quid miri faciat Natura," which was followed by a Greek dialogue in 1765. See Muſæ Etonenſes, &c.

Mr. Fox is author of the 14th, 16th, and perhaps, ſays the preſent lord Holland, his nephew, a few other numbers of a periodical publication in 1779, called the Engliſhman.

In 1793, he publiſhed "A Letter to the Electors of Weſtminſter," which paſſed through thirteen editions within a few months. This pamphlet contains a full and ample juſtification of his political conduct, with reſpect to the diſcuſſions in which he had engaged on the French revolution.

It does not appear that the parliamentary ſpeeches, printed ſeparately as his, of which there are many, were ever reviſed by him, but were taken from the public papers. But "A Sketch of the Character of the late moſt noble Francis Duke of Bedford, as delivered in his introductory Speech to a Motion for a new Writ for Taviſtock, on the 16th of March, 1802," was printed by his authority, and from his own manuſcript copy; and it is ſaid, that he obſerved on that occaſion, "that he had never before attempted to make a copy of any ſpeech which he had delivered in public." Since this, he wrote an epitaph on the late biſhop of Downe, which is engraved on his tomb, in the church of St. James, in the Hampſtead road. "There are," ſays lord Holland, "ſeveral ſpecimens of his compoſition in verſe, in different languages; but the lines on Mrs. Crewe, and thoſe on Mrs. Fox, on his birth-day, are, as far as I recollect, all that have been printed." An ode to Poverty, and an epigram upon Gibbon, though very generally attributed to him, are certainly not his compoſitions.

To lord Holland, however, the world is indebted for an important and ſingularly valuable poſthumous publication of this great ſtateſman, entitled, "A Hiſtory of the early Part of the Reign of James the Second, with an introductory Chapter," &c. It is not known when he firſt formed the deſign of writing a hiſtory; but in the year 1797, he publicly announced in parliament his intention of devoting a greater portion of his time to his private purſuits: "After ſeeing," ſays he, "the conduct of this houſe, after ſeeing them give to miniſters their confidence and ſupport, upon convicted failure, impoſition, and incapacity; after ſeeing them deaf and blind to the conſequences of a career that penetrates the hearts of all other men with alarm; and that neither reaſon, nor experience, nor duty, are ſufficiently powerful to influence them to oppoſe the conduct of government, I certainly do think that I may devote more of my time to private purſuits, and to retirement which I love, than I have hitherto done." When he had determined to conſecrate a part of that time in writing hiſtory, he was naturally led, from his intimate knowledge of the Engliſh conſtitution, to prefer the hiſtory of his own country, and to ſelect a period favourable to the general illuſtration of the great principles of freedom on which it is founded. With this view, he fixed on the revolution of 1688, as being the moſt ſignal triumph of that cauſe to which his public life had been devoted; and alſo, with the deſire of reſcuing from miſrepreſentation the moſt glorious tranſaction of our hiſtory; of inſtructing his countrymen in the real nature of their conſtitution, and of impreſſing on mankind thoſe leſſons applicable to all times, which are to be drawn from that memorable occurrence. It is to be lamented that the author had made ſo little progreſs in this work, when he was called to take a principal part in the government of the country. The volume comprehends only the hiſtory of the tranſactions of the firſt year of the reign of James II., with an introductory chapter on the character and leading events of the times immediately preceding. Short, however, as this fragment is, yet the advantages reſulting from it are numerous and important. It contains a picture, drawn with a maſterly hand, of the practical tyranny that was exerciſed over this nation, under

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the reigns of Charles II. and James II.; which ſhews, that had affairs proceeded, for a ſhort time only, in the ſame courſe, the forlorn and deſolate aſpect of deſpotiſm muſt have been permanently impreſſed upon the country: it likewiſe exhibits a mournful picture of that ſervile ſubmiſſion, which then ſeemed to form the character of the nation, and to point them out as the willing victims of oppreſſion: and it ſtigmatizes thoſe time-ſerving and bigotted hiſtorians, who have endeavoured to diſguiſe the enormities of that period; to write the apology of venality and deſpotiſm; to repreſs the virtuous emotions of hatred and indignation, which the ſcenes then paſſing are calculated to excite; and who have contributed ſo largely to corrupt the moral ſentiments of our people, and extinguiſh among us the love of our country, and a diſintereſted courage in public affairs. Engliſh Peerage. Parliamentary Debates. Hiſtory of the early Part of the Reign of James II., &c. &c.

Fox de Morzillo, Sebastian, a Spaniſh philoſopher and man of letters, was born at Seville in 1528, and purſued his ſtudies partly in his own country and partly in the Netherlands. He began to attract the notice of the learned world by his literary productions ſoon after he was twenty years of age; and in a ſhort time acquired ſo high a reputation, that Philip III. fixed upon him as a fit perſon for the office of preceptor to the Infant Don Carlos. When he was nominated to this high charge, he was a reſident at Louvain; but, on its being notified to him, he inſtantly prepared to return to Spain by ſea. The ſhip in which he embarked was unfortunately wrecked, and he periſhed in the morning of life. The principal works which he left behind him were, "De Studii Philoſophici Ratione;" "De Uſu et Exercitatione Dialecti;" "De Honore;" "De Juventute;" "De Regno et Regis Inſtitutione Lib. iii." Moreri.

Fox, in *Engineery*, ſometimes ſignifies a heading, or ſough underground. See Smeaton's Reports, i. 48.

Fox, in *Geography*, a town of Peru; 9 miles E. of Lopes.

Fox *Iſland*, an iſland near the weſt coaſt of Ireland; 7 miles E. of Slyne head.—Alſo, an American iſland, near the coaſt of Main. N. lat. 44° 2′. W. long. 68° 40′.

Fox *Iſlands*, a group of iſlands between Kamtſkatka and America, forming a part of the chain called the *Aleutian* iſlands, which ſee. Theſe conſtitute, according to the arrangement of Mr. Muller, the fourth claſs of iſlands lying between Kamtſkatka and America; the other three claſſes being the *Saſignes*, comprehending ſix iſlands, *viz.* Behring's and Copper iſlands, and the neareſt Aleutians, of which Otma, Semia, and Anatto are moſt eminent; and *Chao*, comprehending eight iſlands, *viz* Immak, Kiſka, Tſhetgina, Ava, Chavia, Tſhagulak, Ulagabma, and Amtſhigda, or the more diſtant Aleutians; and *Negho*, containing what are called the Andreanofskiye iſlands, ſuch as the ſixteen following, *viz.* Amatkineg, Ulek, Unalga, Navotſha, Uliga, Anægin, Chagulak, Illaſhe, Tekavanga, Kanaga, (which two are remarkable for burning mountains,) Lek, Shetſhuna, Tagalukos, behind which follow ſome uninhabited little rocks and iſlands, one of which, on account of its black cliffs, is called by the Ruſſians Goreloi (the burnt), and laſtly, Atſhak and Amlak. The fourth claſs, or Fox iſlands, called *Kavalang*, comprehend the following ſixteen; *viz.* Amukta, Tſhigama, Tſhagula, Uniſka, Ulaga, Tanagulæna, Kagamin, Kigalga, Shalmaga, Unmak, Agua-Alæſka or Unalaſhka, Unimga or Unimak, toward which a point of land from the continent of America, with a few circumjacent iſlands, is ſaid to project; and beyond this point are Uligan, Autun-Duſſuma, Semedit, and Senegak, whence perhaps Kadiak was formed. The Andreanofskiye and Fox iſlands are in general as mountainous as the Aleutian and Behring's iſland. Their coaſts are rocky, and ſurrounded by breakers. The land riſes immediately from the coaſts to ſteep, bold, rock-mountains, gradually aſcending higher behind each other, and aſſuming the appearance of chains of mountains, with a direction lengthwiſe of the iſland, and having, commonly in the midway of the breadth, the higheſt ridges. Springs riſe at the foot of the mountains, and either flow in broad and rapid ſtreams into the neighbouring ſea; or collecting themſelves in the rocky vales and glens beneath, form ample lakes, which let off their ſuperfluous waters by natural canals into the adjacent bays. Several of theſe iſlands, where at preſent no ſmoking volcano is any longer diſcernible, as Ayak and Tſhetekina, ſeem anciently to have had them, as their traces are ſtill to be ſeen in the ſulphureous boiling ſources that are met with at various intervals. On Tatavanga and Kanaga, among the Andreanofskiye iſlands, and again on Umnak, on the great iſland Unalaſhka, and on Unimga, among the Fox iſlands, are ſtill active volcanoes, which continually emit ſmoke, and from ſome of them frequently iſſue flames. No traces of metals have ever yet been deſcried on theſe volcanic iſlands. But carneoles and ſardonyxes are brought from them. The ſoil of theſe iſlands is ſaid to reſemble that of Kamtſkatka; the ſame kinds of edible wild berries and roots have been found there, excepting ſome few vegetables which ſeem to be of foreign produce. Beſides creeping twigs of willow, larches, alders, and birch, which ſeem as little as on the ſnow mountains, no wood has been perceived on theſe iſlands, Radiak excepted. On Unalaſhka, however, in ſome deep holes, a ſmall quantity of wood ſhoots up. But the ſea wafts all ſorts of floating timber to their ſhores. On the Fox iſlands they have an extraordinary number of foxes, black and grey, as well as red and brown. Here are alſo bears, wolves, river-otters, river-beavers, martins, and ermines, which ſeem to have come over from America. The ſea-otter is frequently caught here. Their ſeas abound in all ſorts of ſeals, dolphins, and whales; ſea-lions and porpoiſes are rare, and ſea-cows not at all to be ſeen. The water-fowl or fiſh are the ſame as at Kamtſkatka. The winter is tolerably mild, but the ſummer equally ſhort and unpleaſant. Theſe iſlands are pretty well peopled; the inhabitants moſtly pay tribute to Ruſſia, and drive a bartering trade with the Ruſſian mariners, who go thither on account of the very profitable chace of ſea-otters and foxes. They are, however, not always to be truſted, as no ſmall number of Ruſſians have experienced to their coſt, having been robbed and murdered by theſe ſavages. Tooke's Ruſſ. Emp. vol. i.

Fox *Iſlands*, are alſo a ſmall cluſter of ſmall iſlands on the ſouth ſide of the gulf of St. Lawrence. N. lat. 51°. W. long. 59° 10′.

Fox *River*, a river of Canada, which runs into the gulf of St. Lawrence; 9 miles N.N.W. of Cape Roſieres.—Alſo, a river of North America, which forms a communication between Green bay in lake Michigan, and lake Winnebago. For four or five miles from the bay the river has a gentle current; then, till you arrive at the Winnebago lake, it is full of rocks and very rapid, ſo that it is neceſſary at many places to land the canoes, and carry them for a conſiderable interval. Its general breadth from the Green lake to Winnebago lake is between 70 and 100 yards; the land on its borders is very good, and thinly wooded with hickery, oak, and hazel. The Attigaumies and Saulies once inhabited the banks of this river. The mouth lies W. long 87° 53′. N. lat. 43° 48′.—Alſo, a river of Canada, which

runs

runs into lake Michigan. N. lat. 48° 30'. W. long. 87° 20'.—Alſo, a river of the weſtern territory of America, which runs into the Theakiki. N. lat. 41° 28'. W. long. 87° 58'.—Alſo, a river of the weſtern territory of America, which runs into the Wabaſh. N. lat. 38°. W. long. 88° 33'.

Fox's *Tram-road*, in Glamorganſhire, is one of the numerous ſeparate eſtabliſhments for improved communication which have ariſen of late years in South Wales. Of this tram road we were uninformed at the time of compiling the general alphabetical account of ſuch eſtabliſhments affixed to our article CANAL; it commences in Neath river, at Neath town, and croſſing the public bridge by the ſide of the carriage way, (a ſingular inſtance,) proceeds one mile to Neath Abbey iron furnace, to the foot of the ſteep plane for horſes, 200 yards long and 70 feet riſe, which aſcends to the bridge-loft, whence the furnace is charged with ore, coak, and lime-ſtone.

Fox, in *Sea Language*, ſignifies a ſort of ſtrand, formed by twiſting ſeveral rope-yarns together, and uſed as a ſeizing, or to weave a mat or paunch, &c.

Fox, *Vulpes*, in *Zoology*, an animal of the dog-kind; much reſembling the common dog in form, and of the ſize of the ſpaniel. It is chiefly diſtinguiſhed by its long, ſtraight tail, with a white tip to it. See VULPES.

It differs, however, from the common dog in the length, denſe diſpoſition, and ſoftneſs of the hairs, eſpecially thoſe about its tail, which is buſhy, much admired by the animal itſelf, and in cold weather wrapped round its noſe; and in its ſmell, which is peculiarly rank and diſagreeable. The ſmell of its urine is remarkably fœtid; inſomuch that the animal covers it in the earth. It is ſaid that the fox makes uſe of its urine as an expedient to force the cleanly badger from its habitation; however, it makes uſe of the badger's hole. Its uſual colour is a reddiſh tawny, though it is ſometimes found white, and ſometimes black. Its fore-feet and tops of the ears are black; the ears are erect, and the lips are white. Its manner of digging itſelf a hole in the earth is alſo a cuſtom wholly different from that of all the dog-kind; and it is far from the tameneſs of that animal, being with difficulty made to loſe its fierceneſs. Of all animals the fox has the moſt ſignificant eye, by which it expreſſes every paſſion of love, fear, hatred, &c.

The fox is a crafty, lively, libidinous animal; it breeds only once a year, unleſs ſome accident befalls its firſt litter, and brings four or five young, which, like puppies, are born blind.

The fox is the Αλοπηξ of Ariſtotle and Ælian, and the Κεῤῥω of Oppian. It inhabits Europe, Aſia, Africa, and America, as far as Chili, and accordingly is a native of moſt northern countries; and there are three varieties of it, differing a little in form but not in colour. They are diſtinguiſhed in Wales by different names. The greyhound fox is the largeſt, talleſt, and boldeſt, and will attack a grown ſheep or wether: the maſtiff fox is leſs, but more ſtrongly built; the cur fox is the leaſt, lurks about hedges, outhouſes, &c. and is the moſt pernicious to the feathered tribe. The firſt of theſe has a white tip to the tail; the laſt a black. The ſkin of this animal is furniſhed with a ſoft and warm fur, which in many parts of Europe is uſed to make muffs and fine cloths.

A fox in the firſt year is called a cub; in the ſecond a fox, and afterwards an old fox. It is a beaſt of chace, uſually very prejudicial to the huſbandman, by taking away and deſtroying his lambs, geeſe, and poultry. It will feed on fleſh of any kind; and, when urged by hunger, eat carrots and inſects, and the dung of other animals; and, near the ſea-coaſts, for want of other food, eat crabs, ſhrimps, or ſhell fiſh. In France and Italy it does incredible damage in the vineyards, by eating the grapes, of which it is very fond, and which make it fat; ſo that at this time its fleſh is reckoned good food. The fox is a great deſtroyer of rats and field animals. It ſecures its booty by digging holes in ſeveral places; and if a whole ſtock of poultry ſhould happen to be its prey, will bring them one by one, thruſt them in with its noſe, and conceal them by ramming the looſe earth upon them, till the calls of hunger induce him to devour them. It does not readily commit thefts in the neighbourhood of its own haunts. It is much terrified by fire-arms, flies from the ſmell of gunpowder, and may be chaſed away by means of ſmoke. The common way to catch him is by gins, which being baited, and a train made by drawing raw fleſh acroſs his uſual paths or haunts to the gin, it proves an inducement to allure him to the place of deſtruction. They are alſo taken with greyhounds, hounds, terriers, and nets; it is a commendable exerciſe to hunt theſe miſchievous beaſts, the nature of which, in many reſpects, is like that of wolves. See HUNTING.

Fox, *Antarctic*, *C. Vulpes Auſtralis*, Coyotl, or Indian fox, Fernand. Mex. Wolf-fox, Bougainville, has the tail pendent, buſhy, and tipt with white, the ears ſhort, erect, and pointed. This animal inhabits America and Falkland iſlands. It is about a third larger than the common fox, and has the habits of the wolf in the ears, tail, and ſtrength of limbs. In Falkland's iſlands it lives near the ſhore, kennels like foxes, and has regular paths from one part of the ſhore to another for ſurpriſing the ſea-fowl, on which it chiefly feeds. It is very tame, barks like a dog, and has a very fœtid ſmell; the head and body are covered with woolly hair of a cinereous brown colour; the legs are daſhed with ruſt-colour. The tail is duſky; and the inſides of the ears are lined with white hair.

Fox, *Arctic*. See LAGOPUS.

Fox, *Black*, *C. Vulpes Lycaon*, reſembles the wolf, and is of an intermediate ſize between that animal and the fox. It has a ſtraight tail, and the body is wholly black; ſometimes variegated with greyiſh, or having the tips of the hairs of a ſilvery whiteneſs. It inhabits the coldeſt regions of Europe, Aſia, and America; and is reckoned the moſt cunning animal of the genus. Its fur is deemed very valuable, being preferred in Ruſſia to the fineſt ſables, one ſkin ſometimes ſelling for two roubles. Thoſe of America are of inferior beauty.

Fox, *Brant*. See ALOPEX.

Fox, *Coal*. See ALOPEX.

Fox, *Corſac*, *C. Vulpes Corſac*, is diſtinguiſhed by its ſtraight, tawny tail, which is black at the root and tip. This ſpecies or variety is leſs than the common fox, but in other reſpects is very ſimilar to it. It is greedy of birds, has a bad ſmell, and howls and barks like thoſe of the common kind; the ears are upright, the hair is ſoft and downy; the tail is buſhy, and as long as the body; the fur is of a pale tawny colour in ſummer, growing grey in winter, with a white throat; the tail is cinereous, except the baſe and tip. It chiefly inhabits the great deſert between the Ural and the Irtiſh, in Aſiatic Ruſſia. Forty or fifty thouſand of the ſkins of this animal are annually ſold by the Kirghis Coſſacks to the Ruſſians, being caught by means of falcons and greyhounds.

Fox, *Croſs*, *C. Vulpes Crucigera*, has a black croſs on the ſhoulder; the fur is thicker and ſofter than that of the common fox, and is reckoned valuable. It inhabits the coldeſt parts of Europe, Aſia, and North America.

Fox,

Fox, *Desert*, or *Karagan*, has a ſtraight tail, with the body of a grey colour, and black ears. It inhabits the deſerts belonging to the Kalmucks and Kirgiſes.

Fox-*hound*. See Dog and Hound.

Fox, *Siberian*. See Lagopus.

Fox, *Silvery*, *C. Vulpes cinereo-argenteus*, has a ſtraight tail, the body of a ſilver-grey colour, and the ſides of the neck of a yellowiſh brown. This animal is ſmaller than the common fox, but agrees with it in figure and manners. It inhabits North America.

Fox, *Grey*, *C. Vulpes Virginianus*, has a ſtraight tail, and the body of a whitiſh-aſh colour. This ſpecies inhabits Carolina, lives in the hollow trunks of decayed trees, and is eaſily tamed.

Fox, *Sea*, *Vulpes marina*, in *Ichthyology*, the name given by authors to a large fiſh, called the *ſea-fox* by us. In the Artedian ſyſtem it is the ſqualus, with a tail longer than the body. See Squalus *Vulpes*.

Fox-*glove*, in *Botany*, the common name of a large well-known plant. See Digitalis.

Fox-*tail Graſs*, the common name of a valuable ſort of natural meadow graſs. See Alopecurus and Grass.

FOXBOROUGH, in *Geography*, a townſhip of America, in Norfolk county, and ſtate of Maſſachuſets; 26 miles S. of Boſton: incorporated in 1778, and containing 779 inhabitants.

FOXERNA, a town of Sweden, in Weſt Gothland; 24 miles N. of Gothenburg.

FOXFORD, a ſmall poſt town of the county of Mayo, Ireland, ſituated on the river Moy, and about two miles from Lough Conn. It is 113 miles W. by N. from Dublin, and eleven from Caſtlebar, on the road to Sligo.

FOXTOWN, a town of America, in the ſtate of North Carolina: 30 miles S. of Newbern.—Alſo, a town of the ſtate of New York; 24 miles W. of New York.

FOY-LA-GRANDE, Sainte, a town of France, in the department of the Gironde, and chief place of a canton in the diſtrict of Libourne. The place contains 2,830, and the canton 11,068 inhabitants, on a territory of 145 kiliometres, in 17 communes.

FOYERS, or Fyers, a ſmall river of Inverneſsſhire, which takes its riſe among the mountains of Abertarff, running in a northerly direction through the valley of Foyers, and emptying itſelf into Loch Neſs, about the midway between its eaſtern and weſtern extremity, is remarkable for a ſtupendous waterfall. In as deep and romantic a glen as perhaps can be imagined, the Foyers pours its waters between lofty mountains, covered with penſile birch trees, exhibiting their naked, abrupt, and broken fronts, from which huge fragments have been detached. The torrent, confined on the rocky ſides, precipitates itſelf with great velocity into the profound beneath, forming a notable cataract. A little below, a bridge has been thrown acroſs the river, whence a ſight of the fall may be obtained; but the moſt advantageous poſition for viewing the object in all its beauty and grandeur, is at the foot of the rocks beneath. Theſe, with the expanſive arch of the bridge, exhibit a fine pictureſque fore-ground, behind which, at the diſtance of about twenty yards, appears the firſt portion of the fall; the central and largeſt break is a few yards nearer, and the third is over a ledge, almoſt under the arch. From accurate meaſurements taken of this, which is called the Upper Fall, the diſtance from the crown of the arch to the ſurface of the water, after the fall, is 200 feet, and of the fall itſelf, 100. Half a mile lower down, the river ruſhes over another ledge, with a noiſe like thunder, into the abyſs below, forming one unbroken ſheet of ſtream as white as ſnow, foaming and raging over the looſe fragments of rock, which retard its impetuous courſe. From the violent agitation ariſes ſo thick a ſpray, as to completely envelope the ſpectator. The ſcenery and effect of this are beautifully and accurately pourtrayed by a real child of nature, the eccentric Burns.

"Among the heathy hills and ragged woods,
The roaring Fyers pours his maſſy floods;
Till full he daſhes on the rocky mounds,
Where through a ſhapeleſs beach his ſtream reſounds.
As high in air the burſting torrents flow,
As deep recoiling ſurges foam below,
Prone down the rock the whitening ſheet deſcends,
And viewleſs echo's ear, aſtoniſhed lends.
Dim ſeen, through riſing miſts and careleſs ſhowers,
The hoary cavern, wide ſurrounding low'rs.
Still through the gap the ſtruggling river toils,
And ſtill below the horrid cauldron boils."

"This," Dr. Garnet obſerves, from whoſe Tour the account has been extracted, "is undoubtedly one of the higheſt falls in the world; and though the immenſe body of water which falls down the celebrated caſcade of Niagara in North America gives a ſuperiority to that, yet it muſt yield to this in point of height; the former fall being 140 feet, and the latter 212.

FOYLE, a river of Ireland, formed by the confluence of the rivers Derg and Fin near Lifford. It paſſes the city of Derry, and four miles below it expands into Lough Foyle. It is navigable by large veſſels to the quay of Derry, and for lighters which carry twenty tons, to Lifford.

Foyle-*Lough*, a large bay, or eſtuary, in the north of Ireland, formed by the expanſion of the waters of the river Foyle, and ſeveral ſmaller ſtreams which run into it. It is twelve miles long, and about ſeven broad, and is land-locked on all ſides, the entrance being only half a mile wide. There is a channel in the middle, which is fourteen fathoms at low water, and ten fathoms at the entrance; but on account of its extreme narrowneſs it is difficult to tack up, when the wind blows down the river. Veſſels turning in with a ſouth-weſterly or weſterly wind alſo run ſome hazard of being ſtranded on the beach of Magilligan. This circumſtance is very unfavourable to the trade of Derry.

FOYLING *of Land*, in *Agriculture*, a term ſometimes made uſe of by old farmers for naked or ſummer fallowing; but which at preſent is ſeldom employed.

Foyling, among *Sportſmen*, a term uſed for the footſteps of a ſtag, on the graſs or leaves.

FOYNA, in *Zoology*, a name given by many to the martin or martes, an animal of the weaſel kind, common with us. See Mustela.

FOZ, in *Geography*, a town of Portugal, in the province of Alentejo, at the conflux of the Zatas and Tagus; 24 miles N. E. of Liſbon.

FOZZANO, a town of the iſland of Corſica; four miles N. of Sarſano.

FRACASTORIUS, Hieronimus, in *Biography*, a celebrated phyſician of Verona, where he was born in 1483. He ſeemed to be born for ſtudy; for ſuch was the ardour with which he applied, and the rapidity with which he advanced in the ſtudy of the languages, the belles lettres, and the ſciences, that he early attained a high degree of excellence as a poet, a philoſopher, an aſtronomer, and a phyſician. Theſe qualities procured him an univerſal eſteem. The general of the Venetian forces gave him his entire con-

fidence, and Fracaſtorius followed him as his phyſician, during many campaigns, and quitted him only at the period of his death, in 1515, when he returned to his native place. It was upon the repreſentations of Fracaſtorius that the fathers, aſſembled at Trent, were induced to transfer the council to Bologna, in order to avoid the contagious epidemic which prevailed at the firſt mentioned place. He maintained a literary correſpondence with moſt of the great men of his age, eſpecially with cardinal Bembo, who was his intimate friend, and to whom he dedicated his elegant poem, entitled "Syphilis," *i. e.* the venereal diſeaſe. This poem was highly admired by Bembo, Sannazarius, and other men of taſte, and was compared with the Georgics of Virgil, for its rich and melodious verſification, its vivid imagery, and its noble ſentiments. Fracaſtorius retired towards the cloſe of his life to a country-houſe near Verona, ſituated at the foot of mount Baldo, where he applied to the ſtudy of aſtrology and coſmography, and died of apoplexy on the 6th of Auguſt, 1553, at the age of 71 years.

All the works of Fracaſtorius have been printed under the title of "Opera omnia Philoſophica et Medica," at Venice, Lyons, &c. His works conſiſt of, 1. "Syphilidis, ſive de Morbo Gallico, Libri tres," firſt publiſhed at Verona in 1530, and afterwards frequently republiſhed, and alſo tranſlated into the Italian and French languages: 2. "Homocentricorum, ſive de Stellis, Liber unus," Venice, 1538, with the following, 3. "Libellus de cauſis dierum criticorum:" 4. "De Sympathia et Antipathia, Liber:" 5. "De Contagionibus, et Contagioſis Morbis, et eorum curatione, Libri tres:" 6. "Naugerius, ſive de Poëtica Dialogus:" 7. "Turrius, ſive de Intellectione Dialogus:" 8. "Fracaſtorius, ſive de Anima Dialogus:" 9. "De Vini Temperatura:" 10. "Joſephi Libri duo:" 11. "Carminum Liber unus:" 12. "Alcon, ſive de cura canum venaticarum."

The town of Verona, which had formerly erected honourable monuments to the memory of Catullus and of Pliny, reſolved to confer the ſame diſtinguiſhing honour on Fracaſtorius; and a ſtatue was acordingly erected to this phyſician, in 1559, "Ex publica Authoritate."

FRACHES, in the *Glaſs Trade*, are flat iron pans, into which the glaſs veſſels already formed are put, when in the tower over the working furnace, and by means of which they are drawn out through the leers, that they may be taken gradually from the fire, and cool by degrees.

FRACTION, in *Arithmetic* and *Algebra*, a part or diviſion of an unit, or integer; or, a number which ſtands to an unit in the relation of a part to its whole.

The word literally imports a broken number.

Fractions are uſually divided into *decimal*, *ſexageſimal*, and *vulgar*.

For *decimal* and *ſexageſimal* fractions, ſee DECIMAL and SEXAGESIMAL.

FRACTIONS, *Vulgar*, called alſo ſimply *fractions*, are always expreſſed by two numbers, the one placed over the other with a line between them.

The lower, called the *denominator* of the fraction, denotes the unit, or whole, that is divided into parts; and the upper, called the *numerator* of the fraction, expreſſes the parts given in the preſent caſe.

Thus, two third parts of a line, or other thing, are written $\frac{2}{3}$; where the denominator 3 ſhews that the whole line is ſuppoſed to be divided into three equal parts; and the numerator 2 indicates or aſſigns two of ſuch parts.

Again, twenty-nine ſixtieths is written $\frac{29}{60}$; where the numerator 29 expreſſes 29 parts of an integer divided into 60; and the denominator 60 gives the denomination to theſe parts, which are called *ſixtieths*.

The real deſign of adding the denominator, is to ſhew what aliquot part the broken number has in common with unity.

In all fractions, as the numerator is to the denominator, ſo is the fraction itſelf to the whole whereof it is a fraction. Thus, ſuppoſing $\frac{3}{4}$ of a pound equal to 15*s*. it is evident, that 3 : 4 :: 15 : 20. Whence it follows, 1°, That there may be infinite fractions of the ſame value, one with another; inaſmuch as there may be infinite numbers found, which ſhall have the ratio of 3 : 4.

Fractions are either *proper* or *improper*.

FRACTION, *Proper*, is that where the numerator is leſs than the denominator; and, conſequently, the fraction leſs than the whole, or integer, as $\frac{2}{4}\frac{5}{6}$.

FRACTION, *Improper*, is where the numerator is either equal to, or bigger than the denominator, and of courſe the fraction equal to, or greater than the whole, or integer, as $\frac{2}{2}\frac{5}{1}$ or $\frac{2}{2}\frac{7}{0}$; or $\frac{9}{2}\frac{0}{2}$.

Fractions, again, are either *ſimple* or *compound*.

FRACTIONS, *Simple*, are ſuch as conſiſt of only one numerator, and one denominator; as $\frac{2}{7}$, or $\frac{14}{350}$, &c.

FRACTIONS, *Compound*, called alſo *fractions of fractions*, are ſuch as conſiſt of ſeveral numerators and denominators; as $\frac{4}{7}$ of $\frac{11}{12}$ of $\frac{5}{6}$ of $\frac{15}{80}$.

Of fractions, thoſe are equal to each other whoſe numerators have the ſame ratio to their denominators.—Thoſe are greater, whoſe numerators have a greater ratio; and thoſe leſs which have leſs: thus $\frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{25}{50} = \frac{1}{2}$. But $\frac{3}{14}$ is greater than $\frac{2}{6}$; and $\frac{4}{6}$ leſs than $\frac{10}{15}$. Hence if both the numerator and denominator of a fraction, as $\frac{4}{6}$, be multiplied or divided by the ſame number 2; the products in the former caſe, $\frac{8}{12}$, and the quotients in the latter $\frac{2}{3}$, will conſtitute fractions equal to the firſt fraction given.

The arithmetic of fractions conſiſts in the *reduction*, *addition*, *ſubtraction*, and *multiplication* of them.

FRACTIONS, *Reduction of*. 1. *To reduce a given whole number into a fraction of any given denominator*.—Multiply the given integer by the given denominator, the product will be the numerator. Thus we ſhall find $3 = \frac{24}{8}$, and $5 = \frac{40}{8}$, and $7 = \frac{28}{4}$, &c.

If no denominator be given, the number is reduced to a fraction, by writing 1 underneath it, as a denominator. Thus $\frac{2}{1}$, $\frac{4}{1}$, $\frac{35}{1}$.

2. *To reduce a given fraction to a fraction equal to it, that ſhall have a given denominator*.—Multiply the numerator by the given denominator, and divide the product by the former denominator, and the quotient ſet over the given denominator is the fraction required. Let it be propoſed to reduce $\frac{3}{4}$ to an equal fraction with the denominator 8; $8 \times 3 \div 4 = 6$, and $\frac{6}{8} = \frac{3}{4}$.

3. *To reduce a given fraction to its loweſt terms*, *i. e.* to find a fraction equivalent to a given fraction ($\frac{20}{48}$), but expreſſed in leſs numbers; divide both the numerator 20, and denominator 48, by ſome one number, that will divide them both without any remainder, as here by 4. The quotients 5 and 12 make a new fraction $\frac{5}{12}$ equal to $\frac{20}{48}$.

And if the diviſion be performed with the greateſt number that will divide them both, the fraction is reduced to its loweſt terms. See COMMON *Meaſures*.

If it happens that unity is the only common meaſure of the numerator and denominator; then is the fraction incapable of being reduced any lower: and numbers whoſe greateſt common meaſure is unit, are ſaid to be *prime* to each other.

4. *To*

4. *To reduce two or more fractions to the ſame denomination*; that is, to find fractions equal to the given ones, and with the ſame denominator. Multiply each numerator, ſeparately taken, into all the denominators but its own, and the products ſhall give the new numerators. Then multiply all the denominators into one another, and the product will be the common denominator. Thus, $\frac{2}{3}$ and $\frac{4}{5}$ are $\frac{10}{15}$, and $\frac{12}{15}$, and $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{4}{5}$ are reſpectively $\frac{40}{60}$, $\frac{45}{60}$, and $\frac{48}{60}$.

5. *To find the value of a fraction, in the known parts of its integer.*—Suppoſe, *e. gr.* it were required to know what is $\frac{9}{16}$ of a pound; multiply the numerator 9 by 20, the number of known parts in a pound, and divide the product by the denominator 16, the quotient gives 11*s.* Then multiply the remainder 4 by 12, the number of known parts in the next inferior denomination; and dividing the product by 16, as before, the quotient is 3*d.* So that $\frac{9}{16}$ of a pound = 11*s.* 3*d.*

6. *To reduce a mixed number, i. e. a number partly integral and partly fractional,* as $4\frac{11}{12}$ *into an improper fraction of the ſame value.*—Multiply the integer 4 by 12, the denominator of the fraction; and to the product 48 add the numerator; the ſum 59 ſet over the former denominator, $\frac{59}{12}$, conſtitutes the fraction.

7. *To reduce an improper fraction into its equivalent mixed number.*—Suppoſe the given fraction $\frac{59}{12}$; divide the numerator by the denominator; the quotient is the integral part, and the remainder ſet over the denominator will be the fractional part. Thus $\frac{59}{12} = 4\frac{11}{12}$.

8. *To reduce a compound fraction into a ſimple one.*—Multiply all the numerators into each other for a new numerator; and all the denominators for a new denominator. Thus, $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{6}$ reduced will be $\frac{15}{48}$.

9. *To reduce a vulgar fraction to a decimal of the ſame value,* ſee DECIMAL.

FRACTIONS, *Addition of vulgar.*—1. If the given fractions have different denominators, reduce them to the ſame. Then add the numerators together, and under the ſum write the common denominator. Thus, *e. gr.* $\frac{2}{3} + \frac{4}{5} = \frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$.

2. If compound fractions are given to be added, they muſt firſt be reduced to ſimple ones; and if the fractions be of different denominations, as $\frac{6}{8}$ of a pound, and $\frac{2}{3}$ of a ſhilling, they muſt firſt be reduced to fractions of the ſame denomination of pounds.

3. *To add mixt numbers.*—The integers are firſt to be added, then the fractional parts: and if the ſum be a proper fraction, only annex it to the ſum of the integers. If it be an improper fraction, reduce it to a mixed number, adding the integral parts thereof to the ſum of the integers, and the fractional part after it. Thus,

$$5\frac{2}{3} + 4\frac{1}{2} = \frac{17}{3} + \frac{9}{2} = \frac{34+27}{6} = \frac{61}{6} = 10\frac{1}{6}.$$

FRACTIONS, *Subtraction of.*—1. If they have the ſame common denominator, ſubtract the leſſer numerator from the greater, and ſet the remainder over the common denominator. Thus, from $\frac{9}{16}$ take $\frac{5}{16}$, and there remains $\frac{4}{16} = \frac{1}{4}$.

2. If they have not a common denominator, they muſt be reduced to fractions of the ſame value, having a common denominator, and then, as in the firſt rule. Thus, $\frac{5}{7} - \frac{2}{5} = \frac{25}{35} - \frac{14}{35} = \frac{11}{35}$.

3. *To ſubtract a whole number from a mixed number, or one mixed number from another.*—Reduce the whole, or mixed numbers, to improper fractions, and then proceed as in the firſt and ſecond rule.

FRACTIONS, *Multiplication of.*—1. If the fractions propoſed be both ſimple, multiply the numerators one by another for a new numerator, and the denominators for a new denominator. Thus $\frac{3}{4}$ into $\frac{5}{8}$ produces $\frac{15}{32}$.

2. If one of them be a mixed, or whole number, it muſt be reduced to an improper fraction; and then proceed as in the laſt rule. Thus, $\frac{2}{8}$ into $5\frac{2}{3}$, gives $\frac{34}{24}$, and $\frac{4}{9}$ into $\frac{10}{1} = \frac{40}{9}$.

In multiplication of fractions, obſerve that the product is leſs in value than either the multiplicand, or multiplicator; becauſe in all multiplications, as unity is to the multiplicator, ſo is the multiplicand to the product: or, as unity is to either factor, ſo is the other factor to the product. But unity is bigger than either factor, if the fractions be proper; and therefore either of them muſt be greater than the product.

Thus, in whole numbers, if 5 be multiplied by 8, it will be as 1 : 5 :: 8 : 40; or 1 : 8 :: 5 : 40. Wherefore in fractions, alſo, as 1 : $\frac{3}{4}$ :: $\frac{5}{8}$: $\frac{15}{32}$; or as 1 : $\frac{5}{8}$ :: $\frac{3}{4}$: $\frac{15}{32}$. But 1 is greater than either $\frac{3}{4}$ or $\frac{5}{8}$: wherefore either of them muſt be bigger than $\frac{15}{32}$.

FRACTIONS, *Diviſion of.*—1. If the fractions propoſed be both ſimple, multiply the denominator of the diviſor by the numerator of the dividend; the product is the numerator of the quotient: then multiply the numerator of the diviſor by the denominator of the dividend, the product is the denominator of the quotient. Thus $\frac{3}{7})\frac{4}{9}(\frac{28}{27}$. Or, invert the diviſor and proceed as in multiplication. 2. If either dividend, diviſor, or both, be whole, or mixed numbers, reduce them to improper fractions; and if they be compound fractions, reduce them to ſimple ones, and proceed as in the firſt rule.

In diviſion of fractions obſerve, that the quotient is always greater than the dividend; becauſe in all diviſion, as the diviſor is to unity, ſo is the dividend to the quotient: as if 3 divide 12, it will be as 3 : 1 :: 12 : 4. Now 3 is greater than 1; wherefore 12 muſt be greater than 4: but in fractions, as $\frac{7}{5}$: 1 :: $\frac{4}{9}$: $\frac{28}{27}$; where $\frac{7}{5}$ is leſs than 1; wherefore $\frac{4}{9}$ muſt be leſs than $\frac{28}{27}$.

FRACTIONS *in ſpecies*, or *algebraic quantities.*—1. *To reduce fractions in ſpecies to their leaſt terms.*—The numerators and denominators are to be divided by the greateſt common diviſor, as in numbers.

Thus the fraction $\frac{aac}{bc}$ is reduced to a more ſimple one $\frac{aa}{b}$ by dividing both aac and bc by c: and $\frac{203}{667}$ is reduced to a more ſimple one $\frac{7}{23}$ by dividing both 203 and 667 by 29; and $\frac{203\,aac}{667\,bc}$ is reduced to $\frac{7aa}{23b}$ by dividing by $29c$. And ſo $\frac{6a^3 - 9acc}{6aa + 3ac}$ becomes $\frac{2a^2 - 3cc}{2a + c}$ by dividing by $3a$. And $\frac{a^3 - aab + abb - b^3}{aa - ab}$ becomes $\frac{aa + bb}{a}$ by dividing by $a - b$. See COMMON *Meaſure.*

2. *To reduce fractions in ſpecies to a common denominator.*—The terms of each are to be multiplied by the denominator of the other.

Thus, having $\frac{a}{b}$ and $\frac{c}{d}$; multiply the terms of one $\frac{a}{b}$ by d, and alſo the terms of the other $\frac{c}{d}$ by b, and they will become $\frac{ad}{bd}$ and $\frac{bc}{bd}$, whereof the common denomi-

nator is $b\,d$. And thus a and $\frac{a\,b}{c}$ or $\frac{a}{1}$ and $\frac{a\,b}{c}$, become $\frac{a\,c}{c}$ and $\frac{a\,b}{c}$.

But where the denominators have a common diviſor, it is ſufficient to multiply them alternately by the quotients.

Thus the fractions $\frac{a^3}{b\,c}$ and $\frac{a^3}{b\,d}$ are reduced to theſe $\frac{a^3\,d}{b\,c\,d}$ and $\frac{a^3\,c}{b\,c\,d}$ by multiplying alternately by the quotients c and d, ariſing by the diviſion of the denominators by the common diviſor b. The other operations, with reſpect to numbers, are eaſily applied to algebraic quantities.

Addition and ſubtraction of fractions in ſpecies.—The proceſs is, in all reſpects, the ſame in ſpecies as in numbers. E. gr.

Suppoſe it be required to add the fractions $\frac{a}{b}$ and $\frac{c}{d}$.

Theſe, when reduced to the ſame denomination, will be $\frac{a\,d}{b\,d}$ and $\frac{b\,c}{b\,d}$; conſequently their ſum is $\frac{a\,d+b\,c}{b\,d}$.

So, if the fraction $\frac{a}{b}$ were to be ſubtracted from $\frac{c}{d}$; having reduced them they will be $\frac{a\,d}{b\,d}$ and $\frac{b\,c}{b\,d}$, as before. Their difference therefore is $\frac{b\,c-a\,d}{b\,d}$.

Multiplication and diviſion of fractions in ſpecies.—Here, too, the proceſs is perfectly the ſame as in vulgar arithmetic. Thus, *e. gr.* ſuppoſe the factors, or fractions, to be multiplied, $\frac{a}{b}$ and $\frac{c}{d}$: the product will be $\frac{a\,c}{b\,d}$.

Or ſuppoſe the fractions required to be divided, $\frac{a\,c}{b\,d}$ and $\frac{a}{b}$; the quotient will be $\frac{a\,c}{b\,d}\times\frac{b}{a}=\frac{a\,b\,c}{a\,b\,d}=\frac{c}{d}$.

Hence as $a=\frac{a}{1}$; the product of a into $\frac{c}{d}$, that is, of an integral quantity into a fraction, $\frac{c}{d}\times\frac{a}{1}=\frac{a\,c}{d}$. Whence it appears, that the numerator of the fraction is to be multiplied by the integer.

Hence, alſo, the quotient of $\frac{c}{d}$ by a, that is, of the broken quantity divided by the whole one, $\frac{c}{d}\times\frac{1}{a}=\frac{c}{a\,d}$.

Beſide the common notion of a fraction, there is another neceſſary to be underſtood. Thus,

Suppoſe $\frac{3}{4}$ of 20*s.* or a pound ſterling were the fraction: this fraction, inſtead of three quarters of one pound, may be conſidered as a fourth part of three pounds; that is, by taking as many of the integers as the numerator expreſſes (*viz.* 3), and dividing them by 4, the denominator, for then the quotient of the ſame value will ariſe; for 4) 60*s.* (15*s.* This ſhews the reaſon of that manner of expreſſion uſed by geometers and algebraiſts, who read $\frac{a}{b}$, thus, a divided by b.

Fraction, *continued*, is uſed for a fraction the denominator of which is a whole number with a fraction, the denominator of which is again a whole number and a fraction, and ſo on, whether this affection be continued *ad infinitum*, or whether the ſeries breaks off after a finite number of terms. Thus,

$$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\text{, \&c.} \qquad \text{or } \frac{1}{2}+\frac{2}{3}+\frac{3}{4}+\frac{4}{5}+\text{, \&c.}$$

are continued fractions.

If we make uſe of letters inſtead of numbers, we ſhall have general expreſſions of theſe fractions, thus,

$$a+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}+\frac{1}{e}+\frac{1}{f}+\text{, \&c.}$$

and

$$a+\frac{\alpha}{b}+\frac{\beta}{c}+\frac{\gamma}{d}+\frac{\delta}{e}+\frac{\varepsilon}{f}+\text{, \&c.}$$

The reduction of theſe continued fractions to thoſe of a common form is not difficult by the uſual rules of arithmetic and algebra. Thus to give an example which may at the ſame time ſhew the uſe of theſe continued fractions; ſuppoſe the continued fractions,

$$3+\frac{1}{7}+\frac{1}{15}+\frac{1}{1}+\frac{1}{292}+\frac{1}{1}+\frac{1}{1}+\text{, \&c.}$$

expreſs the circumference of a circle, when the diameter is one; if we ſtop at $\frac{1}{7}$, we ſhall have $3+\frac{1}{7}=\frac{21+1}{7}=\frac{22}{7}$. If we ſtop at $\frac{1}{15}$, we ſhall have

$$3+\frac{1}{7}+\frac{1}{15}=3+\frac{1}{\frac{106}{15}}=3+\frac{15}{106}=\frac{318+15}{106}=\frac{333}{106}$$

But if we ſtop at $\frac{1}{1}$, which is convenient on account of the ſmall fraction $\frac{1}{292}$ added to the laſt denominator 1, we ſhall then find, $3+\frac{1}{7}+\frac{1}{15}+\frac{1}{1}=\frac{355}{113}$. The firſt of the reductions give the proportion of Archimedes, and the laſt that of Adrian Metius.

But as beginning at the laſt denominator of the continued fraction makes the computation ſomewhat tedious, ſhorter methods have been contrived for the reduction of theſe fractions, and for a continued approximation to their true value. And Mr. Cotes's method for the reduction of ratios or ſmaller terms may be here applied. (See Ratio.) For it is to be obſerved, that when the numerators to the continued fraction are each units, the denominators will be the quotients ariſing from the continued diviſions in Mr. Cotes's method: or in the common, for reducing fractions to a lower denomination, which is in effect the ſame as Euclid's method for finding the greateſt common meaſure of two magnitudes, lib. x. prop. 3. But a detail of theſe things would lead us too far, we therefore refer the reader for

for a farther account of theſe continued fractions to Dr. Wallis's Arithmet. Infinit. prop. 191. Oper. vol. i. p. 469, ſeq. Huygens, Deſcript. Automat. Planetar. in Oper. poſthum. p. 173, ſeq. edit. Amſtelod. 1728, and particularly to Mr. Euler's Analyſ. Infinit. vol. i. cap. xviii. p. 295, ſeq. who has ſhewn the uſe and application of this doctine in many inſtances.

Lord Brouncker ſeems to have been the firſt who conſidered continued fractions, or at leaſt who firſt applied them to the quadrature of curves. The hint ſeems uſeful, but has been pretty much neglected, excepting in approximations to fractions or ratios expreſſed in great numbers. See the article RATIO. His ſeries for the quadrature of the circle, is

$$\square = 1\,\frac{1}{2}\,\frac{9}{2}\,\frac{25}{2}\,\frac{49}{2}\,\frac{81}{2},\ \&c.$$

in his and Dr. Wallis's notation, which amounts to the ſame thing as $1 + \frac{1}{2} + \frac{9}{2} + \frac{25}{2} +$, &c. in the notation of Huygens and Euler.

The ſymbol $\square$ denotes as before the ratio of the ſquare of the diameter to the area of the circle.

FRACTIONS, *Vaniſhing*, are thoſe in which the numerator and denominator vaniſh, or become equal to 0, at the ſame time. Thus, when any quantity N is expreſſed by a fraction $\frac{P}{Q}$, if P and Q vaniſh at the ſame time, we are not thence to conclude, that N is $= 0$. Suppoſe $N = \frac{a\,a - a\,x}{a - \sqrt{a\,x}}$; when $x = a$, the numerator and denominator of N vaniſh together; but if we reduce the value of N to a more ſimple form, by dividing the numerator and denominator by their common diviſor $\sqrt{a} - \sqrt{x}$, we ſhall find $N = a \times \frac{\sqrt{a} + \sqrt{x}}{a} =$ (when $x = a$) $a \times \frac{2\sqrt{a}}{\sqrt{a}} = 2\,a$. The idea of ſuch fractions originated, as Montucla has informed us (Hiſt. Math. vol. ii.) in a ſevere conteſt among ſome French mathematicians, in which Varignon and Rolle were the principal combatants, in reference to the differential calculus, then introduced, which Rolle ſtrenuouſly oppoſed. Among other arguments againſt it, he propoſed an example of drawing a tangent to certain curves at the point where the two parts croſs each other; and, as by that method, the fractional expreſſion for the ſubtangent, had both its numerator and denominator equal to 0, at the point propoſed, he conſidered the expreſſion as abſurd, and hence objected to the method of ſolution. The myſtery was ſoon explained, and firſt of all by Mr. John Bernouilli. Fractions of this kind have been often contemplated by later mathematicians; particularly by Maclaurin (Fluxions, vol. ii. art. 864.) Saunderſon (Algebra, vol. ii. art. 469.) Emerſon (Algebra, p. 212. apud Works, vol. iv.) and De Moivre (Miſcell. Anal. p. 165.) Theſe fractions were the occaſion of a ſharp controverſy between Powell and Waring in their competition for the profeſſorſhip at Cambridge. Waring maintained that the fraction $\frac{p - p^5}{1 - p}$ became 4, when p was $= 1$. Powell objected to this concluſion as abſurd, alleging that when $p = 1$, the fraction $\frac{p - p^5}{1 - p} = \frac{1 - 1}{1 - 1} = \frac{0}{0}$, and loſt the profeſſorſhip. Waring replied that $\frac{p - p^5}{1 - p}$ is $= p + p^3 + p^3 + p^1$ by common diviſion $= 1 + 1 + 1 + 1 = 4$, when p is $= 1$.

Mathematicians have propoſed two methods of finding the value of theſe fractions. The one is by conſidering the terms of the fraction as two variable quantities, continually decreaſing till they both vaniſh together; or finding the ultimate value of the ratio denoted by the fraction. Thus conſidered, it appears that, as the terms of the fraction are ſuppoſed to decreaſe till they vaniſh, or become only equal to their fluxions or increments, the value of the fraction, in that ſtate, will be equal to the fluxion or increment of the numerator divided by that of the denominator, *e.g.* take $\frac{x - x^5}{1 - x}$, when $x = 1$; the fluxion of the numerator is $\dot{x} - 5x^4\,\dot{x}$, and of the denominator $- \dot{x}$; conſequently $\frac{\dot{x} - 5\,x^4\,\dot{x}}{-\dot{x}} = \frac{1 - 5\,x^4}{-1} = \frac{5\,x^4 - 1}{1} = 5 - 1 = 4$; or the value of the fraction $\frac{x - x^5}{1 - x}$, when $x = 1$. Or thus, becauſe $x = 1$, $\frac{x - x^5}{1 - x}$ will be $= \frac{1 - x^4}{1 - x}$; then the fluxion of the numerator, $- 4\,x^3\,\dot{x}$, divided by the fluxion of the denominator, $- \dot{x}$, gives $4\,x^3$ or 4, as before.

The other method is by reducing the given expreſſion to another, in a more ſimple form, and then ſubſtituting the values of the letters. In the former example, $\frac{x - x^5}{1 - x}$ or $\frac{1 - x^4}{1 - x}$, when $x = 1$, divide the numerator by the denominator, and it becomes $1 + x + x^2 + x^3$, which, x being $= 1$, becomes 4 for the value of the fraction, as before. Again, to find the value of $\frac{a\sqrt{a\,x} - x\,x}{a - \sqrt{a\,x}}$, when x is $= a$, in which caſe both the numerator and denominator become $= 0$; divide the numerator by the denominator, and the quotient $\sqrt{a\,x} + x + x\sqrt{\frac{x}{a}}$, when, x being $= a$, becomes $a + a + a = 3\,a$, for the value of the fraction in that ſtate of it. Hutton's Math. Dict. For a farther view of this ſubject, and particularly of Mr. Woodhouſe's objections againſt vaniſhing fractions; ſee *Analytical* FUNCTION.

FRACTION, *Repetend of a decimal.* See REPETEND.

FRACTION, *Logarithm of a.* See LOGARITHM.

FRACTIONS, *ſumming of infinite.* See CALCULUS, and FLUXIONS.

FRACTION, in *Muſic*, is one of the terms implying a part or remainder, which Mr. Overend and other writers on the theory or magnitudes of muſical intervals have adopted as the general name of three different intervals; indeed nearly all the names of ſmall muſical intervals have almoſt the ſame meaning in ſome language, becauſe they all had their origin, or owed their diſcovery from taking the concords, the only intervals marked ſtrongly by nature, from each other, and theſe differences or reſidual intervals again from each other reſpectively, and thus ultimately, what may be called the elementary intervals have been obtained, as the ſame are exhibited in a table, plate V. in vol. xxviii. of the Philoſophical Magazine. See INTERVAL.

Leſſer

Leſſer Fraction of Mr. Overend is an interval, which reſults either by taking a minor comma from a priſma, or a ſemi-comma maxime from a greater reſidual; it is the ſmalleſt interval but one which is yet known, is marked *f*, and forms the ſecond or intermediate term in Mr. Farey's new notation, wherein it has the curious and important property of pointing out, beginning with the ſemitones, and aſcending to what finger-key of the common or Douzeur ſcale any interval belongs; thus $358\,\Sigma + 7\,f + 31\,m$, the expreſſion for the fifth in this notation, ſhews, that it contains ſeven half-notes or finger-key intervals, and ſo of any other interval.

Its ratio is $\frac{450,283,905,890,997,363}{450,395,952,737,049,600}$, which in its component primes is $\frac{3^{17}}{2^{14}\,5^{2}}$; in the new notation it is marked *f*; its common logarithm is .9999266,5010, whereof the reciprocal is 733,4990; its binary or Euler's logarithm is .000259: it having that decimal relation to the octave 1. It is equal to .01,3601 major commas, of which it is the $\frac{1}{73.55198}$ part; it is equal 19.03541 minutes, of which it is the $\frac{1}{.05254}$ part; alſo to .149661 ſchiſmas, of which it is the $\frac{1}{6.5297}$ part.

This interval reſults from the ſubtraction of numerous intervals, as two ſchiſmas from a minor reſidual, three ſchiſmas from a medius reſidual, four ſchiſmas from a ſemi-comma major, five ſchiſmas from a ſemi-comma maxime, two medius reſiduals from three minor reſiduals, five radius reſiduals from three greater reſiduals, two greater reſiduals from five minor reſiduals, a ſemi-comma major from two minor reſiduals, three ſemi-commas major from four medius reſiduals, three diaſchiſmas from a minor ſemitone; this interval alſo reſults when 14 fifths and two minor thirds are taken from 21 minor fourths, but theſe tuneable intervals do not furniſh a practicable mode of tuning this, perhaps, unappreciable interval, becauſe pipes to the compaſs of near nine octaves would be wanted for putting the ſame in practice.

Medius fraction of Dr. Callcott, is an interval which reſults as the difference between a major and a greater reſidual; it is marked *d* in Dr. C's MSS. its ratio is $\frac{50,000,000,000,000,000}{50,031,545,098,999,707}$, which in primes is $\frac{2^{16}\,5^{17}}{3^{35}}$; its value in the new notation is $\Sigma - 3\,f + m$, its common logarithm is .9997260,8915, and reciprocal 2739,1085; its binary or Euler's log. is .000893, and it is .05077 major commas; it is .55888 times the ſchiſma; it reſults as the difference between a greater fraction and two leſſer fractions, and between a minor comma and three medius reſiduals, alſo between the ſum of a ſchiſma and minute and three leſſer fractions, alſo between the ſum of three ſchiſmas and an apotome, and four hyperoches: if 17 minor thirds be added to three fifths and fifteen minor fourths deducted, therefore this interval reſults, but it can ſcarcely admit of accurate tuning by this method, on account of the great number of intervals to be tuned.

Greater fraction of Mr. Overend, is an interval that does not reſult from the ſimple ſubtraction of any two of M. Overend's intervals, but is the ſum of a medius fraction and two leſſer fractions, it is marked F, its ratio is $\frac{4,946,832,462,181,367,513,427,734,375}{4,95\,,760,157,141,521,099,596,496,496} = \frac{3^{39}\,5^{13}}{2^{31}} = \Sigma - f + m$; its common logarithm is .9995793,8935, and reciprocal 4206,1065, its binary log. = .001411; it is = .07797 major commas, and .858202 ſchiſmas; it is the difference between a major reſidual and five ſchiſmas, and between an octave and 13 medius ſemitones; it is the difference between a ſigma and minute, and a leſſer fraction, between a major comma, a minute, and a priſma, between a major reſidual and priſma and a hyperoche. When 25 major thirds and 12 minor thirds are taken from 27 fourths, or when 12 fifths and 13 major thirds are taken from 27 fourths, this interval reſults, but it can ſcarcely admit of correct tuning by theſe methods.

FRACTURE, in *Surgery*, may be defined to be a ſolution of continuity in a bone, commonly occaſioned by external violence; but ſometimes by the powerful action of the muſcles, as is almoſt always the caſe with regard to the knee-pan. The diviſion of a part of a bone with a cutting inſtrument, ſuch as a ſabre, is not uſually conſidered as belonging to the claſs of injuries called fractures, although it will certainly fall within the meaning of the words employed in our definition. However, as every perſon of common ſenſe knows that there is a difference between breaking things and cutting them, we ſhall not offer any apology for the circumſtance of our definition being more comprehenſive than it ſtrictly ought to be. The imperfection is obvious; but, we believe, not very eaſy of removal: all the moſt diſtinguiſhed ſurgical authors have been obliged to be content with defining a fracture in terms, more or leſs, like thoſe which we have ventured to uſe.

General Remarks on Fractures.

Fractures are divided into *ſimple*, *compound*, and *comminuted*.

A *ſimple fracture* is one, in which the bone or bones are only broken in one place, while the ſoft parts remain free from any external wound, communicating internally with the fracture.

A *compound fracture* is ſo called, when the injury of the bone or bones is conjoined with a wound of the integuments; which wound leads down to the fracture, and is in general occaſioned by a protruſion of the broken part of the bone or bones through the ſkin.

A *comminuted fracture* is ſo named, when the injured bone is broken into ſeveral pieces.

The fractured bone may be broad, like the ſcapula and bones of the pelvis; or, it may be ſhort and thick, like the bones of the tarſus and carpus; or, laſtly, it may belong to that long ſet of bones, which are uſually termed by anatomiſts cylindrical.

All the bones of the body are not equally expoſed to fractures. Some are more or leſs protected from the effects of external violence by their ſituation; others, by their ſhape and ſtrength. On the other hand, ſome are particularly often broken, in conſequence of their being ſo placed in the body as to be very liable to receive the force of blows, falls, &c.; while other bones are frequently fractured, on account of their having a certain figure and ſtructure, which render them weak, and incapable of making any conſiderable reſiſtance.

The broad, flat bones are, for the moſt part, ſo ſituated, and ſo circumſtanced, with reſpect to their uſes, that they are not often fractured. The bones of the cranium, and ſome parts of the ſcapula, however, are an exception to this obſervation.

The ſhort, thick bones are ſtill leſs frequently broken. Indeed, their ſhape gives them ſuch ſtrength, and they are generally ſo ſurrounded with elaſtic cartilaginous matter, that

that they can hardly be fractured, without the operation of ſome conſiderable violence particularly directed againſt them. Hence, when they are broken, it is almoſt always in conſequence of their being cruſhed by ſome heavy weight, or waggon-wheel; or by their being ſtruck by a cannon ball, or bullet. We have one exception to make to this remark: the patella, which ranks as a ſhort thick bone, is very often broken; and this by a cauſe widely different from that which uſually produces the fractures of other bones of a ſimilar form. The patella is occaſionally ſplit into two pieces by the powerful action of the muſcles concerned in the extenſion of the leg. Many perſons rate the ſtrength of the muſcles exceedingly high; but few, unacquainted with the facts which preſent themſelves in ſurgery, would have any conception that the muſcles could rend the firm texture of the bones with which they are connected.

The long cylindrical bones, as Boyer remarks, whether they ſerve as pillars, as levers, or as arch-ending points of reſiſtance and ſupport, are more frequently fractured than any other deſcription of bones. They may be broken at any part; but the breach of continuity, in the majority of inſtances, happens at the point of biſection: the fracture being produced, like that of a ſtick bent beyond its natural extenſibility, by a force applied at each extremity. However, the cylindrical bones are alſo ſubject to be fractured near their ends, ſometimes even at their extreme points, as will be ſeen when we treat of fractures of the neck, of the thigh-bone, and humerus.

This diverſity in the ſituation of fractures of the long bones makes a material difference with reſpect to the trouble which is likely to attend the treatment. A fracture near the middle of the bone is the leaſt dangerous; for although the bone is there more ſlender, and the ends of the fracture more apt to be ſeparated, on account of the ſurfaces oppoſed to each other being leſs extenſive, yet the cauſe of the accident, in this kind of caſe, has ſeldom been applied directly to the broken part, and, of courſe, the adjacent ſoft parts are generally free from injury. Beſides, it is a well-known fact, that much more violence is required to break the bone near one of its ends than in the middle; and, conſequently, the firſt caſe muſt commonly be attended with more ſerious miſchief. It is alſo obſerved by Boyer, that the treatment of ſuch fractures, as happen about the middle parts of the long cylindrical bones, can be more effectually conducted, becauſe the apparatus, uſually employed to keep the ends of the fracture in contact, extends a conſiderable way both below and above the ſituation of the injury. In addition to theſe reaſons, why fractures near the heads of the long bones are moſt troubleſome to manage, and moſt dangerous in their conſequences, we have to mention that, in theſe examples, the neighbouring joint is alſo apt to inflame, become ſtiff, and ſometimes affected with an incurable anchyloſis.

Another circumſtance, making a material difference in fractures, is the particular direction which they take, with regard to the axis of the bone, in various caſes. In ſome inſtances, the breach of continuity runs tranſverſely; in others, obliquely. Certain authors, as Duverney and Heiſter, have enumerated and admitted, beſides *tranſverſe* and *oblique* fractures, alſo *longitudinal* ones. But M. Louis and Boyer, with every appearance of reaſon, reject as impoſſible the longitudinal fracture; unleſs by that expreſſion are ſignified the longitudinal ſplinters of comminuted fractures; which ſplinters are very apt to attend theſe injuries, when they are occaſioned by gun-ſhot violence.

A knowledge of the kinds of diſplacement (if we may uſe this term) to which the ends of a fracture are liable, and of the manner in which ſuch diſplacement is produced, is highly important in practice: for the grand object in the treatment conſiſts in preventing the extremities of the fracture from becoming ſeparated, and in rectifying their poſition, whenever they happen to be diſplaced

From the vague, inaccurate way in which the general ſymptoms of fractures are repreſented by moſt ſurgical writers, we ſhould ſuppoſe that the ends of all fractures are neceſſarily diſplaced, and that theſe accidents are invariably attended with deformity. Nothing, however, can be further from the truth than this idea. It is true, that the great ſkill, in the treatment of fractures, conſiſts in keeping the ends of the broken part of the bone in a ſtate of contact; but we are not to infer from this circumſtance, that becauſe a bone is broken, and *may* be diſplaced, that it *muſt always* be ſo. Were we to pronounce that there is no fracture, becauſe there appears no deformity, our deciſion, ariſing from this criterion, would often diſplay ignorance, and be productive of highly miſchievous conſequences to the patient. The leg, that part of the body ſo peculiarly expoſed to a variety of accidents, is frequently broken, while the form of the limb remains unchanged. The caſe which often preſents us with a ſtriking illuſtration of this fact, is when the tibia only is fractured near its upper head, where its diameter is conſiderable, and conſequently the ſurfaces oppoſed to each other ſo extenſive, that they are hardly capable of being ſeparated. In this inſtance, the fibula alſo operates as a ſplint, and keeps the extremities of the fracture in their proper ſituation.

Deſirous, as we have been, of correcting the miſtaken notion, that deformity is a ſymptom *always* attendant on fractures, we ſhould be ſorry to convey to any one a falſe idea, that a deviation of the broken part of a bone from its right and natural poſition, and a conſequent alteration in the original ſhape and appearance of the limb, or part, are not very frequently among the moſt certain ſigns by which the nature of the accident may be known. Fractures of the arm and thigh are, almoſt without exception, attended with deformity, in conſequence of the ends of the broken part of the bone not continuing properly applied to each other. It is the ſame with fractures of the clavicle, as well as with all thoſe in which both bones of the leg and both bones of the fore-arm are concerned.

The derangement to which fractures are ſubject may happen in the direction of the diameter of the bone; be parallel to, or form an angle with, the axis; or merely affect the circumference.

Boyer obſerves, that when a bone is fractured tranſverſely, the contiguous ſurfaces may remain in partial contact, or be totally ſeparated. In a fracture of the tibia, for inſtance, the inferior portion of the bone may be puſhed inward, and totally ſeparated from the ſuperior; or the external part of the former may be placed in contact with the internal of the latter. This incomplete derangement in the direction of the diameter of the bone does not produce any ſhortening of the limb; but when the tranſverſe derangement is complete, then follows that parallel to the axis of the bone. The derangement in the direction of the diameter happens when the fractured bone is of a conſiderable ſize, as the tibia, for inſtance, when the fracture is tranſverſe, and when the proper means of keeping the parts in their natural ſituation have been neglected. But, if the fracture be oblique, the ſurfaces not extenſive, and the accident neglected, the derangement in the direction of the axis takes place, and the limb is ſhortened. Boyer, alſo, notices that the derangement which attends ſuch fractures

as thoſe of the patella, olecranon, &c. might be claſſed with the preceding kind; but with this difference, that the fractured ends, inſtead of riding over each other, recede one from the other, and are always found ſeparated by a greater or leſs diſtance.

Boyer remarks, that the third ſpecies of derangement, or that in which the two portions of a broken bone form an angle one with the other, takes place principally in caſes of comminuted fractures. However, a ſimple fracture of the leg might be diſplaced in this manner, as may eaſily be conceived, by ſuppoſing the foot placed on an inclined plane, in which caſe, the angle formed would be ſalient anteriorly, if the heel were lower than the fore part of the foot; poſteriorly, if the contrary.

The fourth ſpecies of derangement noticed by Boyer, or that affecting the circumference, is produced by the rotation of the inferior portion of the fractured bone on the ſuperior, in ſuch a manner, that the part which was anterior becomes internal, or external. We have an inſtance of this ſpecies of derangement in the fracture of the neck of the thigh bone, when the foot, being ill ſupported by the apparatus, and obeying its weight, aided by that of the leg, and by the contraction of the muſcles, turns outward, and carries the lower portion of the broken bone in the ſame direction. In this caſe the anterior part of the body of the bone correſponds no longer to that of the neck.

It is explained by the above-mentioned writer, that as the bones are only paſſive inſtruments of locomotion, they poſſeſs not, in their own organization, any cauſe of the change of ſituation which takes place with reſpect to the ends of fractures. The cauſes are all aſcribable to external impulſes, the weight of the limb, and the contraction of muſcles. The cauſe of the fracture may be the cauſe of the derangement of the fractured portions. Thus, when the thigh is broken by a fall from ſome height, the weight of the body on the leg, which reſts on the ground, may, beſides bending the thigh bone forward, and breaking it, alſo diſplace the ends of the fracture.

The celebrated ſurgeon Ambroſe Paré had his leg broken, and the ends of the fracture diſplaced by the ſame cauſe. The lower portion of the broken bone was quite ſeparated from the upper, while the latter, driven by the weight of the body, was forced through the integuments, ſtocking, &c. into the very ground.

The angular and the rotatory derangement of the fractures may be occaſioned by the aukward manner in which the aſſiſtants hold the broken limb, as well as by the weight of the limb itſelf. The action of the muſcles, however. is the moſt powerful circumſtance by which the generality of fractures are diſplaced.

It was that great ſurgeon, Mr. Pott, who firſt fixed the earneſt attention of the ſurgical profeſſion on the conſiderable ſhare which the muſcles had in drawing the ends of fractures out of their proper poſition, and in diſplacing them again after they had been ſet.

The ears of every reader muſt be familiarly acquainted with the phraſe of *ſetting* a broken bone; and there is ſcarcely a perſon who does not immediately think, that when a limb is fractured, ſome force muſt be directly uſed, in order to bring the extremities of the fracture into a ſtate of even contact with reſpect to each other. Many, who call themſelves ſurgeons, never take the trouble to conſider whether the ends of a fracture are diſplaced or not. No ſooner do they feel a crepitus, and aſcertain that a bone is broken, than they take it for granted that the extremities of the fracture muſt of courſe be out of their proper place, and that no time ſhould be loſt before they are forcibly pulled back again.

The old writers on ſurgery direct us, in caſes in which the thigh or leg is broken, to place the patient in a ſupine poſture, and the broken limb in a ſtraight one; then, having the upper part of it held firm and ſteady, by proper aſſiſtants, we are ordered, by means of bands, ligatures, or even, in ſome caſes, by pieces of machinery, to make ſuch an extenſion or ſtretching of the limb lengthways, as ſhall enable the ſurgeon to place the ends of the broken bone in as even a poſition, with regard to each other, as the nature of the fracture will admit. "This," ſays Mr. Pott, "is a ſhort deſcription of what, in the vulgar phraſe, is called ſetting a broken bone; and is moſt commonly a painful operation to the patient, a fatiguing one to the operator and his aſſiſtants; and, what is worſe, is, in many inſtances, found to be inefficacious; at leaſt, not fully to anſwer the intention of the one, or the expectation of the other."

After dwelling on the difficulty, inefficacy, and miſchief attending ſuch practice, Mr. Pott remarks, that neither extenſion, nor counter-extenſion, can ever be neceſſary, on account of the mere fracture, conſidered abſtractedly. The broken ends of the bone, or bones, are of themſelves inactive, and, if not acted upon by other parts, they would always remain motionleſs. When any attempt is made to put them in motion, they of themſelves can make no poſſible reſiſtance; nor can any be made on their part, ſave an accidental one ariſing from the points of the fracture being entangled with each other; and when they have been once, by the hand of the ſurgeon, placed properly and evenly with regard to each other, they would of themſelves for ever remain ſo. What, then, is the reaſon why fractured bones always ſuffer a greater or leſs degree of diſplacement? Why is a broken limb almoſt always ſhorter than its fellow? What creates the reſiſtance which we always find in attempting to bring the fractured parts aptly together? Whence does it proceed, that when we have done all that is in our power, (according to this mode of acting,) the ends of the fracture will, in many caſes, become again diſplaced, and lameneſs and deformity frequently enſue? In ſhort, what are the parts, or powers, which act on the bones, and which, by ſo acting on them, produce all theſe conſequences?

Theſe parts, ſays Mr. Pott, are the muſcles, the only moving powers in the animal body. By the action of theſe on the bones all locomotion is performed, and cannot be performed without them; and, although all bones, when broken, are generally in ſome degree diſplaced and ſhortened, yet it will always be found, that in proportion as the muſcles ſurrounding, or in connection with a bone, are ſtrong, or numerous, or put into action by inadvertence or ſpaſm, ſo will the diſplacement of the ends of ſuch bone, when fractured, be. The even and ſmooth poſition of the fractured ends of a tibia, when the fibula of the ſame leg is entire and unhurt, that is, when the muſcles therefore cannot act upon the former; the viſible and immediate deformity, when both the beforementioned bones are broken nearly in the ſame place, that is, when the muſcles can act upon and diſplace ſuch fracture; the great difficulty frequently met with in endeavouring to get a broken os femoris to be even tolerably ſmooth, and to prevent ſuch broken limb from being much ſhorter than the other, are, among others which might be produced, ſuch ſtrong and irrefragable proofs as need no comment.

A very remarkable caſe is cited in "Les Oeuvres Chirurgicales de Deſault par Bichat," to ſhew that the derangement of

of broken thighs is occaſioned by the action of the muſcles. The patient was a carpenter, who had fallen from a ſcaffold, and broken his thigh. On the day after the accident the limb was as long as the other; but the lower extremities were both affected with a complete paralyſis, attended with a retention of urine. However, no ſooner had the muſcles recovered their power of action, in conſequence of moxa being applied, than the ſhortening of the limb made its appearance.

When we come to the conſideration of particular fractures we ſhall have occaſion to point out what muſcles have the moſt conſiderable effect in ſeparating the ends of the broken bone from each other, and what plans may be adopted for the prevention of ſuch diſplacement.

Writers have diſtinguiſhed the cauſes of fractures into two kinds, namely, prediſpoſing and remote.

Among the prediſpoſing are uſually enumerated the ſituation and function of the bones, the age of the patient, and certain diſeaſes under which he may be labouring.

Thus, as Boyer has obſerved, ſuperficial bones are more eaſily fractured than ſuch as are covered with a conſiderable quantity of fleſh. Thus, the radius which ſupports the hand, and ſerves as a kind of handle for it, is more apt to be broken than the ulna. The clavicle alſo is very frequently fractured, in conſequence of its office, which is to keep the ſhoulder in its proper poſition, and bear upon its arched extremity all the motions of the arm.

The bones of old ſubjects are exceedingly brittle, on account of the great quantity of phoſphate of lime contained in their texture, in proportion to the animal matter; or, in other words, by reaſon of the large proportion of the inorganized to the organized part of their ſtructure. On the contrary, the bones of children and young perſons contain a large quantity of fibrous, elaſtic, animal matter, and a ſmaller proportion of earth, ſo that they are very flexible and yielding, by which means they often elude the effects of external violence, and remain unbroken.

Louis and Saviard have related examples, in which female patients labouring under old ulcerated cancers, have had their bones affected with ſuch brittleneſs, that merely moving in bed would break ſome of them. Here the firſt indication is to correct, if poſſible, the ſtate of the ſyſtem which is the cauſe of the fragility of the bones.

Some authors have been abſurd enough to impute the frequency of fractures in cold weather to the bones being then more brittle, as if the great number of falls which happen on icy ſlippery places in the winter ſeaſon were not a more rational explanation of the fact. With regard to the ſymptoms of fractures, ſeveral are only of an equivocal nature, as, for inſtance, the pain, and the difficulty or impoſſibility of moving the limb. The ſame obſervation is alſo applicable to the ſhortening of the limb, and the alteration in its ſhape, which are ſometimes the conſequence of fractures. However, no certain inference can be drawn from theſe ſigns, unleſs it be firſt aſcertained that the deformity is not natural, and does not proceed from a diſlocation. It is true, the limb may occaſionally form ſuch an angle at the broken part, and the ends of the bones may be ſo prominent, that the accident cannot fail to be apparent to the moſt careleſs and leaſt diſcerning examiner. However, this clearneſs in regard to the nature of the caſe is only occaſional, and many fractures are attended with a kind of deformity which involves things in more doubt.

The reader is not to imbibe the ſuppoſition that all fractures are attended with deformity; nor muſt he think, on the other hand, that becauſe there is no change in the ſhape and external appearance of the limb, or part, there is certainly no fracture.

The moſt certain ſymptom of a fracture is what is termed a crepitus, by which is meant, that grating ſenſation and noiſe which the fingers and ears of the ſurgeon have communicated to them when the ends of the fracture rub againſt each other.

Surgeons are generally too ſolicitous about feeling the crepitus, whenever they ſuſpect a fracture. It is undoubtedly the leaſt ambiguous of the ſigns by which the accident may be known; but let it be remembered, that rubbing the ends of a broken bone againſt each other, and againſt the ſurrounding fleſh, puts the patient to moſt excruciating torture, and aggravates all the inflammatory ſymptoms which muſt enſue. Hence, whenever the nature of the caſe is ſufficiently evident from the bent appearance of the limb, projection of the ends of the bone, &c. it does not become a humane practitioner to move and diſturb the fracture for the purpoſe of feeling the crepitus. Such conduct would only be gratifying a moſt uſeleſs kind of curioſity at the expence of much ſuffering to the poor patient.

In ſome inſtances of fractures no crepitus can be diſcovered; nor is there any other ſymptom preſent by which the exiſtence of the accidents can be detected with abſolute certainty. Several cauſes may be the occaſion of this obſcurity. In particular caſes, the injured bone is ſurrounded by ſo conſiderable a quantity of fleſh, that it is next to impoſſible to feel the breach of continuity, or perceive a crepitus. In an example of this kind, the accident may continue for ever undiſcovered, if the ends of the fracture are not materially ſeparated, and, conſequently, there is no deformity. Fractures of the neck of the thigh-bone are often circumſtanced in the foregoing manner. A fracture of the tibia, fibula, or ulna, alone, is frequently very difficult to diſcover, becauſe the other bone, which remains uninjured, prevents any change in the ſhape of the limb, and keeps the ends of the fracture from moving with ſufficient freedom to communicate the diſtinct ſenſation of a crepitus.

We ſhall conclude theſe obſervations, relative to the diagnoſis of fractures, with earneſtly exhorting ſurgeons, in all caſes of doubt, to act in the ſame way as they would do were they certain of there being a fracture. The application of a bandage, ſplints, &c. can never do harm, and may be the means of preſerving the patient from irremediable deformity and lameneſs. Every experienced practitioner knows how difficult it frequently is to feel a diſtinct crepitus when a ſingle rib is broken; but, becauſe he cannot actually perceive the ends of the bone grate, he does not omit to apply a tight bandage round the thorax, provided the kind of pain which the patient complains of in reſpiration, and the nature of the blow, juſtify a ſuſpicion that the accident has happened.

On the ſubject of the prognoſis we have to remark, that, in general, fractures of bones, which are acted upon by numerous powerful muſcles, are more troubleſome to cure than other fractures which befall bones differently circumſtanced.

Fractures of the arm are generally attended with leſs danger than thoſe of the leg.

Fractures which take place near the middle of a long bone are uſually not ſo ſerious in their conſequences as fractures which happen in the vicinity of a joint. In the firſt caſes, the force has commonly operated at ſome diſtance from the breach in the bone, and the ſoft parts immediately round the fracture have conſequently not ſuffered any conſiderable degree of contuſion. But, when the head of a long bone is broken, the force has in general been ap-

plied directly to the fractured part, ſo that the ſkin and muſcles are more injured than in the preceding kind of caſe; and, as the neighbouring joint is liable to inflame, anchyloſis is apt to enſue. Another reaſon why a fracture of the head of a long bone is troubleſome to cure, is, that the ſplints cannot effectually keep the ſhort fragment ſteady.

Oblique fractures of the limbs are far more dangerous than tranſverſe ones, becauſe the two ſloping ſurfaces ſlip over each other, and make no reſiſtance to the muſcles, which have a continual tendency to draw upward the lower part of the broken bone.

Compound fractures are infinitely more hazardous than ſimple ones, and often terminate in the loſs of the limb, or even of the patient's life. The practitioner is frequently called upon to exerciſe the niceſt judgment and diſcrimination in determining whether an attempt ſhould be made to ſave the limb in theſe caſes, or amputation be at once performed.

The peril attendant on all fractures may be greatly increaſed by the ſoft parts being conſiderably contuſed or lacerated, by ſome large artery being wounded, &c.

Fractures of the lower extremities, *cæteris paribus*, are accounted more dangerous and difficult of cure than thoſe of the arm and fore-arm.

It ſeems hardly neceſſary to obſerve, that the patient's age, and the ſtate of his health, make a material difference in the degree of danger attendant on a fracture. A debilitated old man cannot be expected to get well ſo often and expeditiouſly as a younger perſon, poſſeſſing a fine conſtitution. Childen's fractures are united with aſtoniſhing quickneſs.

The ſcurvy is ſaid to hinder broken bones from uniting, by preventing the formation of callus. Authors have alſo aſſerted, that pregnancy has the ſame effect; but Boyer does not believe this to be true, and our own experience enables us to corroborate what this laſt author has ſtated; for we attended, a few years ago, a young woman who broke both bones of her leg, when five or ſix months advanced in pregnancy, but who, notwithſtanding her ſtate, recovered in leſs than two months.

There are certain perſons, in whom bones which happen to be fractured, remain diſunited throughout life; nor can any very good explanation of the reaſon of this circumſtance be afforded. In the ſituation of the fracture a ſupernumerary joint is formed, and the limb continues for ever afterwards flexible in a ſituation where it ought not to be ſo. On this ſubject we ſhall have occaſion to ſay a few words again.

The general doctrine relative to the treatment of fractures has been arranged under the following heads:

Extenſion.
Counter-extenſion.
Coaptation, or Setting.
Application of Medicaments.
Deligation, or Bandage.
Poſition.
Prevention, or Relief of Accidents.

In every caſe of fracture, where the ends of the broken part of the bone are diſplaced, it is obviouſly the firſt indication to put them into an even and natural poſition with regard to each other. It is only with this view that extenſion and counter-extenſion are ever requiſite.

Extenſion is the force exerted on the lower portion of the broken bone, in order to bring down its upper end into a ſtate of coaptation with the lower end of the upper piece of the ſame bone. Counter-extenſion is a reſiſting force, employed to prevent the whole limb, or even the whole body, from obeying the force of extenſion.

The reader is already apprized of the various kinds of derangement to which fractures are ſubject, and alſo of the principal ſhare which the muſcles have in diſplacing the ends of broken bones, reſiſting their coaptation, and putting them out of their proper poſition again, after they have been ſet. Such information muſt at once lead us to perceive that both in the ſetting, and throughout the whole of the treatment of fractures in general, the great ſurgical aim is to diminiſh as much as poſſible the power of ſuch muſcles as have moſt influence in throwing the ends of the broken bone out of their right poſition.

Mr. Pott undertook to conſider what it was which gave to a muſcle, or to the principal muſcles of a limb, the greateſt power of reſiſting any force applied to them *ab externo*, in order to draw them out into greater length; for, ſays he, whatever that is, the ſame thing will be found to be the cauſe of the different degrees of reſiſtance in ſetting a fracture.

This eminent ſurgeon contends, that putting the muſcles into a ſtate of tenſion, or into a ſtate approaching nearly to that of tenſion, almoſt neceſſarily gives them an opportunity of exerting their greateſt power, either of action or reſiſtance. On the other hand, he enquires what is the ſtate or poſition of a muſcle, which is moſt likely to prevent it from acting, and diminiſh, as much as poſſible, its power of reſiſtance? Or, what is that poſition of a limb which, in the caſe of a broken bone, will moſt incapacitate the muſcles from acting on and diſplacing it; and which will, in the greateſt degree, remove that reſiſtance which they have it in their power to make to the attempts for the reduction of ſuch fracture? Mr. Pott believed, that putting a limb into a poſition which relaxes the whole ſet of muſcles belonging to the broken bone, muſt beſt anſwer ſuch purpoſe, and, conſequently, he urgently recommended ſurgeons to put the limb into this poſture at the time of making the extenſion and reducing the fracture. In caſes of broken thighs and legs, the poſition which he adviſed was that in which the limb lies on its outſide, with the knee half bent, and the thigh in a ſimilar ſtate, as will be hereafter deſcribed.

Practitioners have undoubtedly received from the able writings of Pott a great deal of valuable information; and enforced, as all his precepts are, in an authoritative, animated ſtyle, they make conſiderable impreſſion, and are, perhaps, too liable to be received as incontrovertible truths, needing no further inveſtigation. When we are told that relaxing a muſcle, or bringing its origin and inſertion nearer together, diminiſhes its power, we ſee the truth of the obſervation, becauſe a muſcle acts by ſhortening itſelf; and it obviouſly can only ſhorten itſelf to a certain degree. But when we are adviſed to put a limb into ſuch a poſition as ſhall relax the whole ſet of muſcles, which have the power of moving the broken bone, we are puzzled to conceive what poſture can be meant; for it is evident, that when we bend a joint, we make the extenſor muſcles tenſe; and, that when we ſtraighten it, we put the flexors on the ſtretch. In the preciſe poſitions which Mr. Pott recommends for fractured thighs and legs, ſo far is the whole ſet of muſcles from being relaxed, that many of them may be ſaid to be very much on the ſtretch; and, in the caſe of a broken arm, with the elbow bent, are not the triceps and anconæus in a ſtate of tenſion, in conſequence of the ſame poſture, by which the biceps and brachialis internus are relaxed?

By theſe obſervations we are far from intending to inſinuate, that any of the poſtures, to which alluſion has been made, are not ſuch as ought to be preferred. Our preſent

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deſign is only to ſhew, that to entertain an idea that every muſcle, belonging to a bone, may be relaxed by bending a joint, is abſurd in the extreme.

It is by no means true that, in every fracture, extenſion and counter-extenſion are requiſite: in fractures of the patella and olecranon they would abſolutely be improper. In theſe examples, it is only neceſſary to extend the leg and fore-arm, ſo as to relax the muſcles which draw up the upper piece of the bone, and then it may eaſily be puſhed into contact with the lower portion.

When the derangement is in the direction of the diameter of the bone, a very little extenſion is enough; as here the only object of it is to diminiſh the friction of the ſurfaces of the fracture, which are to be moved in oppoſite ways.

When the two portions of a broken bone form an angle with each other, no extenſion and counter-extenſion are neceſſary; and the ſurgeon has only to put the limb on a horizontal plane, in order to bring the bone into its right poſition.

It is equally evident, that the rotatory derangement of a fracture requires no ſuch proceedings, ſince the bone may be ſet right by merely turning the lower fragment in a direction contrary to that in which the fracture has been diſplaced.

Extenſion and counter-extenſion, then, can only be of real uſe when the derangement happens in the direction of the axis of a bone.

It is not an uncommon ſuppoſition, that a fractured limb may be in ſuch a ſtate as not to admit of the extenſion neceſſary for its being ſet; and when much ſwelling, inflammation, and pain, affect the member, ſome practitioners confine their attention at firſt entirely to theſe ſymptoms. Under this method of treatment, the ſpace of time which is loſt in relieving theſe complaints is ſometimes conſiderable; ſo conſiderable that, as Mr. Pott obſerves, an even coaptation becomes afterwards impracticable: and then the inflammatory ſymptoms, which nine times in ten are capable of immediate relief, are urged as an excuſe for unneceſſary lameneſs and deformity.

The fact is, no fracture which is diſplaced ſhould ever be allowed to remain ſo: the moſt powerful of thoſe muſcles which produce the derangement ought, if poſſible, to be relaxed, by placing the limb in a judicious poſture; and in ſuch poſture the bones ſhould be ſet, without one moment's time being loſt. The coaptation of the fracture is, in fact, the moſt effectual means of diminiſhing the tenſion, ſwelling, and pain in the limb; as any one may conceive, who has a juſt notion of what miſchief the rough, ſharp extremities of an unſet fracture muſt do to the ſurrounding ſoft parts. The foregoing ſymptoms, which would ſubſide almoſt of themſelves after the fracture has been ſet, might, under the uſe of poultices and fomentations, conſume ſo much time, that, on an attempt being afterwards made to ſet the fracture, the bone would be found already united in its deformed poſition, and all change for the better now impracticable.

The general cuſtom of ſurgeons in this country is to apply the power of extenſion to the lower portion of the broken bone, and that of counter-extenſion to the upper piece; and when the ſtrongeſt muſcles, concerned in diſplacing the fracture, have been relaxed, the hands of the ſurgeon, ſometimes aided by thoſe of an aſſiſtant, uſually ſuffice for making ſuch extenſion and counter-extenſion as is neceſſary for putting the ends of the fracture into as even a ſtate of coaptation as the nature of the caſe will allow.

In France, the moſt diſtinguiſhed ſurgeons, like Deſault and Boyer, make the requiſite degree of extenſion and counter-extenſion in a manner very different from that which is adopted by Engliſh practitioners. Theſe foreign ſurgeons object to our method, that it is often difficult to take hold of the upper and lower portions of a fractured bone, and ſometimes quite impoſſible, as when the neck of the thigh-bone is broken; and that applying the force immediately upon the muſcles which ſurround the fracture irritates them, and makes them enter into violent and ſpaſmodic contractions. Hence, Deſault and Boyer adviſe the extenſion to be made on the lower part of the limb, or on the bone which articulates with the lower piece of the fracture, while the counter-extenſion is to be made on the bone which articulates with the upper piece. For example, in the caſe of a broken leg, they recommend the extending power to act on the foot, and the counter-extending on the thigh; and in the inſtance of a fractured thigh, they adviſe ſuch powers to operate on the leg and pelvis.

In regard to the choice of theſe methods, we have to remark, that as, in this country, moſt fractured limbs are placed in the bent poſition, in order to be ſet and united, the French mode of making extenſion and counter-extenſion is quite inadmiſſible, becauſe the direction of the bones, above and below the fractured one, is, in ſuch poſition, quite different from that of the latter.

We ſhall now ſuppoſe coaptation performed, and the ends of the fracture placed together in as ſmooth a manner as poſſible. The next indication is to keep them quietly in this poſition, until they have acquired a firm union to each other. This object is generally much more difficult of accompliſhment than ſetting the bone; for the muſcles have a continual tendency to draw the ends of the fracture aſunder again: and when ſuch muſcles are ſtrong and numerous, the fracture oblique, and the patient very much troubled with involuntary ſpaſms, all the care and ſkill of the moſt conſummate ſurgeon will ſometimes hardly avail in making the extremities of the fracture grow together, without ſome degree of deformity.

For the purpoſe of preventing the ends of the fracture from changing their poſition, it is not enough to put the limb in ſuch poſture as tends to relax the muſcles, which have the greateſt power in diſturbing the coaptation; for, in general, no poſture can poſſibly be choſen which will incapacitate every muſcle connected with the broken bone. Beſides, whatever poſition we chooſe, the weight of the limb will gradually occaſion a material alteration in it, unleſs care be taken to lay the fracture on a bed which is not liable to yield much. Indeed, it is greatly to be lamented that, in all our public hoſpitals, there ſhould be no beds expreſsly allotted to patients with broken limbs. As Boyer, Deſault, and others, have inſiſted on, the horizontal ſupport, given to a fractured leg or thigh, ought to be capable of making conſiderable reſiſtance, without being hard enough, however, to create any uneaſineſs or pain. Hence, a mattreſs of hair ſeems preferable to one made of wool, or feathers; which ſubſtances are too ſoft, and conſequently yield to the weight of the limb. The good effects of a favourable poſture are to be aſſiſted with the mechanical ſupport derived from an apparatus, which uſually conſiſts of a piece of plaſter, ſome kind of bandage, pads and compreſſes, and long, flat, broad pieces of wood or tin, called ſplints.

With regard to the *application of medicaments*, in caſes of ſimple fractures, a piece of plaſter, compoſed of the ſoap-cerate, ſeems now to have obtained the univerſal approbation of all the beſt ſurgeons of the preſent day. It was firſt brought into general uſe by that diſtinguiſhed ſurgeon Mr. Pott, who recommended it, in his remarks on fractures, in preference to adheſive plaſters, which formerly were ſometimes applied. "The adheſive plaſter," ſays this author,

" muſt for ever be wrong upon any rational principle. The intention, in applying any kind of external medicine to a broken limb, is, or ought to be, to repreſs inflammation; to diſperſe extravaſated blood; to keep the ſkin lax, moiſt, and perſpirable; and, at the ſame time, to afford ſome, though a very ſmall, degree of reſtraint or confinement to the fracture, but not to bind or preſs; and it ſhould alſo be calculated, as much as poſſible, to prevent itching, an herpetic eruption, or an eryſipelatous efflorescence. Adheſive plaſters of all kinds, let the compoſition of them be what it may, are, from this one quality, the leaſt likely to contribute to any of the good ends propoſed; and the moſt likely to be the cauſe of the contrary inconveniences, which ought moſt carefully to be avoided. They obſtruct perſpiration, they heat the ſkin, they produce itching, eruption, and inflammation; and if the fracture be quite ſurrounded by them, and the limb be from any cauſe ever ſo little inclined to ſwell, they make a tight, painful, and pernicious ſtricture, much greater even than a roller, and leſs likely to relax." Mr. Pott next proceeds to recommend the ſoapcerate plaſter, which, he obſerves, lies very eaſy, repels inflammation, is not adherent, comes off clean, and very ſeldom, if ever, irritates or cauſes either herpes or eryſipelas.

The next practical maxim which this writer urged was, that whatever application be made to the fracture, it ſhould be put on in ſuch a manner as will allow it to be renewed and ſhifted, as often as neceſſary, without moving the limb in the leaſt. He inſiſted, that when once a broken thigh or leg has been put to rights, and has been properly depoſited in an eligible ſituation, it ought never to be lifted up, or moved from it again, without neceſſity, until the fracture is perfectly united; and ſuch neceſſity will not very often occur. The frequent motion of a fractured limb cannot poſſibly contribute to the patient's eaſe; nor will any one contend, that when a broken limb has been once depoſited in the beſt poſition poſſible, that ſuch poſition can be mended, merely by taking ſuch limb up and laying it down again.

Theſe facts led Mr. Pott to condemn the employment of any kind of apparatus, which could not be taken off without diſturbing the fracture; and hence he reprobated the plan of applying a common roller to broken legs, which ſort of bandage ſtood in need of being removed and put on afreſh every three or four days; which could never be done, without lifting up the limb from the ſplint and pad on which it was depoſited.

Deligation, as it was termed, is another part of the treatment of fractures in general. The ancients, and the majority of practitioners up to the time of Pott, uſed to apply what is commonly called a roller, which was of different lengths, or ſometimes conſiſted of one, two, or more pieces. Hippocrates was in the habit of employing three; Celſus, ſix; and later ſurgeons, one. Mr. Pott remarks, that, by ſuch kind of bandage, three intentions were formerly aimed at; *viz.* to confine the fracture, to repreſs or prevent a flux of humours, and to regulate the callus. However, though this author acknowledges that ſome ſort of bandage is neceſſary in every ſimple fracture, as well for preſerving ſome degree of ſteadineſs in the limb as for the retention of the applications, yet neither of theſe ends can be anſwered merely, or even principally, by bandage of any kind whatever. Hence Mr. Pott contends, that if every ſort of deligation cannot be a principal, but only an acceſſorial kind of aſſiſtance, very little to be depended upon, ſuch kind of bandage as is moſt difficult to be applied with juſtneſs and exactitude, ſuch as is ſooneſt relaxed and out of order, ſuch as ſtands moſt frequently in need of renewal, and, in ſuch renewal, is moſt likely to give pain and trouble, muſt be more improper and leſs eligible than one which is more eaſily applied, leſs liable to be out of order, and which can be adjuſted without moving the limb.

The *degree of ſupport and ſteadineſs*, communicated to a fractured limb by a linen roller, muſt obviouſly be very trivial. The old idea, alſo, of *preventing a flux of humours*, by means of the bandage, was entirely erroneous. If, ſays Mr. Pott, by the points and edges of the broken bone the muſcles and other ſoft parts be unavoidably wounded and torn; or, if the ſame kind of miſchief be incurred by the inadvertence or indiſcretion of the patient, or of thoſe who aſſiſted in getting him home, or from the violence uſed in extending the limb and ſetting the fracture, inflammation muſt be excited, and pain and tumefaction will be the conſequence; and theſe will continue for ſome time in every fracture; but their duration will be longer or ſhorter, in different caſes, and under different circumſtances. Evacuation, reſt, and a favourable poſition of the limb, will, and do in general, remove all theſe complaints. Bandages, however, can do nothing more, in bringing about this benefit, than keep the applications in their proper place: on the contrary, if the bandage be a roller, it muſt, by the frequent neceſſity of its being adjuſted, and the frequent motion of the limb, in ſome degree counteract the proper intention of cure.

The third purpoſe for which the roller was formerly applied was the *regulation and reſtraint of the callus*. The old ſurgeons uſed to look upon callus as a particular juice always ready to ooze from the ends of fractures, for the purpoſe, as it were, of ſoldering them together; but it was imagined that, unleſs ſuch callus was reſtrained by art, it would always flow in ſuch quantity as to create trouble and deformity. This gelatinous kind of fluid is undoubtedly the medium by which fractures are united; but, Mr. Pott very ably explains, that art is by no means capable of managing it. He admits, that the callus does oftentimes create tumefaction and deformity, or even lameneſs; but, he contends, that the fault, in theſe caſes, does not lie in the mere redundance of ſuch juice: it is derived from the nature of the fracture, from the inequality of it when ſet, and from the inapt poſition of the broken ends, with regard to each other; nor is ſurgery, nor the ſurgeon, any otherwiſe blameable in this caſe than as it was, or was not, originally in their power to have placed them better. The inequality of the fracture occaſions the ſeeming redundance of callus, and the ſwelling in the place of the union. Mr. Pott obſerves, that when a bone has been broken tranſverſely, or nearly ſo, and its inequalities are therefore neither many nor great; that when ſuch broken parts have been properly ſet, and proper methods uſed to keep them conſtantly and ſteadily in ſuch ſtate, the divided parts unite by the intervention of a gelatinous effuſion, which is gradually converted into new bone. The place where the union has taken place is very little perceptible, and cauſes no deformity nor inconvenience. But, when a bone has been broken very obliquely, or very unequally; when the parts of a fracture are ſo circumſtanced as not to admit of exact coaptation; when ſuch exact coaptation, as the fracture perhaps would have admitted, has not been judiciouſly made; when from unmanageableneſs, inadvertence, or ſpaſm, the proper poſition of the limb has not been attended to, or preſerved: in all ſuch caſes, there muſt be conſiderable inequality of ſurface; there muſt be riſings on one ſide, and depreſſions on another; and the callus cannot unite the parts in the ſame time, or in the ſame way, as when the fracture is tranſverſe, and evenly ſet. The deformity will be proportioned to the greater or leſſer exacti-

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tude with which the fracture is put in a ſtate of coaptation; the moſt diſfigurement happening when the fracture is not ſet at all, that is, when the broken ends of the bone unite by touching each other's ſides.

Mr. Pott concludes this part of the ſubject with remarking, that this doctrine of callus, conſidered as a particular kind of juice, and as being liable to great redundance, if not prevented by art, has not only miſled many people, but has often been made uſe of as a cover to ignorance and neglect. When lameneſs and deformity have been the conſequences of one or both theſe cauſes, more than of the nature and circumſtances of a fracture, the callus has been found ready at hand to take the blame; and the ideal exuberance of this cement has often been urged as an excuſe for real want of knowledge, or for groſs neglect.

Inſtead of a common roller, all ſurgeons now employ, for ſimple fractures of the leg and thigh, what is uſually termed the eighteen-tailed bandage. In general, the pieces which are to ſurround the limb are ſo arranged as to form a right angle with the piece which runs along under the member. However, Mr. Pott adviſes us to tack on the croſs-pieces, ſo as to make an acute angle; by which means they will fold over each other in an oblique direction, ſit more neatly and more ſecurely, and have more connection with, and more dependence on, each other. The eighteen-tailed bandage was uſed for compound fractures ſome time before its application was extended to ſimple ones. In the firſt inſtances, ſurgeons were ſtruck with the advantage of not being obliged to lift up and diſturb the limb every time it was dreſſed, and every time the bandage became ſlack. As Mr. Pott remarks, the pain attending motion in a compound fracture, and the circumſtances of the wound, are certainly very good reaſons for dreſſing ſuch wound with a bandage, which does not render motion neceſſary: but, he aſks, what can make it right to move a limb, in the caſe of ſimple fracture? When a broken bone has been well ſet, and the limb well placed, no good can ariſe from moving it; but conſiderable miſchief may be occaſioned by the diſturbance. Perfect quietude is as neceſſary towards the union of a bone in a ſimple as in a compound fracture. In the latter caſe, there is a wound which requires to be dreſſed, and motion may excite rather more pain than in the former; but, notwithſtanding this, motion is alſo highly prejudicial in the caſe of a ſimple fracture. Mr. Pott has explained, that every benefit, which can be ſuppoſed to be obtained by the common roller, is equally attainable from the uſe of the eighteen-tailed bandage, with one additional, and, to the patient, moſt invaluable advantage, *viz.* that of never finding it neceſſary to have his leg or thigh, once during the treatment, moved from the pad on which it has been laid.

The reader muſt not infer from the foregoing obſervations, that a common roller is never eligible for ſimple fractures on the contrary, it is always preferred for fractures of the arm, and generally alſo for thoſe of the fore-arm.

The next parts of the apparatus for fractures are the ſplints, which are uſually made of wood, tin, or paſteboard, and are applied length-ways on the broken limb. In fractures of the arm and thigh ſurgeons generally make uſe of four; in thoſe of the leg and fore-arm, two. As the deſign of ſplints is to communicate to the limb, for a certain time, ſteadineſs and inflexibility, it is obvious that they ſhould always be formed of ſuch materials as are ſufficiently firm and unyielding.

The old ſurgeons uſed to err conſiderably in the application of ſplints, only employing ſuch as were ſo ſhort, that they merely extended a little way above and below the fracture, without reaching to either of the neighbouring joints. In this manner of application, and of this ſize, as Mr. Pott has remarked, ſplints are in fact neither more nor leſs than compreſſes, and compreſſes made of very bad materials. All the good that ever is or that can be done by them, when of ſuch length, and ſo applied, might certainly be done in a better manner by a more proper kind of compreſs; and every diſadvantage which a hard reſiſting compreſs, injudiciouſly applied, is capable of producing, is probable to reſult from them thus uſed.

The ſame author explains, that the true and proper uſe of ſplints is to preſerve ſteadineſs in the whole limb, without compreſſing the fracture at all. By the firſt effect, they become very aſſiſtant to the curative intention; by the ſecond, they are very capable of cauſing pain and other inconveniences, at the ſame time that they cannot, in the nature of things, contribute to the ſteadineſs of the limb. In the caſe of a broken leg, the ſplints ſhould be long enough to reach above the knee, and below the ankle; and, in all inſtances, they ſhould be hindered from making painful preſſure on any part of the limb, by lining them with pads, well ſtuffed with tow, wool, or any ſoft ſubſtance.

When the thigh-bone is fractured, if the limb is laid in the ſtraight poſition, one ſplint ſhould reach from the hip to the outer ankle, and another from the groin to the inner ankle.

The proper *poſition* in which fractured limbs ſhould remain, during the cure, would be our next ſubject for conſideration, were we not induced to defer what we have to ſay on this point till we treat of particular fractures.

With reſpect to the *prevention and relief of accidents*, the chief ſymptoms which the ſurgeon has to counteract are inflammation and ſwelling of the limb. In order to avert theſe complaints, the moſt effectual plan, as the reader muſt already underſtand, is, after ſetting the fracture, to keep it completely motionleſs, until it has become firmly united. That all diſturbance of the rough, ſharp extremities of a recently broken bone muſt irritate and do great miſchief to the ſurrounding ſoft parts, is a truth ſo manifeſt as to need no comment.

When the ſurgeon, on his firſt arriving in the patient's chamber, finds the limb not merely fractured, but conſiderably bruiſed; or when, after a day or two, great ſwelling and inflammation come on; the moſt proper practice is to wet the bandage with the ſaturnine lotion, and place folded linen, wet with the ſame application, under the upper pad and ſplint. It will not be neceſſary to take off the ſplint every time more of the lotion is to be applied: it will be quite enough to ſqueeze ſome of the fluid out of a ſponge into the interſpace between the ſplints; by which means, the bandage and linen will be kept conſtantly wet, and an inceſſant evaporation from the limb maintained. When a good deal of ecchymoſis prevails, a lotion compoſed of vinegar, ſpirit of wine, and muriate of ammonia, is the moſt efficacious in promoting the abſorption of the extravaſated blood. We need hardly obſerve, that when it is deemed proper to apply a lotion, the emplaſtrum ſaponis becomes ſuperfluous.

Patients with fractured limbs ſhould be kept on a low regimen, for the firſt few days, unleſs extreme old age or great debility ſhould forbid; but, after the hazard of inflammation is over, a nouriſhing diet is to be recommended, as a certain vigour in the circulation, and ſtrength of conſtitution, greatly expedite the proceſs by which broken bones unite.

In ſome patients who have fractured limbs, the ſwelling and inflammatory ſymptoms are ſo conſiderable, that prudence dictates the propriety of taking away blood. The

neceſſity of ſuch practice particularly occurs when the bone has been broken with great violence, and the patient is ſtrong, robuſt, and of a plethoric habit.

Another invariable indication, throughout the treatment of all fractures, is to keep the bowels in a regular ſtate; for coſtiveneſs is very apt to reſult from the degree of confinement to which the patient is unavoidably ſubjected.

The ſurgeons ſhould never forget to preſcribe opium, in all caſes of fractures attended with ſevere pain, violent ſpaſms, loſs of ſleep, &c.

When an artery of a certain magnitude happens to be wounded by the ſharp point of a fractured bone, and a conſiderable quantity of blood is effuſed in the cellular membrane, it may be indiſpenſably neceſſary to cut down to the veſſel, and tie it with two ligatures, one above, the other below the laceration in it. J. L. Petit mentions an inſtance, in which an aneuriſm was produced by a wound of the anterior tibial artery, in the caſe of a broken leg.

With regard to the proceſs by which fractures unite, it is not very diſſimilar from that by which wounds in ſoft parts are healed. The veſſels of the broken ſurfaces of the bone, very ſoon after the accident, pour out coagulated lymph. Into this lymph either the neighbouring veſſels ſhoot, or in it new ones are in ſome inexplicable way or another generated. The veſſels, in a certain time, acquire the power of ſecreting lime, and thus convert the coagulating lymph into new bone, or callus, which, from being at firſt as flexible as cartilage, gradually aſſumes all the firmneſs, inflexibility, and other qualities of original bone. Some perſons, when they ſee a broken limb raiſed from the ſplints, at the end of about a fortnight, are apprehenſive leſt the bones ſhould ſnap again; but, though they may be obſerved to bend, they do not break, which laſt evil is generally prevented by the great flexibility of the callus in the early ſtate of its formation.

Surgeons occaſionally meet with patients in whom there ſeems to be no power of forming callus, ſo that fractures cannot unite. The cauſe of this peculiarity, as far as we have been able to learn, ſeems to be involved in obſcurity, and probably will never be well underſtood. It is not one kind of conſtitution in which ſome impediment to the generation of callus prevails; for we ourſelves have ſeen fractures remain diſunited in perſons of very different temperaments, notwithſtanding the greateſt care was taken, and the utmoſt ſkill exerted to procure an union. We have ſeen an inſtance in which a ſtrong, healthy, muſcular young man broke the os brachii, ſomewhere about the inſertion of the deltoid muſcle; but, notwithſtanding every poſſible attention, ſuch fracture never united, and was at length converted into a kind of joint. This patient ſubmitted to have the ends of the fracture cut down to, and fairly ſawn off, but, though the limb was a ſecond time carefully kept in ſplints and a ſling, no union enſued. The only remarkable particularity about this man was a great indifference to pain.

We have alſo met with a very hypochondriacal patient, a man about two or three and thirty years old, in whom a fracture of the tibia and fibula did not unite till after a very conſiderable ſpace of time, not leſs than four months.

There was likewiſe, at the latter end of the year 1808, in St. Bartholomew's hoſpital, a woman, whoſe fractured os brachii remained diſunited for ſeveral months, though particular attention was paid to her. It happened, that while ſhe was under ſir James Earle ſhe was ſeized with ſome illneſs, of which ſhe died. The arm was now carefully examined, in order to ſee whether any cauſe could be diſcovered for the want of union in the fracture; and, on making an inciſion into the limb, the upper ſharp end of the lower portion of the broken bone was found conſiderably drawn upward, and ſtuck in the ſubſtance of the biceps muſcle. This circumſtance will at once account for the exceſſive pain which the woman ſuffered whenever her arm was moved, and explains why no union took place in the fracture, the extremities of which were not at all in contact. We are not, however, to conſider this cauſe as a general one, which prevents the union of fractures; for in moſt inſtances the ends of the bone are known to touch each other fairly, and to be in the proper poſition for uniting.

We have already recorded the failure of one operation, which was performed with a view of making a broken arm unite; and, though ſeveral attempts of the ſame kind have been made by eminent ſurgeons, they have all failed. Hence, at preſent, little encouragement is held out for perſevering in a proceeding which is attended with ſome conſiderable danger, and a vaſt deal of pain, as any one may readily conceive, who reflects on what ſevere ſteps muſt be taken in order to cut down to, turn out, and ſaw off the extremities of ſuch fractures as intereſt the arm, the thigh, or the leg.

Compound Fractures.

We have already ſtated that, in the language of ſurgery, a *compound* fracture denotes one which is complicated with a wound in the integuments, which wound is generally occaſioned by a protruſion of one of the ſharp ends of the broken bone, and of courſe leads down to, and communicates with, the fracture.

The circumſtance of there being this ſort of injury done to the ſkin makes a very material difference in the nature of the caſe, ſince it increaſes the danger in a manner which is always a ſource of alarm to practitioners of the greateſt profeſſional judgment and moſt extenſive experience. It is not, however, every wound which may happen to attend a fracture, that can occaſion the conſiderable augmentation of danger to which we have alluded. The ſame violence which breaks the leg or the arm may cut, or lacerate, at the ſame time, ſome portion of the ſkin and muſcles, more or leſs diſtant from the fracture; but, provided ſuch miſchief done to the ſoft parts is not of itſelf perilous from its extent or other circumſtances, it does not produce any ſerious aggravation of the ſymptoms likely to ariſe from the fracture.

The increaſed danger of a compound fracture eſſentially depends on the circumſtance of there being conjoined with the breach of continuity in the bone *ſuch a wound as makes an external opening into the fracture.*

According to Mr. Pott, the firſt object of conſideration in compound fractures is, "whether the preſervation of the fractured limb can, with ſafety to the patient's life, be attempted; or, in other words, whether the probable chance of deſtruction, from the nature and circumſtances of the accident, is not greater than it would be from the operation of amputation. Many things may occur to make this the caſe. The bone or bones being broken into many different pieces, and that for a conſiderable extent, as happens from broad wheels or other heavy bodies of large ſurface, paſſing over or falling on ſuch limbs; the ſkin, muſcles, tendons, &c. being ſo torn, lacerated, and deſtroyed, as to render gangrene and mortification the moſt probable and immediate conſequence; the extremities of the bones forming a joint, being cruſhed, or, as it were, comminuted; and the ligaments connecting ſuch bones being torn and ſpoiled; are, among others, ſufficient reaſons for propoſing and for performing immediate amputation: reaſons which, notwithſtanding any thing that may have been ſaid to the contrary, long and reiterated experience has approved, and which are vindicable upon every principle of humanity or chirurgic knowledge.

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" When a ſurgeon ſays, that a limb, which has juſt ſuffered a particular kind of compound fracture, ought rather to be immediately cut off than that any attempt ſhould be made for its preſervation, he does not mean, by ſo ſaying, that it is abſolutely impoſſible for ſuch limb to be preſerved at all events; he is not to be ſuppoſed to mean ſo much in general, though ſometimes even that will be obvious; all that he can truly and juſtly mean is, that from the experience of all time, it has been found that the attempts to preſerve limbs ſo circumſtanced have moſt frequently been fruſtrated by the death of the patients in conſequence of ſuch injury; and that from the ſame experience, it has been found that the chance of death from amputation is by no means equal to that ariſing from ſuch kind of fracture.

" Every man knows that apparently deſperate caſes are ſometimes cured; and that limbs ſo ſhattered and wounded as to render amputation the only *probable* means for the preſervation of life, are now and then ſaved. This is an uncontroverted fact, but a fact which proves very little againſt the common opinion; becauſe every man of experience alſo knows that ſuch eſcapes are very rare, much too rare to admit of being made precedents, and that the majority of ſuch attempts fail.

" This conſideration relative to amputation is of the more importance, becauſe it moſt frequently requires immediate determination; every minute of delay is, in many inſtances, to the patient's diſadvantage; and a very ſhort ſpace of time indeed frequently makes all the difference between probable ſafety and fatality. If theſe caſes in general would admit of deliberation for two or three days, and during that time ſuch circumſtances might be expected to ariſe as ought neceſſarily to determine the ſurgeon in his conduct, without adding to the patient's hazard, the difference would be conſiderable; the former would not ſeem to be ſo precipitate in his determination as he is frequently thought to be, and the latter being more convinced of the neceſſity, would ſubmit to it with leſs reluctance. But, unhappily for both parties, this is ſeldom the caſe; and the firſt opportunity having been neglected, or not embraced, we are very frequently denied another. Here, therefore, the whole exertion of a man's judgment is required, that he may neither raſhly and unneceſſarily deprive a patient of a limb, nor, through a falſe tenderneſs and timidity, ſuffer him to periſh by endeavouring to preſerve ſuch limb. Some degree of addreſs is alſo neceſſary upon ſuch occaſion, in order to convince the patient that what ſeems to be determined upon haſtily and with precipitation, will not ſafely admit of longer delay."

Mr. Pott next enters into ſome obſervations relative to the treatment, when it is judged prudent to endeavour to ſave the limb, and he explains, that the firſt object is the reduction of the fracture. He obſerves, that if the bone be not protruded forth, the trouble of reducing and of placing the fracture in a good poſition will be much leſs than if the caſe be otherwiſe; and that, when the bone is protruded, the difficulty is always in proportion to the comparative ſize of the wound through which ſuch bone has paſſed. In a compound fracture of the leg or thigh, it is always the upper part of the broken bone which is thruſt forth. If the fracture be of the tranſverſe kind, and the wound large, a moderate degree of extenſion will in general eaſily reduce it; but, if the fracture be oblique, and terminates, as it often does, in a long ſharp point, this point very often makes its way through a wound only juſt large enough to permit ſuch extenſion. In this inſtance the very placing of the leg in a ſtraight poſition, in order to make extenſion, obliges the wound or orifice to gird the bone tight, and makes all that part of it which is out of ſuch wound preſs hard on the ſkin of the leg underneath it. In theſe circumſtances, (continues Mr. Pott,) all attempts at reduction in this manner will be found to be impracticable; the more the leg is ſtretched out, the more tightly will the bone be begirt by the wound, and the more will it preſs on the ſkin underneath.

The above eminent ſurgical author next cenſures the method not unuſually reſorted to in this caſe, of ſawing off a piece of the protruded bone. He does not, however, condemn ſuch a proceeding as always or abſolutely unneceſſary or wrong, but, as being ſo in moſt inſtances. In ſome few caſes, and when the end of the bone is exceedingly ſharp, he acknowledges the utility of having recourſe to the ſaw.

Mr. Pott ſtates that the two moſt proper means of overcoming the impediment to the reduction are change of poſture of the limb, and enlargement of the wound. He ſays that, in many caſes, the former of theſe, under proper conduct, will be found fully ſufficient, and that when it fails, the latter ſhould always be made uſe of. The poſition of the limb which this author adviſes to be adopted is the bent one, in which he conceived the muſcles were relaxed, and the bone was leſs begirt by the wound.

When the projecting end of the fracture cannot be reduced, with the aid of a favourable poſition and proper extenſion, it becomes neceſſary to make an enlargement of the wound. This operation, according to Mr. Pott, is free from danger, the ſkin being the only part requiring to be cut.

When the bone is broken into ſeveral pieces, and any of them are either totally ſeparated, ſo as to lie looſe in the wound, or ſo detached as to render their union highly improbable, all ſuch pieces ought to be taken away; but Mr. Pott very properly recommends them to be removed with all poſſible gentleneſs, without pain, violence, or laceration, without the riſk of hemorrhage, and with as little poking into the wound as poſſible. Any ſharp, irritating points of bone on the end of the fracture ſhould alſo be removed. This part of the treatment ought to be executed with great caution; for, as the foregoing ſurgeon judiciouſly remarks, if the parts ſurrounding the fracture be violated, that is, be torn, irritated, and ſo diſturbed as to excite great pain, high inflammation, &c. it is exactly the ſame thing to the patient, and to the event of the caſe, whether ſuch violence be the neceſſary conſequence of the fracture, or of the unneceſſary and awkward manner of poking into, and diſturbing the wound.

In the reduction of a compound fracture, the indication is the ſame as in a ſimple one, *viz.* by means of a proper degree of extenſion to obtain as apt a poſition of the ends of the fracture with regard to each other as the nature of the caſe will admit, and thereby to produce as perfect and as ſpeedy an union as poſſible. Attention alſo to the relaxation of ſuch muſcles as have the greateſt power to impede and diſturb the coaptation is here equally proper.

The wound being dilated, if neceſſary; looſe pieces of bone removed, if there were any; and the fracture reduced and placed in the beſt poſſible poſition; the next thing, as Mr. Pott remarks, is to dreſs the wound.

We have already ſtated, that the principal part of the additional danger attendant on a compound fracture ariſes from the circumſtance of there being a wound which communicates with the injured part of the bone. Provided the ſurgeon can ſucceed in uniting ſuch wound by the firſt intention (and this ſucceſs may often be obtained), a vaſt deal of the peril is at once removed, and the caſe is, as it were, all on a ſudden converted into one partaking of the more mild nature of a ſimple fracture. Hence, inſtead of dry lint and a pledget, which Mr. Pott recommends to be applied alone,

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the moſt eminent ſurgeons in London now employ ſtrips of adheſive plaſter, with which they cloſe the wound, keep its edges accurately in contact, and give it an opportunity of uniting by adheſion. In ſhort, the dreſſings are to be the ſame as thoſe commonly uſed for healing recent inciſed wounds, *viz.* adheſive plaſter, with as much or little plain lint as may ſeem proper, and whatever pledget of ſimple ointment the practitioner may chooſe.

It muſt be obvious, however, that ſince the wound of a compound fracture is produced in a rough, violent manner, by a protruſion of the end of the bone, union by the firſt intention cannot take place ſo frequently as in wounds made with a ſharp cutting inſtrument. But though it be true, that the attempt fails more often than it ſucceeds, yet the practice is not at all the leſs commendable, for it is productive of no harm, is ſometimes attended with an union of ſome part of the wound, when not with the whole, and always affords the patient his chance of ſpeedily eluding the alarming ſymptoms always apt to accompany a fractured limb, having a wound leading down to the breach of continuity in the bone. The degree of ſuch chance will always be greater, in proportion as the wounded part has ſuffered leſs of any kind of miſchief, in addition to the mere diviſion of the fibres. When the fleſh has been much torn and bruiſed, beſides being divided, the probability of the wound healing by adheſion is conſiderably diminiſhed.

Sometimes the wound may preſent ſo ragged, contuſed, and lacerated an appearance, that any man of the leaſt experience would be able to foreſee, that inſtead of union by the firſt intention, ſloughing muſt enſue. Perhaps in a few caſes of this deſcription it might be as well to give up the employment of adheſive plaſters, and have recourſe at once to the mildeſt emollient applications under the ſplints.

It too frequently happens, that the wound of a compound fracture ſuppurates ſo that it can only be healed by granulations. In this ſtate dry lint, and a pledget of any ſimple ointment, are the moſt eligible dreſſings; but others may be indicated in the progreſs of the caſe according as the aſpect and appearance of the ſore undergo changes. The lint ſhould be laid on lightly, be of the ſofteſt kind, and only in ſufficient quantity to abſorb the diſcharge. It ſhould never be crammed into the wound, nor be ſo applied as to prevent the exit of the matter. "The times of dreſſing," (ſays Pott,) "muſt be determined by the nature of the caſe; if the diſcharge be ſmall or moderate, once in twenty-four hours will be ſufficient; but if it be large, more frequent dreſſing will be neceſſary, as well to prevent offence, as to remedy the inconveniences ariſing from a great diſcharge of an irritating, ſharp ſanies."

Mr. Pott diſapproved of the general plan of enveloping compound fractures from the very firſt in ſoft, warm, relaxing poultices, which, he thought, ought only to be uſed when the limb is actually in a tenſe, ſwollen, and painful ſtate. When the parts were not in this ſituation, he was of opinion, that the prevention of inflammation formed the grand indication, for which object he adviſed the employment of diſcutient applications, ſuch as mixtures of ſpirit of wine, vinegar and water with ſal ammoniac, the aqua ammoniæ acetatæ, aqua lithargyri acetati, and medicines of this claſs, in whatever form the ſurgeon might prefer.

Theſe latter remedies were to be aſſiſted with the uſual antiphlogiſtic means, particularly phlebotomy. With regard to bleeding, in caſes of compound fractures, we have to obſerve, that although it appears to have the authority of Pott in its favour, all the moſt celebrated ſurgeons now agree, that patients in large cities and hoſpitals will not bear this evacuation. In country practice, however, circumſtances are different, and veneſection may be performed, and that repeatedly, not only with ſafety, but with the moſt ſtriking advantage. When a patient who has met with a bad compound fracture of the leg happens to be in London, and eſpecially if he is alſo in an hoſpital there, the loſs of blood by the lancet too often makes him totally incapable of bearing the long and copious diſcharge which frequently enſues, and brings him into the extreme ſtate of debility.

Compound fractures ought generally to be dreſſed every day when they are in a ſuppurating ſtate. In doing this, the limb ſhould not be moved in the leaſt, or only ſuffer ſuch diſturbance as is utterly unavoidable. Surgeons have long been acquainted with the ſuperior advantage of the eighteen-tailed bandage in theſe inſtances, although it was not till the time of Pott that it came into common uſe for ſimple fractures. The reader already knows that its great recommendation is the manner in which it admits of being opened, ſo as to allow the limb to be looked at without the ſmalleſt motion of the fractured part.

The obſervations, which have been made on the ſubject of ſplints, and the poſition of the limb, in our general remarks on fractures, are all applicable here.

Of all caſes, compound fractures require at firſt the moſt rigid obſervance of the antiphlogiſtic regimen. As Mr. Pott ſtates, pain is to be appeaſed, and reſt obtained by anodynes; inflammation is to be prevented or removed by free and frequent bleeding (out of large cities and hoſpitals), by keeping the body open, and by the adminiſtration of ſuch medicines as are beſt known to ſerve ſuch purpoſes. In this firſt ſtage alſo, the treatment of the limb muſt be calculated either for the prevention of inflammatory tumefaction, by diſcutient applications, or for the removal of ſwelling and tenſion, when they have already come on, by fomentations and emollient remedies.

When the foregoing mode of treatment ſucceeds, the wound either unites by the firſt intention, heals in a quiet manner with an inconſiderable degree of ſuppuration, or elſe it is at firſt attended with great and extenſive inflammation, which leads to the formation of large abſceſſes and lodgments of matter. When the attempts of the ſurgeon fail, the limb is ſeized with mortification.

If the wound heals favourably, the ſurgeon has only to avoid doing miſchief, either by his manner of dreſſing, or by diſturbing the limb. Mr. Pott obſerves that nature unmoleſted will accompliſh her own purpoſe, and art has little more to do, than preſerve the due poſition of the injured part.

When large quantities of matter form and lodge, the utmoſt exertion of the judgment will ſometimes be neceſſary in the treatment of the caſe. "Enlargement of the preſent wound, for the more convenient diſcharge of matter, new or counter-openings, for the ſame purpoſe, or for the extraction of fragments of broken or exfoliated bone, will very frequently be found neceſſary, and muſt be executed." Mr. Pott expreſſes his preference of a counter-opening to a compreſs, which has occaſionally been uſed, with a view of preventing the lodgment of matter, and which ſometimes acts diametrically oppoſite to the intention with which it is uſed, beſides requiring more preſſure to make it efficacious than a limb, in ſuch circumſtances, can generally bear.

While the firſt or inflammatory ſtage of a compound fracture laſts, and large abſceſſes have not taken place, the antiphlogiſtic treatment is indicated. No ſooner has ſuppuration occurred, and extenſive collections of matter formed, than all evacuations ſhould be diſcontinued, and the patient's ſtrength be ſupported with all poſſible aſſiſtance from diet and medicines.

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The detention and irritation of a ſplinter of bone have been known to keep up a large, diſagreeable diſcharge for a conſiderable length of time. Mr. Pott obſerves, that if ſuch diſcharge be made, and there be neither ſinus nor lodgment to account for it, and all other circumſtances are favourable, an examination ſhould always be made, in order to know whether ſuch cauſe does not exiſt, and if it does, it muſt be gently and carefully removed.

In caſes of bad compound fractures, attended with a great deal of ſuppuration, the diſcharge ſometimes becomes too profuſe for the patient to bear, notwithſtanding the moſt ſkilful treatment, and he is neceſſitated to part with his limb, as the only means of ſaving his life, after undergoing very ſevere ſufferings. In ſpeaking of this ſubject, Mr. Pott has occaſion to remark, that he never had found it neceſſary to amputate a limb for a compound fracture, on account of the profuſe diſcharge, when ſuch fracture was in an united ſtate. Though amputation is ſometimes rendered indiſpenſable in ſpite of the beſt treatment, yet this eminent ſurgeon was convinced, that the neceſſity for ſo ſevere a proceeding was occaſionally produced by reducing the patient too much. On finding all febrile complaint at an end, all inflammatory tumour and hardneſs gone, the patient rather languid than feveriſh, the pulſe rather weak and low, than hard and full, the appetite fail, an inclination to ſweat and be purged, without aſſignable cauſe, and this in conſequence of a large diſcharge of matter from a limb, which has ſuffered great inflammation, but which has now become rather ſoft and flabby than hard and tumid, we are recommended to ſupport the patient *totis viribus*.

When an endeavour is made to ſave a limb, which has ſuffered a compound fracture, and the attempt fails from the very firſt, gangrene and mortification are the conſequences ariſing, ſometimes from the miſchief done to the limb at the time that the bone is broken, ſometimes from the laceration of the parts made by the protruſion of the bone.

Mortification may alſo be occaſioned by improper treatment, ſuch as violent extenſion, irritation of the wounded parts with the probe, painful dreſſings, improper diſpoſition of the limb, and the neglect to give uſeful medicines. Mr. Pott notices that all, or any of theſe cauſes may either induce ſuch a ſtate of inflammation as ſhall end in gangrene, or may permit the inflammation neceſſarily attendant upon the accident, to terminate in the ſame event.

When the mortification is the mere conſequence of the injury done to the limb, Mr. Pott has explained, that it generally makes its appearance very early, and its progreſs is too rapid for art to check. Hence when this kind of diſorder is likely to enſue, no time can be ſpared; the impending miſchief muſt either be ſubmitted to, or prevented by early amputation. A few hours (ſays the above writer) make all the difference between probable ſafety and deſtruction. If we wait till the diſeaſe has taken poſſeſſion of the limb, even in the ſmalleſt degree, the operation will ſerve no purpoſe, but that of accelerating the patient's death. The gangrene always extends higher up the interior, than the ſuperficial part of the limb, and when once begun, it can never be ſtopped by amputation.

Therefore when the firſt opportunity of performing the operation has been neglected, the attempt ſhould not be thought of while the mortification is in a ſpreading ſtate; but the practitioner ſhould now endeavour, by all poſſible means, to aſſiſt nature in ſeparating the dead from the living parts. It is a lamentable truth, however, that in this ſtate of things the patient generally dies, and his life falls a ſacrifice to an injudicious effort to ſave his limb.

When the mortification is not the immediate effect of the miſchief done to the limb by the accident; but is the conſequence of high inflammation, badneſs of general habit, wrong treatment, &c. the progreſs of the diſorder may ſometimes be checked and ſtopped, and the dead parts ſeparated from the living ones, by adopting ſuch means as each particular caſe may require. Inflammation will ſtand in need of antiphlogiſtics, pain and irritation of anodynes, and bark, joined ſometimes with cooling, ſometimes with cordial, medicines will be proper. The external applications ought to conſiſt in fomentations, emollient poultices, and dreſſings of the moſt lenient kind.

But we need not ſpeak further on this part of the ſubject, as whatever more is neceſſary to be known will be explained in other places. See GANGRENE, MORTIFICATION, SPHACELUS.

We ſhall finiſh theſe remarks on compound fractures with a citation from an author, whoſe works abound with the richeſt practical information. "There are three points of time, or three ſtages of a bad compound fracture, in which amputation of the limb may be neceſſary and right, and theſe three points of time are ſo limited, that a good deal of the hazard or ſafety of the operation depends on the obſervance, or non-obſervance of them.

"The firſt is immediately after the accident, before inflammation has taken poſſeſſion of the parts. If this opportunity be neglected, or not embraced, the conſequence is either a gangrene, or a large ſuppuration with formation and lodgment of matter. If the former of theſe be the caſe, the operation ought never to be thought of, till there is a perfect and abſolute ſeparation of the mortified parts. If the latter, no man can poſſibly propoſe the removal of the limb, until it be found, by ſufficient trial, that there is no proſpect of obtaining a cure without, and that by not performing the operation, the patient's ſtrength and life will be exhauſted by the diſcharge. When this becomes the hazard, the ſooner amputation is performed the better. In the firſt inſtance, the operation ought to take place before inflammatory miſchief is incurred; in the ſecond, we are to wait for a kind of criſis of ſuch inflammation; in the third, the proportional ſtrength and ſtate of the patient, compared with the diſcharge and ſtate of the fracture, muſt form our determination." See Pott on Fractures.

Particular Fractures.

Fractures of the Oſſa Naſi.—The ſituation of the oſſa naſi expoſes them very much to external violence; but the manner in which they are implanted between the aſcending proceſſes of the upper maxillary bones, and the way in which they are ſupported by the vomer and os frontis, are reaſons why they are not ſo frequently fractured by blows and falls, as would otherwiſe be the caſe. However, they do ſometimes give way, and become depreſſed and ſeparated from the adjacent bones. Both of them are not always broken at the ſame time. In certain inſtances, one is found fractured all acroſs, while the other is only elevated, or beaten inward, without there being in it any breach of continuity. A fracture of the oſſa naſi is not unfrequently attended with a ſimilar injury of the perpendicular lamellæ of the os ethmoides, in which event, the latter proceſs is invariably driven to one ſide or the other, and may eaſily be moved either with the little finger or a probe introduced into the noſtril. A fracture of the oſſa naſi is often accompanied by ſerious ſymptoms, inflammation of the pituitary membrane, ſwelling of the noſe and face, more or leſs ophthalmy, and occaſionally a bleeding which cannot eaſily be ſtopped. The reſpiration alſo ſometimes ſeems oppreſſed; and when the vio-

lence of the blow has been ſuch as not to have entirely ſpent itſelf on the fracture, but to have extended to the cribriform lamella, the effects of a concuſſion of the brain ſometimes enſue, and even an extravaſation may happen within the cranium, as is proved by the teſtimony of the beſt obſervers. A fracture of the noſe may eaſily be diſtinguiſhed from the very firſt. The diagnoſis, however, is more obſcure when inflammation and ſwelling have taken place; but, upon the whole, we may ſtate that the nature of the accident may always be aſcertained with facility.

The treatment of the caſe conſiſts in replacing the deranged pieces of bone, by means of a probe, or any other ſuitable inſtrument, introduced up the noſtril. Thus the fragments may be moved as far outward as neceſſary, while the ſurgeon, applying the index finger of his left hand externally, endeavours to prevent any preternatural projection. The ſame plan muſt be adopted on both ſides of the noſe, when the two oſſa naſi are fractured at once, and the broken pieces diſplaced. When the ſeptum naſi is thrown out of its due poſition, it muſt be rectified with any convenient inſtrument, care being taken not to paſs ſuch inſtrument too far, or forcibly, upward, for fear of injuring the delicate tranſverſe lamella of the os ethmoides.

Should the efforts of the ſurgeon be interrupted by the patient's ſneezing, it will be neceſſary to wait a little before repeating the attempt.

When the fracture is attended with a wound of the integuments, and the fragments of bone are ſo detached as to leave no hope of their re-union, they ought to be extracted with as much care and as little irritation as poſſible.

When the fracture is ſimple, and not at all diſplaced, the treatment is limited to general means for averting and diminiſhing inflammation.

In other inſtances, in which the pieces of bone ſlip out of their right poſition, the fragments ſhould be ſupported with a bit of hollow bougie, ſurrounded with lint and introduced up the noſtril. Writers alſo recommend, for the ſame purpoſe, a piece of quill cut open at each end and wrapt round with agaric, which, they ſay, tends to check the troubleſome hemorrhage generally attending ſuch caſes. This latter duty agaric may probably fulfil with about as much certainty as lint, which, being always at hand, is therefore to be preferred.

Hollow tubes, of ſome kind or another, are certainly better than the ſolid ſubſtances uſed by Hippocrates, and alſo preferable to the patient's fingers, which the ſame author employed in the majority of inſtances. Foreſtus imitated Guy de Chauliac in adviſing the uſe of cannulæ, on the ground that they both facilitated reſpiration, and aided in keeping the parts from falling inward.

The fragments of the fracture having been replaced, linen wet with the ſaturnine lotion ſhould be applied, and compreſſes laid on each ſide of the face, in the hollow between the cheeks and the noſe. Theſe applications are to be kept in their reſpective places with a roller.

A force, which breaks the oſſa naſi, may alſo beat inward the cribriform lamella and the criſta galli of the os ethmoides, ſo as to occaſion a dangerous degree of preſſure on the brain. When the ſymptoms, and the extent to which the oſſa naſi are depreſſed, lead the ſurgeon to ſuſpect the miſchief which we have juſt now mentioned, an immediate endeavour ſhould be made to draw downward and forward the cribriform lamella and criſta galli, which object might perhaps be moſt conveniently accompliſhed by introducing a pair of ſmall common forceps into each noſtril, and preſſing the two inſtruments together againſt the naſal proceſs of the ethmoid bone, which, by their means, could then be pulled downward and forward.

Fractures of the lower Jaw.

Although the lower jaw-bone is moveable, conſequently, capable of yielding to ſuch force as is likely to injure it, and notwithſtanding it is ſufficiently compact to make conſiderable reſiſtance, yet it is a bone which is frequently broken. The fracture may be ſituated either in its body or its branches, and be diſplaced or not. It is principally when the ſolution of continuity happens near the poſterior angle, that neither of the broken ſurfaces is thrown out of its due poſition; for in this caſe, the pterygoid, temporal, and maſſeter muſcles keep up the back part of the bone in ſuch a manner, that the ſterno-hyoidei and digaſtrici are prevented from drawing downward the anterior middle portion. A fracture of the lower jaw may be aſcertained by putting a finger into the mouth, upon the front teeth of the ſide on which the accident is ſuſpected, and by preſſing upon them at the ſame time that the fingers of the other hand are applied along the baſe of the jaw towards the angle of the ſame. When preſſure is now alternately made with each hand, the ſurfaces of the fracture will move, and often occaſion a diſtinct crepitus. The diagnoſis is much more plain when the fracture is diſplaced, for if the body of the bone ſeparates from the ramus, and falls downward, the mouth is found wide open, and drawn to one ſide in ſuch a way, that the commiſſure of the lips is conſiderably inclined downward, while the back teeth remain much higher than the front ones. If the ends of the fracture ride over each other, the mouth will appear wider on the ſide where ſuch circumſtance has occurred, and will project more forward. The teeth, alſo, inſtead of being arranged in the ſame line, will be, ſome diſplaced inward, others outward.

The generality of fractures of the jaw are attended with a conſiderable degree of ſwelling and ecchymoſis. In conſequence of the contuſion and laceration which the ſoft parts ſuſtain, very bad ſymptoms ſometimes ariſe.

In certain inſtances, either paralyſis, or a convulſive affection of the cheek of the ſame ſide is induced, by the injury done to the nerve which runs in the canalis mentalis, and has numerous communications with the portio dura of the ſeventh pair. According to writers, the hearing may be more or leſs impaired; a kind of tinnitus aurium occaſioned; ophthalmy excited; a profuſe diſcharge of ſaliva from the mouth brought on; and convulſive motions of the lips produced.

The fracture is ſometimes diſplaced, ſometimes not. In the latter caſe, it is only neceſſary to keep the injured bone well ſupported againſt the os maxillare ſuperius, by applying a compreſs on the ſide, on which the accident has occurred, and retaining ſuch compreſs in its ſituation by means of Galen's bandage, made either with four or ſix tails, and applied with its middle to the chin, while the extremities of its tails are to be pinned to the patient's night-cap.

This bandage, which is one of the beſt uſed in ſurgery, and celebrated for its antiquity, is deſcribed in another part of this work. See BANDAGE.

When the fracture is diſplaced, the plan to be followed is not quite ſo ſimple. If the anterior portion of the bone be ſituated lower down than the poſterior, the index finger muſt be put againſt the root of the coronoid proceſs, which part is to be gently puſhed backward, while the index and middle-fingers of the other hand are applied to the front teeth, and the thumb under the chin. The latter part is to be raiſed at the ſame time that the back portion of the

bone is puſhed back, ſo that the two pieces are replaced together.

In caſes in which one of the two portions is forced over the other, the fingers are to be placed, as above directed, and one piece of the bone is to be puſhed backward, the other forward, until the ſurfaces of the fracture are evenly in contact. This event may be aſcertained by the touch, by the diſappearance of deformity, and by the regularity in the arrangement of the teeth.

It very frequently happens, that a tooth is ſituated exactly in the courſe of the fracture. In this circumſtance, the generality of ſurgical writers direct us to regard the looſened tooth in the light of an extraneous ſubſtance, likely to be productive of harm, and conſequently requiring removal.

It alſo often occurs, that one or more teeth, ſituated in the vicinity of the fracture, are driven out of their ſockets. In this caſe, we are to replace the teeth without delay, and fix them in their proper places by tying them to the neighbouring ones. Celſus recommends this method, in the following terms, "ſi hi labant (dentes), ulteriores inter ſe ſetâ deligandi ſunt." Hippocrates adviſes the uſe of a piece of golden wire for the purpoſe.

Having ſet the fracture as evenly as circumſtances will allow, the next object is to apply the apparatus, by which the broken bone is to be kept from becoming diſplaced again. Cuſtom ſanctions the application of a piece of ſoap-plaſter to the integuments covering the fracture, though we ſhould have ſome difficulty to offer any good reaſon for the practice, except neatneſs of appearance; for, with regard to efficacy, there can be none.

Several oblong compreſſes are next to be prepared, in one of which a piece of paſteboard is to be put. Theſe may be wet with ſome diſcutient lotion, ſuch as that made of the aqua lithargyri acetati, or the one compoſed of vinegar, ſal-ammoniac, and ſpirit of wine. After the compreſſes have been applied, in ſuch manner as ſeems beſt calculated for keeping the fracture from becoming diſplaced, they are to be retained in their place with Galen's bandage, made either with four, or ſix tails.

The bandage alluded to is an exceedingly ancient one, being mentioned by Celſus, in treating of the fractured jaw. "Mollis habena (ſays he) media in longitudinem inciſa, ut utrinque mentum complectatur, et inde capita ejus ſupra caput adducta ibi deligentur."

During the whole of the treatment, the patient muſt refrain from making any attempt to move his jaw, and he ought to be fed with a ſpoon, and only have ſuch nouriſhment as does not ſtand in need of maſtication. When the fracture is complicated with a wound, the dreſſings ſhould be changed with the utmoſt care, and as ſeldom as circumſtances will permit. While the apparatus is off, an aſſiſtant muſt attentively ſupport the fractured bone, until the bandage is put on again.

Hippocrates conſidered it highly neceſſary, in the courſe of the caſe, to feel the inſide of the mouth tolerably often, in order to aſcertain the ſtate of the fracture, and rectify it when diſplaced.

Fractures of the jaw are generally united in about three weeks; at the end of which time, the patient may commonly be allowed to converſe, and even to leave off the bandage.

In an inſtance, in which the lower jaw was fractured by a piſtol being diſcharged in the mouth, Deſault paſſed a hollow bougie down the pharynx from the left noſtril. The inſtrument was faſtened in this ſituation with a ligature, the ends of which were pinned to the patient's night-cap. Thus food and medicines were injected into the ſtomach, without any diſturbance or motion of the jaw. The plan is certainly deſerving of imitation in every bad caſe.

Fractures of the jaw are very apt to be followed by troubleſome abſceſſes, and tedious exfoliations.

Fractures of the Zygoma.

The zygoma, which extends from the outſide of the temporal bone to the os malæ, ſeems, from its ſituation, more expoſed to fractures than all the other bones of the face. However, as far as our experience goes, it is not very often broken, and, beyond a doubt, it is much leſs frequently injured in this way, than either the lower jaw, or the frontal bone.

Two examples of the zygoma being fractured are related by Duverney in his "Traité ſur les Maladies des Os." In one of theſe caſes the fragments were depreſſed againſt the temporal muſcle; in the other, one portion projected outward. Theſe differences muſt have ariſen from the particular way in which the blow had acted in each inſtance. The patient was incapable of depreſſing the lower jaw, without conſiderable ſuffering; the pain in the ſituation of the fracture was very great; the temporal muſcle was exceedingly tenſe; and the face was ſomewhat convulſed, a circumſtance which the author imputed to the preſſure made on the branches of the portio dura of the ſeventh pair of nerves. In the patient to whom we have firſt alluded, there was felt, in the place which had been ſtruck, a kind of hollow, which was occaſioned by the depreſſion of the fragments of bone. The hollow became ſtill more evident, when the index finger was introduced into the mouth, conſiderably above the grinding teeth of the upper jaw, and then puſhed from within outward. Duverney, finding it impracticable to elevate the pieces of bone with his finger, introduced a flat bit of wood about as large as a finger over the grinding teeth, as far back as he could, and made the patient firmly ſhut the jaw. The preſſure made by this ſort of wedge, between the coronoid proceſs and the zygoma, made the latter gradually reſume its natural poſition, care being taken to uſe a thicker piece of wood, in proportion as the broken part became more and more replaced.

In the ſecond caſe, the projecting portion of the zygoma was eaſily reſtored to its proper place, by preſſure. The applications and bandage were ſimply retentive.

Fractures of the Vertebræ.

Blows, falls, the paſſage of heavy carriages over the trunk, and particularly gun-ſhot wounds, are cauſes capable of producing fractures of the vertebræ. Theſe bones, however, are ſo thick, ſhort, and ſtrong, and ſo ſurrounded with maſſes of muſcle, that, with the exception of the projecting ſpinous proceſſes, they are not frequently broken, and indeed can only be thus injured by great violence, directed in a particular manner.

Fractures, both of the ſpinous proceſſes, and of the corpora vertebrarum, are generally alarming caſes, on account of the afflicting ſymptoms which commonly enſue. The danger does not abſolutely originate from the miſchief done to the bone; but from the concuſſion of the ſpinal marrow, occaſioned by the external violence, or from the compreſſion or laceration of the ſame part, ariſing from ſome of the fragments of bone being driven againſt it. The injury, indeed, which the parts within the ſpinal canal often ſuſtain, is ſo great, that, if the patient lives a certain time, they often inflame, and a large quantity of matter is formed around the continuation of the dura mater, which covers the medulla ſpinalis.

Cocchi, an Italian practitioner, has noticed all the bad ſymptoms with particular preciſion. In ſpeaking of the bony fragments, he obſerves, "officulis comminutis, medullam per ea deſcendentem comprimi, pungi atque inflammari neceſſe eſt, et ſubjectas corporis partes univerſas reſolvi ac veſicæ et recti inteſtini vim conſtringentem amitti, adeo ut urina et excrementa vel ſupprimantur, vel ſine voluntate prorumpant. Quâ certiſſimâ atque evidentiſſimâ notâ, nos ſæpe conjecimus vertebræ alicujus proceſſum ſpinoſum introrſum confractum fuiſſe; et quum plerumque vel cita vel tarda inſecuta ſit, inciſis corporibus, id mali ſolum fuiſſe vidimus, etſi nullo modo vertebræ exciderint. Antiqui id parum perſpexiſſe videntur, à quibus noxæ et pericula vertebris luxatis tribuuntur, quæ revera fractarum ſunt. Hoc infortunium longe frequentius quoque quam illud accidere comperimus, ſecùs ac illi putarunt." Notwithſtanding the ſentiment of the foregoing author, that ſuch ſymptoms are particularly apt to proceed from a fracture of ſome of the ſpinous proceſſes, it is certain, that the more common cauſe is a fracture of the corpora vertebrarum, the damage done to which is often irremediable.

Practitioners, however, ought to be appriſed, that a ſimilar train of evils may depend altogether on a concuſſion of the ſpinal marrow, without any fracture whatever. This fact, in caſes in which the bodies of the vertebræ are ſuſpected to be broken, always throws an immoveable degree of doubt and obſcurity over the real ſtate of circumſtances. A fracture of the ſpinous proceſſes may often be diſtinctly felt; but that of the other parts of the vertebræ in general only admits of ſuſpicions, which can never be confirmed, except where the fatal termination of the caſe gives the ſurgeon an opportunity of opening the body.

It was a circumſtance obſerved by Albucaſis, that fractures of the upper vertebræ are, for the moſt part, attended with a paralyſis of the upper extremities, while fractures of the lumbar vertebræ were generally productive of a paralytic affection of the lower ones. Avicenna remarks, that ſuch injuries of the corpora vertebrarum always occaſion death, which ſeldom enſues from a mere fracture of one or more of the ſpinous proceſſes. The latter kind of accident, indeed, has been known to occur, and the fragments of bone to be at the ſame time diſplaced, without the acceſſion of any alarming ſymptoms. The caſe is always to be regarded as much leſs dangerous than one in which any other part of the vertebra is broken.

Notwithſtanding the opinion delivered by Avicenna, it is certain that a fracture of the body of a vertebra is not neceſſarily fatal in every inſtance, eſpecially when the accident has ariſen from a gun-ſhot wound. Several examples, confirming the truth of this remark, are to be met with in ſurgical books. In the majority of examples, however, the patients linger, and die of a ſlow ſort of fever.

When the bodies of any of the vertebræ are fractured, the practitioner only has it in his power to render himſelf uſeful, by paying attention to general indications. Circumſtances, however, are different, when the ſpinous proceſſes are broken. In theſe inſtances an endeavour is to be made to put the detached fragments of bone in their right ſituation; an object which may ſometimes be accompliſhed, when the parts make a conſiderable projection.

Writers on ſurgery alſo ſpeak of uſing an elevator for raiſing depreſſed pieces of fractured vertebræ, when the accident is complicated with a wound; of this practice we can ſay nothing ourſelves, ſcarcely being able to conceive that any opportunity for it can occur, or that the thing is very practicable.

In caſes of fractured vertebræ a roller may be applied round the body, and kept from ſlipping down by a ſcapulary; but it is plain, that ſuch an apparatus is more for the ſake of appearances, than of any real efficacy. When the ſpinous proceſſes are broken, the compreſs ought to be put under the bandage along each ſide of the detached fragments.

All injuries of the ſpine are apt to produce paralyſis of the lower extremities, and of the bladder and rectum. Hence the patient is frequently incapable of voiding his urine, and the practitioner is obliged to have recourſe to the catheter. In many caſes the urine comes away without the patient's knowledge, and the fæces are alſo involuntarily diſcharged. See INCONTINENCE *of Urine*, and RETENTION *of Urine*.

Fractures of the Sternum.

When the ſternum is broken, it is generally in conſequence of a very violent fall againſt ſome hard projecting body. The accident being produced in this manner, the fragments of bone ſeldom continue exactly in their natural poſition, but are almoſt always more or leſs diſplaced, and, by making preſſure on the neighbouring parts, give riſe to ſymptoms of an urgent nature. Sometimes the violence of the blow ruptures one of the internal mammary arteries, ſo that an extravaſation takes place, and brings on a train of alarming complaints. Such an effuſion of blood, however, is more frequently attendant on gun-ſhot injuries of the ſternum, than common fractures. The patient does not in the firſt inſtance experience conſiderable ſuffering, becauſe the extravaſation occurs ſlowly, and the layers of the mediaſtinum make a good deal of reſiſtance to the diffuſion of the blood. At length, however, the quantity effuſed becomes very great, and an exceſſive difficulty of breathing, and a ſenſe of weight in the region of the ſternum, are the conſequences. It is ſaid that on examining the integuments covering the bone, a kind of incipient œdema may be felt, which ſhould draw the ſerious attention of the practitioner to the effects which are likely to enſue.

When the mammary veſſels are uninjured, and the above ſort of ſymptoms ariſe, they are much later in making their appearance. They are alſo dependant, not on an effuſion of blood, but on the formation of abſceſſes in the vicinity of the fracture, and beneath the bone. Such purulent collections have alſo been compared by ſurgical authors, with the ſuppurations which ſo frequently happen under the cranium in conſequence of injuries of the head, from external violence. The writings of Juncker, Duverney, and J. L. Petit, ſhew the truth of this obſervation. Verduc, who refers the bad ſymptoms to the pieces of bone being driven inward, and recommends the fragments to be elevated, deſcribes the complaints as even more dangerous, and more ſpeedily fatal than thoſe which are produced by blood or matter under the cranium.

When the fracture of the ſternum is a ſimple one, unattended with any particular complaints, has been occaſioned by a fall or blow, and the fragments are not at all diſplaced, the treatment is reduced to great ſimplicity. The patient is to be kept on a low regimen, at perfect reſt, and ſhould be bled and purged according to the exigency of the caſe. The topical part of the treatment conſiſts in applying ſome ſoap-plaſter to the ſituation of the injury, and a roller round the body, with a ſcapulary.

When any portion of the fractured ſternum is beaten inward, ſo as to preſs upon and dangerouſly irritate any of the ſubjacent parts, the depreſſed piece ſhould be raiſed without loſs of time. For this purpoſe, it will generally be neceſſary to make a diviſion of the integuments with a

ſcalpel

ſcalpel, and then to employ the inſtrument called an elevator, much in the ſame way as it is uſed on the ſkull. See ELEVATOR and TREPANNING.

In gun-ſhot wounds of the thorax, the ſternum may be ſhattered into many pieces. In ſuch a caſe, it would be the duty of the practitioner to remove, with a pair of forceps, all the detached fragments, which, if left in the wound, would not unite to the reſt of the bone; but only act as extraneous bodies.

Where an extravaſation of blood, or a collection of purulent matter, under a fractured ſternum, are known to exiſt, and to be the cauſe of urgent and perilous ſymptoms, the ſurgeon would be called upon to make a perforation in the bone with a ſmall trephine. However, before having recourſe to this proceeding, he ought to be ſure that the bad ſymptoms do depend on the preſence of a fluid in the anterior mediaſtinum, and are not altogether the effect of inflammation conſequent to the violence.

We ſhall conclude theſe remarks on fractures of the ſternum with ſtating, that as the chief danger of ſuch caſes is in proportion to the irritation and inflammation which are excited in the thoracic viſcera, the principal objects in the treatment are, to prevent the broken pieces of bone from hurting the pleura, pericardium, and lungs, by projecting inward, and to avert inflammation in the cheſt, as much as poſſible, by repeated veneſections, low diet, quietude, aperient medicines, &c.

Fractures of the Ribs.

The ribs are broken almoſt as frequently as any bones of the human body. The labourer who falls from a ſcaffold, the poor fellow who is run over by a carriage, the man of pleaſure who is thrown from his horſe, the ſailor who tumbles from aloft, and all deſcriptions of perſons ſubject to falls in running up and down ſtairs and ladders, are often under the ſurgeon's care for fractured ribs. Only one of theſe bones may be broken, but in many caſes the accident befals ſeveral at the ſame time. The part of the ribs where fractures are moſt commonly ſituated is their greateſt convexity, which muſt obviouſly be the moſt expoſed to the effects of external violence.

The falſe ribs are not ſo apt to be fractured as thoſe which have the epithet true given to them. The reaſon of this circumſtance is owing to the moveable nature of the former, a quality which enables them to elude the conſequences of external force. The guarded ſituation of the firſt true rib beneath the clavicle is alſo a cauſe why it is very ſeldom broken.

The diagnoſis of fractures of the ribs is ſometimes ſufficiently plain, but in numerous inſtances the moſt diſcerning ſurgeon can obtain no certainty. When the patient is thin, when ſeveral ribs are fractured, and particularly when the ends of the fracture are diſplaced inward or outward, the practitioner is always able to aſcertain the nature of the accident, beyond the ſhadow of a doubt. Under theſe circumſtances, a crepitus may alſo be felt on making the patient cough, ſo as to ſhake the injured bones, and at the ſame time placing one's hand upon the hurt ſide of the thorax.

However, more obſcurity often prevails, when the patient is fat, when only a ſingle rib is broken, and when the ends of the fracture are undiſplaced. A pricking ſenſation in the ſide, attendant on the motion of the ribs in reſpiration, is frequently a juſt ground of ſuſpicion, that one of theſe bones is fractured, eſpecially when the nature of the fall, or blow, makes the accident not improbable. In all caſes of doubt, the prudent ſurgeon makes it an invariable maxim to act in the ſame way as he would do were he certain that the ribs are broken. This line of conduct is particularly commendable; becauſe it can do no harm, ſuppoſing no fracture to exiſt, and when ſuch an injury has really happened, the relief and the prevention of dangerous conſequences, reſulting from the adoption of the proper treatment, are of the greateſt importance.

The practice, in caſes of fractured ribs, conſiſts in diminiſhing the motion of theſe bones as much as poſſible, taking meaſures for the hindrance and diminution of inflammation of the pleura and lungs; and, in particular, in appeaſing any cough under which the patient may happen to be ſuffering.

The firſt of theſe indications is fulfilled by means of a roller applied round the thorax as tightly as the patient's feelings will permit. Inſtead of a roller, the generality of ſurgeons rightly prefer employing a ſtrong piece of linen, large enough to ſurround the cheſt, and laced with due tightneſs in front of the body. Such an apparatus is not ſo apt to become ſlack as a roller, and it has this advantage, that the patient himſelf, in the abſence of the ſurgeon, can eaſily increaſe or diminiſh the tightneſs of the cloth, as circumſtances may require. Before putting on any kind of bandage, however, the ſurgeon ſhould examine the ſituation of the fracture, and put the ends of the bone, or bones, as nearly as poſſible into a right poſition. This object is to be effected by making ſkilful preſſure with the fingers on the injured ribs. It is uſual alſo to apply a piece of the ſoap-plaſter to the integuments in the vicinity of the fracture. Together with ſuch application, one or two compreſſes may be uſed, if the practitioner is of opinion that they will be of any ſervice in keeping the ends of the bone, or bones, ſteady, and in their proper poſition.

Whether the bandage conſiſt of a common roller, or a broad piece of cloth laced in front, a ſcapulary muſt be employed for the purpoſe of preventing the apparatus from ſlipping downward.

One of the principal dangers ariſing from fractures of the ribs, is inflammation of the pleura, or membrane which lines the cheſt. Hence the ſecond indication which we above ſpecified, and which is fulfilled by ſtrict attention to the antiphlogiſtic ſyſtem of treatment. Indeed, all experienced ſurgeons, on being firſt called to a patient having a fractured rib, or ſuſpected of having ſuch, make it a rule to direct immediate veneſection, and to take away about ſixteen or eighteen ounces of blood. The evacuation is to be repeated or not, according to circumſtances. It is only in very debilitated, aged ſubjects, that it is right to diſpenſe with bleeding.

Sometimes the point of a fractured rib, by being beaten inward, lacerates ſome of the air-cells of the lungs. In conſequence of this accident, a portion of the air contained in theſe organs inſinuates itſelf between the pleura pulmonalis and pleura coſtalis every time that the cavity of the cheſt is enlarged in inſpiration, and thence partly eſcapes into the common cellular membrane of the body through the breach in the pleura coſtalis, on every diminution of the thorax in expiration. The ſwelling of the parts which are thus inflated with air, is termed emphyſema, and frequently takes place in a degree almoſt incredible, the cellular ſubſtance becoming ſo diſtended as to be in many parts of the body ſeveral inches thick. The principal danger, however, is not from this diffuſion of air; but from its confinement in the cheſt, where it often accumulates more quickly, than it can eſcape through the laceration in the pleura, and conſequently produces ſuch a degree of preſſure on the mediaſtinum, diaphragm, and oppoſite lung, that a fatal

fatal interruption of reſpiration is occaſioned. We need not ſay more at preſent concerning this affection, as it is treated of elſewhere. See EMPHYSEMA.

Another occaſional attendant on bad caſes of fractured ribs, is an extravaſation of blood in the cavity of the cheſt. Such an effuſion and an emphyſema we have, in certain inſtances, found exiſting together. The reader will find ſome obſervations on extravaſation in the cheſt, in the articles EXTRAVASATION and WOUNDS.

Fractures of the Os Ilium, Os Iſchium, and Os Pubis.

The ſtructure of the os ilium and os iſchium is ſuch, and the muſcles upon them are ſo numerous and bulky, that fractures of theſe bones hardly admit of being felt, except when ſituated about the upper part of the ilium, or the tuberoſity of the iſchium. Neither theſe bones, nor the os pubis, however, are very frequently broken, and when the accident does happen, it is almoſt always in conſequence of gun-ſhot injuries, or the paſſage of heavy carriage-wheels over the pelvis. Boyer has recorded an inſtance in which the anterior ſuperior ſpinous proceſs was fractured by the kick of a horſe. It is eaſy to conceive that the ſame deſcription of violence might alſo break either the os pubis, or the criſta of the ilium. As great violence is generally requiſite to produce the breach of continuity, the integuments and muſcles are commonly ſeverely injured at the ſame time, as well as the viſcera of the pelvis. Indeed, the danger of theſe accidents may be eſtimated by the degree of miſchief done to the internal parts, for it is from this cauſe that a fatal inflammation of the bladder, inteſtines, and peritonæum, and a train of afflictions depending on a paralytic affection of the urinary organs frequently originate.

When the os ilium is fractured all acroſs, the accident may in ſome inſtances be detected by making preſſure on the criſta of this bone, by which means a crepitus may ſometimes be rendered perceptible. The fragments of the fracture are very ſeldom diſplaced, being retained in their proper ſituation by the glutæi and iliacus internus muſcles.

In order to diſcover fractures of the os ilium, the ſurgeon ſhould make the patient lie on that ſide of the body which is free from injury, with the thorax and abdomen inclined forward, and the thighs bent.

When a ſuſpicion is entertained that the os pubis is fractured, the examination ſhould be made while the patient lies upon his back with his cheſt inclined forward, and his thighs in a ſtate of flexion.

Fractures of the os iſchium may be diſcovered by examining juſt under the lower edge of the buttock, by the ſide of the anus.

The ſwelling which occurs very often renders all information, derived from handling the parts, exceedingly obſcure and doubtful. In this circumſtance, the practitioner can only conjecture that a fracture of ſome part of the pelvis has happened from a conſideration of the ſymptoms. Theſe are generally of the following deſcription; a difficulty of walking, in conſequence of a blow, or fall on the pelvis, or of the paſſage of a carriage over it, a retention of the urine and fæces, followed by an incontinence of the ſame, oppreſſive pains, a paralytic affection of the thighs and legs, œdema of theſe parts, and even ſloughing. Very often, in conſequence of the violence done to the viſcera, hiccough and vomiting are excited, and extravaſations of blood, and collections of matter are produced.

The majority of ſuch patients as we have known die from fractures of the os ilium, os iſchium, and os pubis, have fallen victims to extenſive inflammations in the pelvis and abdomen.

We have already remarked, that the fractures themſelves are ſeldom diſplaced, ſo that what relates to their treatment is exceedingly ſimple, merely conſiſting in applying a roller round the pelvis, and putting a piece of ſoap-plaſter on the ſituation of the broken part. The grand indication is to obviate the conſequences of inflammation of the parts within of the pelvis, and of the peritonæum and abdominal viſcera, by copious and repeated veneſections, and the application of leeches and bliſters to the hypogaſtric region, on the very firſt occurrence of pain or tenſion.

All complaints, in regard to the evacuation of the urine and fæces, are alſo to be carefully attended to. The ſurgeon muſt never neglect to employ the catheter as often as circumſtances require, and he ſhould endeavour to deviſe proper means for preſerving a due degree of cleanlineſs, which is ſo eſſential to the recovery of perſons likely to undergo a long confinement.

In many caſes the violence inflicted is ſo great, that the patient cannot move in the leaſt for the purpoſe of obeying the calls of nature, without being put to the moſt excruciating and intolerable agony. Boyer ſucceſsfully contrived, by means of a piece of girth web laid under the pelvis of one of his patients, and faſtened to a pulley fixed at the top of the bed, to enable the poor ſufferer to raiſe himſelf ſufficiently from the ſurface of the bed to let a pan be put under him for the reception of the fæces. However, a bed made on the principles of the one lately recommended to the public by ſir James Earle, would be the moſt advantageous.

In certain examples abſceſſes cannot be prevented from forming in the pelvis, notwithſtanding the moſt judicious treatment. Suppurations of this kind are particularly apt to ariſe when any detached ſplinters of bone are driven inward.

It is poſſible for the bladder to be wounded by a ſharp ſpicula of the fracture, and an extravaſation of urine to be the conſequence. Default met with a caſe of this deſcription, where the piece of bone was taken out of a wound which was made to let out the effuſed urine. Were ſuch a caſe to preſent itſelf, the practitioner ſhould keep a gum catheter conſtantly introduced, in order to prevent any quantity of urine from collecting, and afterwards becoming diffuſed.

Fractures of the Os Sacrum.

The os ſacrum cannot be broken without the operation of conſiderable force. Hence the accident is not frequent, and, when it does happen, is generally occaſioned by the fall of a very heavy body immediately againſt the bone, the paſſage of a cart or waggon over its convex ſide, or by high falls on the part. The upper portion of a broken ſacrum obviouſly cannot be diſplaced, by reaſon of the firm manner in which it is connected with the lower lumbar vertebra. The lower piece is alſo ſeldom diſplaced, becauſe there are no muſcles which tend to produce ſuch an effect. The violence itſelf, however, may ſometimes drive the inferior fragment inward, an event which is more likely to occur when the fracture is ſituated low down towards the os coccygis.

As in the caſes which form the ſubject of the foregoing ſection, the chief part of the peril depends upon the injury which the pelvis and abdominal viſcera have ſuſtained, and the inflammation which they may undergo, ſo, in the preſent inſtances, the danger principally originates from the ſame cauſe, and the miſchief done to the ſeveral nerves.

From the ſhort ſtatement already made, it muſt be evident that the indications in the treatment of a fractured ſa-

crum

orum are very much like thoſe which preſent themſelves in the foregoing ſpecies of fractures. The fractured ſurfaces being ſeldom ſeparated and diſplaced, the injury of the bone commonly demands a very ſimple plan, which conſiſts in applying a piece of the emplaſtrum ſaponis and a T bandage. If a caſe ſhould occur in which the lower fragment is diſplaced, the reduction is to be accompliſhed in the way which will be explained in treating of fractures of the os coccygis.

The moſt alarming ſymptoms, and ſuch as require the utmoſt ſurgical ſkill, are the inflammation which is apt to affect the viſcera, the retention, or incontinence of urine, the involuntary diſcharge of the fæces, and the paralyſis of the lower extremities, complaints which too frequently attend the accident, and bring on a fatal termination.

Upon this ſubject we need not here enlarge, as we have already delineated the proper plan of treatment in ſpeaking of fractures of the other bones of the pelvis, and further information will be found in future articles. See INCONTINENCE *of Urine*, and RETENTION *of Urine*, *&c.*

Fractures of the Os Coccygis.

The os ſacrum, although a bone of conſiderable ſtrength, is more frequently broken than the os coccygis, which eludes the effect of external violence by its great degree of moveableneſs. Force operating, however, in a particular manner, may occaſion a fracture, and one ſymptom of the accident is ſaid to be an acute pain in the ſituation of the injured bone, when the patient walks, which exertion puts into action the fibres of the glutæi muſcles ariſing from the part.

A fracture of the os coccygis may alſo be diſplaced by the lower fragment being driven inward. When this is the caſe, the practitioner ſhould endeavour to replace the piece of bone, by means of his fore-finger introduced into the rectum, and the ſkilful aſſiſtance of the fingers of his other hand externally.

With regard to the treatment adapted for keeping the fracture in a ſteady and undiſplaced condition, the practitioner can do little more than apply a piece of the emplaſtrum ſaponis and a T bandage, the patient being enjoined to avoid walking and making any preſſure on the part.

Fractures of the Clavicle.

The ſituation, the ſlenderneſs, and the curved ſhape of the clavicle; the manner in which the bone is only ſupported at each end; the great efforts which it has to ſuſtain when, in falling, the hands are brought forward; and ſeveral other anatomical and incidental conſiderations ſufficiently obvious, afford a full explanation of the reaſon why fractures of the clavicle happen exceedingly often, and are much more common than its diſlocations. The middle of the bone is more frequently broken than its other parts, and the fracture is almoſt always diſplaced, on account of the weight of the arm and the action of the pectoral muſcle, the humeral portion of the bone falling under that which remains connected with the ſternum. Encyclopédie Méthodique, Partie Chirurgicale, art. Clavicule.

A fracture of the clavicle is a caſe in which the diagnoſis is remarkably eaſy; the accident, indeed, being obvious at firſt view, eſpecially when the fragments are diſplaced, when there is no ſwelling, and when the patient is not exceedingly fat. The ſhoulder becomes depreſſed, approximated to the ſternum, and ſo inclined towards the thorax, that there is no ſpace betwixt them. It is only with difficulty that the arm can be raiſed, brought forward, or put to the ſide. When the fracture is ſimple, and its ends not conſiderably ſeparated, the pain is ſometimes moderate, or even trifling; but, upon the gentleſt attempt being made to move the arm, the patient ſuffers great agony, which ceaſes immediately the fracture is replaced. When the fractured bone is not in its due ſituation, the humeral portion drawn down by the weight of the ſcapula, by that of the arm, and by the action of the deltoid muſcle, becomes concealed under the ſternal portion. The diſplaced condition of the bone is increaſed whenever the muſcles act with violence, and the pain is aggravated by carrying forward the arm, or preſſing it forcibly to the ſide.

It is not common for a fracture to occur at the ſcapulary end of the clavicle; but there is no doubt that a direct force, falling on the ſhoulder, may break any part of the bone. When the accident is thus produced, the ſoft parts may alſo ſuffer more or leſs contuſion and laceration. The bone may be broken in more places than one, and the caſe receive the appellation of a comminuted fracture.

When the violence acts upon the extremities of the clavicle, as happens in falls on the outſide of the ſhoulder and on the hands, while the arms are extended, the clavicle may be very much bent, and ſo obliquely broken, that the ends of the bone will protrude through the ſkin, and occaſion what is termed a compound fracture.

Exceſſive violence applied to the ſhoulder may injure the cervical nerves, and has been known to bring on a paralyſis of the arm, an affliction with which fractures of the clavicle may of courſe be ſometimes complicated.

Although the records of ſurgery fully demonſtrate that fractures of the clavicle have been, from the earlieſt periods, among the moſt common accidents to which mankind have always been ſubject, yet it is well known that the treatment of no other kind of fracture remained ſo long as that of the collar-bone in a ſtate of imperfection and error. Falſe notions and abſurd practice deſcended regularly from one generation of ſurgeons to another, from the days of Hippocrates to thoſe of Pott and Deſault.

The following obſervations, taken from Deſault's Pariſian Chirurgical Journal, tranſlated by Mr. Goſling, afford a good explanation of the opinions which have prevailed reſpecting the treatment of fractures of the clavicle.

"The attention of the Greek phyſicians was directed to the projection generally formed by the ſternal fragment, which they conceived ſhould always be depreſſed to the level of the humeral portion; and they endeavoured to accompliſh this object by mechanical means; ſuch as the application of lead, or thick compreſſes, retained on the clavicle by means of bandages. Such was the method employed, till the inſufficiency and bad tendency of this practice were pointed out by Hippocrates, who, being more accurate and attentive in his obſervations than his predeceſſors, remarked that the projecting end of the ſternal portion was in fact not more elevated, but that this appearance aroſe from the humeral portion being depreſſed, in conſequence of being drawn down with the ſhoulder, and that conſequently our endeavours ſhould be directed to raiſe this portion on a level with the other. Such are the principles on which his doctrines and practice were founded; he recommends the arm to be brought to the ſide, and the ſhoulder to be elevated, ſo as to form an acute angle, and to be maintained in that ſituation by a proper bandage. This plan, according to our author, will tend to bring the ends of the bone in a ſtate of appoſition, and procure their reunion, at leaſt it will effect this when the humeral portion is depreſſed below the ſternal, which is generally the caſe. But this method will not always completely ſucceed; for inſtance, when the bones ride over each other, or when the

ſcapular

ſcapular portion is forced backwards. In theſe caſes, Hippocrates recommends the patient to be laid on a hard body, (a plank, for inſtance,) and his ſhoulders to be drawn backwards with ſome degree of force, and maintained in this ſituation by a ſort of ſpica bandage. If the ſcapular fragment ſhould project forward, he recommends the elbow to be brought forward on the breaſt, and the palm of the hand to be applied againſt the oppoſite ſhoulder. And, with reſpect to the caſe, which very rarely occurs, of the ſcapular portion projecting above the ſternal, he ſays nothing, as the weight of the ſhoulder is alone ſufficient to bring it to its former ſituation.

"What Paulus Æginetus ſays on fractures of the clavicle ſeems to be a commentary on the text of Hippocrates; he makes his extenſion by carrying the arm upwards and outwards. In certain caſes, he places a compreſs between the ſhoulders, whilſt an aſſiſtant draws them backwards, and then applies a ſpica bandage; he alſo mentions, that the arm ſhould not be ſupported, but left hanging to the ſide, when the humeral portion is more elevated than the ſternal; in a word, his ideas and practice are preciſely the ſame; the only circumſtance in which he varies, is recommending a ball to be placed in the axilla, to make a more forcible extenſion, when the means recommended by Hippocrates are inadequate to the reduction.

"Albucaſis, the author, who revived ſurgery among the Arabians, borrowed of Paulus Æginetus the idea of placing a ball in the axilla, and the uſe of the figure-of-8 bandage: he kept the ſhoulder conſtantly elevated, and ſupported the arm during the day in a ſling, which he fixed, in the day, to the neck of the patient, and ſupported, at night, by placing a pillow under the axilla.

"Lanfranc and Gui de Chaubac have only tranſcribed what has been ſaid by the above-mentioned authors: the laſt, inſtead of laying the patient on a thick pillow, attempts the reduction by applying the knee between the ſhoulders of the patient (agreeable to moſt modern practitioners, who have imitated this practice); and, if the depreſſed portion was not by this means ſufficiently elevated, he recommended the application of an agglutinative plaſter to produce this effect, a doctrine ſo abſurd, that we are aſtoniſhed to find it mentioned by ſome modern authors.

"Pecceti has gone farther than preceding writers, whoſe works he has attentively conſidered, and from whom he has frequently tranſcribed; for, he recommends the ball to be left in the axilla during the whole treatment, but ſtill uſes the figure-of-8 bandage.

"Subſequent writers have only commented on thoſe authors we have recited; but, as the greateſt part were not practitioners, they have omitted the explanation of one part of their doctrine, the moſt eſſential of all.

"The ball, which, with Paulus Æginetus, Avicennus, and Albucaſis, was the principal means of reduction, has been viewed only by the moderns as merely a means to fill up the axilla, to prevent the parts being excoriated from the application of the bandage: but this is not the only error into which they have fallen; the fracture of the clavicle was invariably followed with more or leſs deformity, a remark generally made. Moſt ſurgeons, miſled by a falſe theory reſpecting the union of fractures, conceived it was impoſſible to ſurround the clavicle by a bandage that would prevent the irregular ſhooting of the callus. Some, however, obſerved that the bandage of the ancients, then in uſe, did not prevent the motion of the fractured portions; but the means that they ſubſtituted and adopted on the ſame principles were not found to anſwer the intention.

"The iron croſs of Heiſter and of the author of "La Chirurgie complette," the compreſs by which Mr. Petit kept the ſhoulders backwards, and other contrivances, are only different modifications of the figure-of-8 bandage; the inconveniences and inſufficiency of which are demonſtrated by every modern author; and, indeed, it is unneceſſary to reaſon on the ſubject, as we find, from experience, it is abſolutely inadequate to produce the effect we wiſh; and, indeed, in the opinion of all ſurgeons, no bandage has been yet contrived to retain the fractured parts ſufficiently to prevent deformity and pain.

"Default, firmly perſuaded that a conſtant ſtate of extenſion was abſolutely neceſſary to keep the parts in a ſtate of immobility and procure their re-union, invented, in 1768, a bandage that completely anſwered this indication, which ſome perſons have conceived is to be found in Paulus Æginetus. This author certainly accompliſhed the reduction when it was difficult, by bringing the elbow on the breaſt, and ſeparating, at the ſame time, the ſuperior part of the arm, by means of a thick ball placed in the axilla; but, from his own account, we learn, that he did not keep up this means of extenſion during the whole treatment. He, indeed, adds, in a few lines, that after the reduction of the fracture, and applying thick compreſſes, a ball of wool ſhould be placed in the axilla, and the bandage ſhould paſs under both axillæ, on the fractured clavicle, ſcapula, &c.

"After the application of this bandage, it is evident, that placing a ball of wool in the axilla was merely to furniſh a point of ſupport to the bandage, which, without this precaution, would have paſſed only over thoſe parts where the muſcles project. What further confirms this idea is, that the author employs no method to keep the arm cloſe to the trunk; but reſts ſatisfied with ſuſpending it to the neck by means of a leather ſtrap, and ſupporting the fore-arm in a ſling, in the ſame way as after bleeding. Pecceti recommends the ball that was uſed in the reduction to be kept in the axilla; but ſtill we do not ſee his direct indication, as he employs, like his predeceſſors, the bandage of the figure of 8, and ſays nothing of the manner of retaining the ball, nor of the neceſſity of keeping the arm cloſe to the trunk."

Default uſed to ſet a broken clavicle in the following manner. The patient was deſired to ſtand, while an aſſiſtant elevated the arm ſufficiently to make it perpendicular to the axis of the body. Default next applied to the ſide of the breaſt a pad, made of old linen, as long as the humerus, in the form of a wedge, the width of which was from four to five inches; and the baſe, which was three inches thick, was placed in the axilla, and retained in that ſituation by means of a bandage five or ſix ells in length, and three fingers in breadth. One end was applied to the middle of the pad, and confined in that ſituation by two circular turns round the body, then paſſed before the breaſt above the right ſhoulder, then behind, and afterwards under; the roller was then brought horizontally before the breaſt on the pad, then obliquely upwards behind the breaſt, on the right ſhoulder, juſt forwards, and then under; then it was carried horizontally behind the breaſt on the pad, and continued in the ſame way till the whole bandage was expended.

The ſurgeon ſupported the pad in the axilla with one hand, and with the other elevated the elbow, ſo as to bring the ſcapular fragment of the clavicle in contact with the ſternal portion, preſſing the pad againſt the breaſt; making with the arm, by this method, a lever of the firſt ſpecies, by which means the arm was brought from the trunk, and the clavicle kept in a ſtate of extenſion.

An aſſiſtant was deſired to retain the arm in this ſituation with one hand, and with the other to ſupport the fore-arm,

bent

bent in a horizontal poſition; the palm of the hand applied to the anterior part of the breaſt. By this plan of treatment the bones were brought to their natural ſituation, and to ſuch an exact ſtate of appoſition, that no irregularity or deformity remained.

The arm was retained in this poſition by a bandage of ſix or ſeven ells in length, and four fingers in breadth; the end was applied before the right axilla, and brought horizontally before the breaſt, on the ſuperior part of the arm, behind the breaſt, and under the axilla: this firſt turn of the bandage was farther ſecured, by being twice paſſed in the ſame manner: the turns were then reflected over each other, and expanded on the breaſt and the reſt of the arm; and, as it approached near the elbow, the bandage was drawn tighter, and paſſed in circular turns round the fore-arm, and pinned to that part.

The corners of the pad were pinned to the upper part of the bandage, and the hand received an additional ſupport by the middle of a compreſs, the ends of which were pinned to the anterior part of the bandage; the vacuities above and below the clavicle were filled with lint; and the fractured portions covered with compreſſes, dipt in aq. veg. which were doubled, and ſeven or eight inches in length, and three wide.

Under the right axilla, the end of a bandage, ſeven or eight ells in length, and three fingers wide, was applied, and paſſed obliquely above the breaſt, on the compreſſes which covered the clavicle, behind the ſhoulder and the arm, under the elbow, (which the aſſiſtant ſtill continued to ſupport,) then obliquely upwards before the breaſt, and under the right axilla. Over the firſt turn of the bandage it was paſſed three times preciſely in the ſame way, and the remainder of the bandage, brought from behind forwards under the right axilla, was expended in circular turns, paſſed from the right to the left on the arm, and round the breaſt, to fix the firſt part of the bandage, and to carry back the arm that correſponded with the fractured clavicle: particular attention was paid to prevent the bandage getting looſe, by ſecuring it in different parts by means of pins. See Pariſian Surgical Journal, vol. i.

Deſault's bandage is ſimple, although ſome attention will be neceſſary in applying it. Its mode of acting is obvious. The cuſhion or compreſs, which acts as a ſupport to the internal ſurface of the arm, is ſhaped in ſuch a manner, that at the time the elbow is brought cloſe to the breaſt, the ſuperior part of the arm is ſeparated ſome diſtance from the body. The arm, carried outwards, drags the ſhoulder at the ſame time, and with it the ſcapular portion of the fractured clavicle, which would have been carried inwards by the pectoral muſcles, the ſeratus major anticus, and the ſubclavius, if their action had not been oppoſed by the thickneſs of the ſuperior part of the cuſhion. The circular turns of the bandage, which fix the arm againſt the breaſt, have the double advantage of keeping up the extenſion, and preventing at the ſame time the motions of the arm and ſhoulder, and, conſequently, retaining the portions of the fractured bone in a conſtant ſtate of appoſition. The elevation of the arm tends to place the humeral portion of the clavicle on a level with the ſternal; and the turns of the bandage, paſſing at one part under the elbow and fore-arm, and at another part on the fragment that is moſt elevated, which it depreſſes, and raiſes the other, bringing their ſurfaces oppoſed to each other. This bandage ſerves to confine the actions of the trapezius and ſterno-maſtoideus, which are attached to this bone. With reſpect to the ordinary time for the conſolidation of the fracture, Hippocrates fixes it from fourteen to twenty days; Albucaſis, from twenty to twenty-four or twenty-eight; and this calculation agrees nearly with the reſult of Deſault's experience. Pariſian Chirurgical Journal.

Notwithſtanding the excellency of the foregoing plan, Engliſh ſurgeons are not much in the habit of following it, perhaps on account of its being a little more complicated than the method of confining the ſhoulders back with a figure-of-eight-bandage, and ſupporting the arm in a ſling, as is their uſual mode. The obvious imperfection of the figure-of-eight bandage is, that it tends to depreſs the ſcapulary end of the clavicle, at the ſame time that it draws it backward. We need ſcarcely remark, that when ſuch bandage is uſed, the margins of the axillæ muſt be defended with tow, and that it is cuſtomary to put a piece of the emplaſtrum ſaponis on the ſkin covering the fracture.

Fractures of the Scapula.

The ſituation of the ſcapula, and the quantity of muſcle upon it, render the body of this bone not very liable to be broken; but the accident does every now and then take place. Particular parts of the ſcapula, however, are frequently fractured; as, for inſtance, the acromion, the inferior angle, the neck, and the coracoid proceſs.

When the acromion is broken, the weight of the arm, and the contraction of the deltoid muſcle, draw the detached piece downward, while the trapezius and levator ſcapulæ draw the reſt of the bone upward and backward.

When the lower angle of the ſcapula is broken, it is drawn forward by the action of the ſerratus major anticus, the reſt of the bone remaining in its natural ſituation. If the portion of the angle fractured off be conſiderable, it may alſo be pulled upward and forward by the teres major, and ſome fibres of the latiſſimus dorſi.

In fractures of the coracoid proceſs, this part is ſeparated from the reſt of the ſcapula, in conſequence of being drawn downward and forward by the action of the coraco-brachialis and ſhort head of the biceps.

Fractures of the neck of the ſcapula are followed by a falling down of the ſhoulder, occaſioned by the weight of the arm. The appearance of the limb is like that of a diſlocation; but the difference of the caſe is eaſily diſtinguiſhed by the facility with which the os brachii may be puſhed up to its proper height, the perception of a crepitus, and the falling down of the limb again, as ſoon as it is left unſupported.

It frequently happens, that after a fall, or blow on the ſhoulder or arm, when the clavicle and ſcapula cannot be diſcovered to be any where broken, a great deal of pain, and a manifeſt crepitus occur on moving the ſhoulder-joint. It is probable that, in ſome caſes of this kind, a ſmall portion of the head of the os brachii, or a little piece of the glenoid cavity of the ſcapula, may be broken off.

The ſymptoms of a fractured acromion are, pain in the ſituation of the injury, a change in the external appearance and ſhape of the ſhoulder, and a falling downward of the detached portion of the bone, which may be raiſed into its proper poſition by bringing up the elbow cloſe to the ſide.

Fractures of the inferior angle are very obvious and eaſy of detection, by reaſon of the great ſeparation which takes place between the fragment and main part of the bone. The detached piece, alſo, does not move with the reſt of the ſcapula.

Fractures of the ſpine of the ſcapula are rendered manifeſt

by the irregularity which is generally produced in the courſe of that prominent proceſs. A crepitus is likewiſe perceptible.

When the body of the ſcapula is fractured, the nature of the accident is uſually made ſufficiently plain by the crepitus which takes place on moving the ſhoulder and arm.

Fractures of the body of the ſcapula are ſometimes comminuted; but, as the fragments are covered with muſcles on both ſides, they are hardly ever diſplaced.

The treatment of fractures of the ſcapula preſents the ſame indications which accompany fractures in general. In longitudinal and tranſverſe fractures of the body of the bone the ſurgeon has very little to do: a piece of the emplaſtrum ſaponis and ſome compreſſes ſhould be laid over the ſituation of the injured part, and be kept on with a ſpica bandage. The chief indication, however, is to maintain the broken bone in a motionleſs ſtate; an object which can only be accompliſhed, by preventing the arm itſelf from moving. Hence, it becomes neceſſary to confine the humerus cloſe to the ſide, by applying a roller round it and the body together, from the ſhoulder to the elbow.

We have remarked, that when the lower angle of the ſcapula is broken, the fragment becomes drawn downward and forward by the action of the ſerratus major anticus muſcle. Hence, it is proper to bring the ſcapula towards the ſeparated fragment, by bringing the arm itſelf downward and forward, in which ſituation it ſhould be confined with a roller. The fore-arm ſhould alſo be ſupported in a ſling, and the fragment of bone be kept as much upward and backward as poſſible, by means of proper compreſſes and a bandage.

When the acromion is fractured, the action of the deltoid muſcle tends to draw downward and outward the detached portion. The treatment conſiſts in raiſing the arm ſufficiently to make the head of the os brachii force the outer part of the acromion upward, at the ſame time that an aſſiſtant puſhes the ſcapula downward and forward, in the oppoſite direction to that in which the ſurgeon puſhes the arm. In this country, practitioners uſually apply a piece of the emplaſtrum ſaponis to the ſituation of the fracture, and then the ſpica bandage. But theſe latter proceedings are only for the ſake of appearances, and tend to no particular good. The grand object ſhould be to maintain the ſhoulder and arm in the poſition above deſcribed; and it may be effected by applying a roller round the arm and trunk together, and putting compreſſes and a bandage on the ſcapula.

There is an advantage, alſo, in making the head of the os brachii ſtand more out, on bringing the elbow cloſe to the ſide; and it was with this view that Deſault was in the habit of placing a ſmall pillow in the arm-pit, before he bound the arm and body together with the roller.

The treatment of fractures of the coracoid proceſs conſiſts in bringing the os brachii forward towards the ſternum, and placing the ſhoulder downward and forward, ſo as to relax the muſcles which have the power of diſplacing the fragment. The arm ſhould be kept in the poſition which we have ſpecified, by means of a ſling. A roller may be uſed for keeping the ſhoulder downward and forward, and ſome uſe may be derived from placing a compreſs juſt under the detached piece of bone.

When the neck of the ſcapula is fractured, the glenoid cavity and the whole of the upper extremity fall ſo much downward as to occaſion the appearance of a diſlocation. The plan which the ſurgeon ought obviouſly to follow in this caſe, is to raiſe the os brachii ſufficiently to bring the external piece of the neck of the ſcapula into contact with the internal one. The limb and glenoid cavity ſhould then be prevented from falling down again by ſupporting the elbow and fore-arm in a proper ſling. A piece of the emplaſtrum ſaponis and a ſpica bandage are next applied by the generality of practitioners. But a more uſeful ſtep is to prevent all motion of the ſhoulder and arm, by binding the os brachii cloſe to the ſide with a roller. Thus the fracture will be kept in a quiet ſtate, which is highly favourable to the union of all broken bones.

Fractures of the Humerus, or Os Brachii.

It is remarked by ſurgical writers that fractures of the humerus are very ſeldom diſplaced in the longitudinal direction, eſpecially when the ſolution of continuity is ſituated at the lower part of the bone. Here the brachialis internus and triceps muſcles, being attached to the humerus on all ſides, prevent both the fragments from becoming ſeparated. Circumſtances are different when the fracture happens above the inſertions of the deltoid and coraco-brachialis muſcles. If we conſider the action of theſe muſcles, and the manner in which the latiſſimus dorſi, pectoralis major, and other muſcles exert themſelves, we ſhall diſcover in ſuch powers many cauſes to diſplace the fracture, particularly when it is an oblique one, as is often the caſe.

All oblique fractures of the os brachii are generally diſplaced, whenever the part of the bone in which the ſolution of continuity has happened is above the middle. The upper ſurface of the fracture being then unfitted for making an effectual mechanical reſiſtance to the aſcent of the lower one, the latter eaſily glides upward and rides over the former, on being drawn in ſuch direction by the action of the deltoid, biceps, coraco-brachialis, and long portion of the triceps.

The humerus is ſubject to fractures at every part, from the head to the condyles of the bone. When the ſolution of continuity happens above the inſertion of the pectoralis major, latiſſimus dorſi, and teres major muſcles, ſurgeons call it a fracture of the neck of the humerus, an expreſſion which does not ſtrictly accord with the idea which anatomiſts give us, of what ought properly to be regarded as that part of the bone. The neck, in anatomical language, means the circular contraction which ſeparates the head from the tuberoſities; but ſeveral eminent writers on ſurgery imply by a fracture of the neck of the humerus any ſolution of continuity above the inſertion of thoſe particular muſcles which we have juſt been enumerating.

The general ſymptoms attendant on fractures of the humerus are, a change in the direction, and a ſhortening of the limb; a diſtinct crepitus on moving the lower portion of the broken bone; conſiderable pain, which is materially increaſed by every movement of the arm; the uſe of the limb is loſt, &c. The reader is already appriſed that when the fracture is ſituated low down, its ends will not ride over each other ſo as to ſhorten the member.

The diagnoſis of moſt fractures of the os brachii is ſufficiently plain: it is only when the neck of the bone is broken that any obſcurity is likely to prevail, and that there is any probability of miſtaking the caſe for a luxation of the ſhoulder. A little reflection will ſoon qualify any practitioner to avoid the error; for the differences of the two caſes are conſiderable.

Fractures of the neck of the humerus are attended with a depreſſion at the upper and outer part of the arm.

When the head of the bone is diſlocated into the axilla, a deep hollow may be felt immediately under the acromion, in the

the place which the head of the bone ought to occupy. The ſhoulder is not ſo prominent as natural, and the acromion ſeems to form a preternatural projection. The limb is alſo lengthened.

On the contrary, when the neck of the bone is fractured there is no alteration in the ſhape of the ſhoulder; the acromion does not appear to make any uncommon projection; there is no unuſual hollow immediately under it, and whatever depreſſion occurs, is ſituated lower down.

The limb, inſtead of being lengthened, is ſhortened; in the axilla, inſtead of the round, ſmooth head of the bone, the rough end of the lower fragment may ſometimes be felt; and added to all theſe circumſtances, there is that almoſt deciſive ſymptom, a crepitus.

Before proceeding to ſpeak of the treatment of fractures of the humerus, we ſhall make a few remarks on ſuch injuries, when they affect the lower end of the bone.

The inferior end of the os brachii is ſometimes fractured in ſuch a way, that a longitudinal ſolution of continuity divides the two condyles from each other, and, extending more or leſs upward, is bounded by another tranſverſe or oblique diviſion, which affects the whole thickneſs of the bone. Hence, there are three different pieces of bone, and two fractures.

In certain inſtances, fractures of the lower end of the os brachii are of a more ſimple deſcription; for the diviſion may be oblique, and run down in the direction outward, or inward, ſo as to extend acroſs one ſide of the lower end of the bone, and reach into the joint, thereby detaching only one of the condyles from the body of the bone. It is alſo poſſible for the internal condyle to be broken, without the fracture having any communication whatſoever with the cavity of the joint.

When the bone is ſo broken, as to be ſplit into three portions, with a ſeparation of both condyles, the deformity is greater, and the fractured part more moveable than in the other example. On making preſſure either on the front or back part of the joint, the two condyles become more diſtant from each other, and the injured part of the arm ſeems widened. The patient commonly keeps his fore-arm in a ſtate of pronation; and the practitioner, on taking hold of both condyles at once, and moving them in contrary directions, may feel a manifeſt crepitus.

When only one condyle is detached, the ſurgeon may alſo feel a grating on moving the ſeparated fragment; but the deformity is much leſs conſiderable.

In ordinary fractures of the humerus, the firſt duty of the ſurgeon is to put the ends of the broken bone into as even a poſition with regard to each other as circumſtances will allow. However, when the ſolution of continuity is tranſverſe and ſituated low down, the reader already knows that it often happens that the fragments are little if at all diſplaced.

It was once the cuſtom to place the arm at a right angle with the body; but this method, being found diſadvantageous, it was abandoned; and modern practitioners now univerſally give the preference to that poſition in which the arm lies in the direction of the trunk. Such poſture is found to be leſs irkſome to the patient, and the ends of the fracture are leſs apt to be diſturbed, ſince there is no occaſion to move the limb out of that poſition during the whole of the treatment.

It is cuſtomary, alſo, to adviſe the patient to go to bed, and to remain there for the firſt few days. As ſoon as the patient is in bed, no time is to be loſt before the ſurgeon ſets about reducing and putting up the fracture.

Abroad, ſurgeons direct one aſſiſtant to take hold of the wriſt and make the requiſite degree of extenſion, while another graſps the upper part of the os brachii, and the practitioner himſelf endeavours with his fingers to make the ends of the fracture lie as ſmoothly and evenly as poſſible. In this country we are in the habit of acting ſomewhat differently; for we bend the elbow-joint in the firſt inſtance, and apply our extenſion and counter-extenſion immediately to the lower and upper portions of the broken bone.

We muſt alſo remark that fractures of the humerus ſeldom require a violent degree of extenſion.

The fracture having been reduced and put into an even ſtate of coaptation, the next indication is to keep it quietly in ſuch condition, until a firm union of one portion of the bone to the other has taken place.

The means employed for this purpoſe are, a piece of the emplaſtrum ſaponis, a roller, ſplints well lined with ſoft pads, and a ſling for the ſupport of the fore-arm and hand.

The integuments in the vicinity of the fracture have commonly applied to them two pieces of the ſoap-plaſter, which together ought to extend all round the limb. This method is preferable to ſurrounding the part with one larger piece, which, in caſe of much ſwelling taking place, might not yield ſufficiently to prevent the unpleaſant conſequences likely to ariſe from any undue preſſure on, and confinement of, the member in this circumſtance.

The roller is next to be applied from the elbow up to the armpit, in the common way, the practitioner taking care not to make the bandage too tight; a thing which could do no good, and might be productive of pain and other bad effects.

It is plain that the preceding parts of the apparatus are more uſed for the ſake of neatneſs and appearances than for any particular efficacy. The moſt uſeful means are the ſplints and ſling.

Four ſplints are uſually employed; *viz.* one on the inſide; one on the outſide; one on the back; and another on the fore-part of the arm. The external one ſhould reach from the acromion to the outer condyle; the inner one, from the margins of the axilla to the internal condyle; the back one, from the head of the bone down to the olecranon; and the anterior one, from the ſame height down to the bend of the elbow. The bad conſequences of their preſſure on the ſoft parts are to be prevented, by placing betwixt the ſkin, and the inſide of the inſtruments, pads made of tow, or wool. Compreſſes ought alſo to be uſed for hindering the ends of the ſplints from chafing the margins of the axilla, or any other place where the patient feels uneaſineſs from a ſimilar cauſe.

Splints made with longitudinal joints, and lined with leather, are very good ones for fractures of the humerus. When the inſtruments are too long, and none of the proper ſhortneſs are at hand, the ſurgeon commonly cuts off as much of each ſplint which he ſelects as is neceſſary.

The ſplints being all arranged in their reſpective places, the practitioner maintains them ſo with three or four bits of tape, doubled into as many nooſes, applied at different parts of the limb, and tied in bows.

Many ſurgeons act very properly in not truſting entirely to tapes, which are apt to become ſlack after a little while, ſo as to allow the ſplints to ſlip and move about. Such practitioners, with great prudence, apply a roller over the ſplints, and then the tapes, if they are required.

As all motion of the elbow-joint, and of the radius, would produce a diſturbance of the fracture, it is neceſſary to lay the fore-arm in a ſling, and keep it perfectly at reſt. The ſling ſhould not preſs the elbow too forcibly upward, which,

in cafes of oblique fractures, would be apt to make the lower piece of the broken bone afcend and ride over the lower one.

We fhall now introduce a few obfervations on the treatment of fractures of the neck of the humerus.

Sometimes fractures of the neck of the humerus are not at all difplaced, and the diagnofis is confequently very difficult. However, in the generality of cafes, the lower end of the fracture is drawn out of its proper pofition, while the upper one continues quite undifplaced, being of little extent, and acted upon by few mufcles.

In ordinary inftances, the lower fragment is not materially difplaced in the longitudinal direction; though cafes do occur, in which the bone is confiderably out of its right fituation in this refpect. This happens when the fracture is exceedingly oblique, and the mufcles contract with unufual violence, and alfo when the force, which breaks the bone, continues to operate after the fracture, fo as to feparate the ends of the bone from each other. In "Les Oeuvres Chirurgicales de Default," it is faid, that in this manner the inferior end of the fracture has been driven through the deltoid mufcle and fkin of the fhoulder. According to Petit, the action of the mufcles is in general effectually refifted by the weight of the limb, and the fracture is only difplaced in the tranfverfe direction, inward or outward. In the firft cafe, which is the leaft frequent, the elbow is feparated from the trunk, and cannot be put near to it without pain. In the fecond cafe the elbow inclines towards the fide.

Default advifes the reduction to be made as follows: one affiftant is to fix the trunk, by drawing towards himfelf the oppofite arm. A fecond affiftant is to take hold of the fore-arm, in a ftate of half-flexion, placing one of his hands behind the wrift to ferve as a fulcrum, while the other is applied to the middle of the front of the fore-arm for the purpofe of preffing it downward, fo as to make the requifite extenfion.

In this way the reduction may be accompliftied with very little force, directed according as the lower fragment is difplaced inward or outward.

The indications in the treatment of fractures of the head or neck of the humerus are, to make the arm and fhoulder immoveable; to bring either outward or inward the lower end of the fracture, and to draw downward the fame. Thefe are the objects which every bandage ought to fulfil; but it fhould be underftood, that the laft purpofe is of the leaft importance, becaufe, in general, the weight of the arm is alone fufficient to counteract fuch mufcles as have a tendency to draw the lower end of the fracture upward.

The following was the apparatus, which the celebrated French furgeon, Default, was in the habit of employing with fuccefs for the cure of fractures of the above defcription.

1. Two bandages, one about five or fix ells long, the other eight or ten, both being about three finger-breadths wide. 2. Three ftrong fplints, of different lengths, and two finger-breadths broad. 3. A linen pillow, three or four inches thick at one of its ends, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow. 4. A fling to fupport the fore-arm. 5. A towel to cover the whole of the apparatus.

The reduction is to be effected as above explained, and the affiftants are to continue the extenfion. Then the furgeon is to take the firft roller, which is to be wet with the aq. veg. min. and is to fix one of its heads by applying two circular turns to the upper part of the fore-arm. The bandage is now to be rolled moderately tight round the arm upward, making each turn overlap two-thirds of that which is immediately below it. When the roller has reached the upper part of the limb, it muft be doubled back a few times to prevent the folds which the inequality of the part would create. The bandage is afterwards to be carried twice under the oppofite axilla, and the reft of it, rolled up, is to be brought up to the top of the fhoulder, and committed to the care of an affiftant.

The firft fplint is to be placed in front, reaching from the bend of the arm as high as the acromion. The fecond, on the outfide from the external condyle to the fame height. The third, behind, from the olecranon to the margin of the axilla. The pillow interpofed between the arm and thorax ferves as a fourth fplint, which becomes ufelefs. An affiftant applies thefe parts of the apparatus, and holds them on by applying his hands near the bend of the arm, in order not to obftruct the application of the remainder of the bandage.

The furgeon takes hold of the bandage again, and applies it over the fplints with moderate tightnefs, and the bandage ends at the upper part of the fore-arm, where it began.

The affiftants continually keeping up the extenfion, the furgeon is to place the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be difplaced inward; but downward, if this fhould be difplaced outward, which is moft common. It is to be attached by two pins to the upper part of the roller.

The arm is to be brought near the trunk, and fixed upon the pillow, by means of the fecond roller, applied round the arm and thorax. The turns of this bandage fhould be very tight below, and rather flack above, if the fracture fhould be difplaced inward: but, if outward, they fhould be flack below and tight above.

The fore-arm is to be fupported in a fling, and the whole of the apparatus is to be covered with a napkin, which will prevent the bandages from being difplaced.

Fractures of the lower end of the os brachii were regarded by Paré, Petit, Heifter, Duverney, and feveral other furgical authors, as very apt to be attended with alarming confequences, large abfceffes, gangrenous mifchief, caries, anchylofis, &c.

The experience of Default affords ample proof, that the foregoing evils are not fo likely to happen, as former furgeons believed, at leaft under judicious treatment.

We know, that every fracture near a joint is not invariably dangerous, nor productive of permanent inconveniences. The refult of fractures of the patella and olecranon, cafes which are particularly common, ought to inform us, that, though fractures near joints, fometimes, have a difagreeable termination, they frequently end in a very favourable manner. Compound fractures of any large joints, however, may be juftly looked upon as cafes of the moft dangerous defcription; they often require the performance of amputation immediately after the accident.

When the lower end of the os brachii is fractured, the detached condyle, or condyles, are fometimes difplaced; but, in general, the feparation is not confiderable, owing to the fragments being drawn in oppofite directions by the mufcles of the arm and fore-arm, which powers counteract each other. Whenever the feparation is wide, it is the direct of the external violence.

The condyles may be difplaced forward, or backward, or they may recede from each other fideways.

From this account it is plain, that the object of the apparatus fhould be to prevent the fragments from being difplaced in thefe four directions.

The

The fracture having been reduced, and ſome of the emplaſtrum ſaponis applied, a roller ſhould be put round the part, and then round the fore-arm, in order to make gentle compreſſion on the muſcles inſerted into the condyles. Such preſſure, Default believed, diminiſhed the power of the muſcles in acting upon, and diſplacing the parts. The ſame diſtinguiſhed ſurgeon next adviſes the application of four ſplints, one in front of, one behind, and two others to the ſides of the arm. He thought that there was no utility in having the ſplints to extend very high up the arm, in this particular caſe. The anterior and poſterior ſplints he recommends to be made flexible at their middle part, which is to be put oppoſite the elbow-joint, ſo as to allow it to be in a ſtate of flexion, at the ſame time that they reach for a certain extent down the fore-arm.

We need ſcarcely remark, that the fore-arm muſt alſo be kept at reſt in a ſling.

Fractures of the Olecranon.

The ancients have not left us any remarks of importance concerning fractures of the olecranon, and ſeveral modern writers appear to have been very imperfectly acquainted with the ſubject.

Putting out of conſideration pronation and ſupination, which have little connection with the preſent caſes, we may obſerve that the elbow is a joint admitting of flexion and extenſion, for which purpoſes, the rounded and pulley-like extremity of the os humeri is received, and moves in a correſponding cavity of the ulna, called *ſigmoid*. The two proceſſes, by which this cavity is in ſome degree formed, are its anterior, called *coronoid*, and its poſterior, called *olecranon*. In order the better to regulate the degree of flexion and extenſion, there are two cavities, ſituated at the inferior extremity of the os humeri; one on the anterior, the other on the poſterior ſurface; into theſe the two proceſſes of the ulna are occaſionally received. When the joint is in the greateſt degree of flexion, the coronoid proceſs is received into the anterior cavity; and, when in the greateſt degree of extenſion, the extremity of the olecranon occupies the poſterior cavity.

In order to communicate motion to this arrangement of parts, muſcles are ſituated in various directions; but the muſcle, by which extenſion is chiefly performed, the triceps extenſor cubiti, being inſerted into the extremity of the olecranon, has an attachment peculiarly advantageous and mechanical, as it is thereby at ſome diſtance from the centre of motion, conſequently, leſs exertion will be neceſſary to accompliſh extenſion.

When by any accident the olecranon is broken off, two very important changes are induced. Firſt, the lever, which enabled the muſcle to act ſo advantageouſly, is removed. Secondly, the ſpace, in which the muſcle acted, is now ſhortened. Hence, that bony arrangement, that was before ſo favourable to motion, is now deſtroyed; and the muſcle, by whoſe agency ſuch motion was performed, has its power conſiderably leſſened. See ſome remarks by Haighton in the ninth volume of the Medical Commentaries, p. 382.

Fractures may occur either at the baſe, or the extremity of the olecranon. The firſt kind of caſe is the moſt common. The ſolution of continuity is ſometimes oblique, though, generally, tranſverſe. The accident is uſually occaſioned by external violence; but, in certain inſtances, the proceſs is torn off by the violent action of the powerful muſcle, which is attached to it.

The following deſcription of the ſymptoms of this fracture will enable any practitioner to detect what has happened with equal eaſe and certainty. The contraction of the triceps, being no longer reſiſted by any connection with the main portion of the ulna, this muſcle pulls upward the ſmall piece of bone broken off, ſo as to produce an interſpace between ſuch fragment and the reſt of the bone. The interſpace is ſituated at the back part of the joint, and may be increaſed, or diminiſhed, by ſimply augmenting the bent, or extended ſtate of the fore-arm. The patient cannot ſpontaneouſly extend his fore-arm, owing to the connection of the triceps with the ulna being deſtroyed. Whether the anconæus alone may be adequate to accompliſh this motion in certain examples, we will not take upon us to decide; but, certain it is, the fore-arm is always found in a half-bent ſtate, in conſequence of the flexor muſcles not having any conſiderable antagoniſt. The detached portion of the olecranon becomes drawn higher up than the condyles of the os humeri, whereas, in the natural ſtate, the latter proceſſes are ſituated higher than the point of the olecranon, when the fore-arm is in a ſtate of half-flexion. The fragment of bone may be moved in any direction, without any motion being imparted to the ulna. When the fore-arm is extended, and the ſurgeon puſhes down the retracted piece of bone, a grating or crepitus generally admits of being felt.

We may alſo remark, that this accident, like moſt other fractures, is attended with a good deal of pain, and the ſoft parts ſoon become affected with conſiderable ſwelling.

In the Pariſian Chirurgical Journal, vol. i. are ſome obſervations on the Treatment of the Fractures of the Olecranon: ſome of theſe we ſhall take the liberty of introducing into this work.

The ancients have tranſmitted to us nothing on fractures of the olecranon, unleſs we admit that Paulus Eginetus has made alluſion to them in the following paſſage: "Cubitus frangitur—circa partem ad cubiti gibbum." (De Re Medicâ, lib. 6. cap. 100.) The moderns, and even Petit himſelf, have not diſtinguiſhed this from other fractures of the ulna. The majority of practitioners, miſled by a falſe theory, and perſuaded that loſs of motion was neceſſarily conſequent to all fractures, connected with the articulations, did not even attempt its reduction. They kept the arm in a ſling in a flex poſition, in order that the anchyloſis might be as little inconvenient as poſſible. And what tended to confirm them in their error was, that the powers of extenſion were totally loſt by the obſervance of the extended poſition, and in conſequence of the muſcles remaining for ſuch a length of time in a ſtate of inaction.

Duverney is the firſt who has propoſed a methodical treatment for this accident. (Mal. des Oſ. tom. i. p. 325.) This fracture, he ſays, is to be diſtinguiſhed by the circumſtance of the fractured portion being drawn up by the actions of the extenſor muſcles, and the impoſſibility of moving the fore-arm, which reſts hanging by the ſide of the body. He accompliſhes the reduction by extending the fore-arm, puſhing down the proceſs of the olecranon with his thumbs, and retaining it in this ſituation by means of a thick narrow compreſs placed above the fracture. A circular compreſs, and a bandage like that uſed in bleeding, are then applied over the former application. The limb, ſlightly bent, was next laid on a pillow; and, at the expiration of a few days, an endeavour was made to prevent an anchyloſis by gentle and repeated motion.

M. David attributes the anchyloſis, which often followed fractures of the olecranon, to the ignorance of the ſurgeon Reſt and extenſion, he thinks, eſſentially neceſſary to the reunion; but as ſoon as this has taken place, which is generally about the twenty-fifth day, he recommends the arm to be gently moved, and this motion to be increaſed every day.

He obſerves, alſo, that if the arm be extended too much, the extremity of the ulna will be forced in, and the union will either be imperfect, or the motions of the joint attended with difficulty. Diſſert. ſur les Effets du Mouvement, &c. p. 63, &c.

It is ſtated in the Pariſian Chirurgical Journal, that, before the time of its publication, the ſubject of fractures of the olecranon had not been duly conſidered. Duverney's method was ſubject to many inconveniences: his compreſſes, bandages, &c. could eaſily be diſplaced; and he applied nothing to prevent the flexion of the fore-arm. When the bandage was too looſe, the olecranon could not be retained in its ſituation; and when it was too tight, much ſwelling was induced.

The following was Default's plan, which does not materially differ from the mode followed in this country, and appears to us judicious and deſerving of imitation.

While the aſſiſtants extend the fore-arm, one turn of a ſingle-headed roller, moiſtened with the ſaturnine lotion, is to be applied round the wriſt, and continued over the whole fore-arm as high as the bend of the elbow. The fractured olecranon is to be drawn down towards the ulna, while the ſkin is pulled upward by an aſſiſtant, ſo as to prevent it from being wrinkled. When this caution is overlooked, ſome folds of the integuments are apt to get between the diſunited parts, and prove an impediment to the re-union. When the finger is removed, which is employed for preſſing the olecranon againſt the ulna, the fragment of bone is to be kept in its proper ſituation by a turn of the roller, which is to be carried from the upper and front part of the fore-arm above the elbow, and then on the inſide of the limb. The roller is now to be reflected back again on the anterior part of the fore-arm, ſo as to make a bandage in the ſhape of a figure of eight, ſimilar to what is uſed after bleeding. The application of the roller is to be continued as high as the upper part of the arm, where it is to be fixed by a circular turn.

A ſtrong ſplint is next applied to the whole length of the arm and fore-arm. The inſtrument is to be a little bent at the joint, in order to prevent the complete extenſion of the fore-arm; by which means, according to Default, the end of the fractured ulna would be forced into the cavity of the olecranon, and puſhed more forward than the other fragments, ſo as to render the union irregular.

The ſplint is to be retained with the reſt of the roller, and the limb laid on a pillow, in ſuch a way that the preſſure may be every where equal.

When the bandage grows ſlack, in conſequence of the ſubſidence of the ſwelling, it is to be taken off and re-applied.

At the end of three weeks, the ſplint may be left off, and a roller alone uſed for keeping the limb extended a few days longer. All bandages may now be omitted, and the ſurgeon ſhould accuſtom the patient to bend and extend the joint for a certain time every day.

We have never ſeen any ill effects ariſe from keeping the fore-arm quite extended; but, ſhould it be deemed proper to keep the limb a little bent, and ſhould no ſplint like that recommended by Default be at hand, the ſurgeon might make a ſtraight one anſwer the purpoſe, by filling up the ſpace under the middle of the ſplint, in front of the elbow-joint, with a proper-ſhaped pad, made with tow, or any other ſoft material.

It ſometimes happens, that one of the bones of the fore-arm is broken, together with the olecranon; and, as it is uſual to bend the limb in the treatment of the firſt injury, and extend the arm for the cure of the ſecond, the practitioner may be thrown into embarraſſment by meeting with a caſe of this deſcription.

The matter, however, is very ſimple. Bending the arm is not eſſential for the cure of fractures of the radius or ulna, but is abſolutely requiſite for uniting the broken olecranon, ſo as to prevent future lameneſs. Hence, the proper method is to keep the limb in a ſtraight poſition, and pay attention to both accidents. We have, in this manner, cured a caſe of fractured olecranon and radius with the utmoſt ſucceſs. It ſhould alſo be noticed, that this practice was what the eminent Default was in the habit of following, and adviſing in his lectures.

Fractures of the Fore-arm.

The fore-arm is particularly often the ſituation of fractures; and this circumſtance is aſcribable both to the way in which the radius and ulna are expoſed to direct external violence, and to the manner in which every force applied to the hand is tranſmitted to the former of theſe bones. Hence it happens, that fractures of the radius are much more frequent than thoſe of the ulna; but the conjoined number of theſe accidents, with regard to the two bones, appears, from a comparative table kept at the Hôtel-Dieu, in the time of Default, to equal, or rather exceed, the number of fractures affecting any other part of the body.

In ſome inſtances, we find both the bones of the fore-arm broken together; while, on other occaſions, only one bone is injured.

Fractures of both Bones of the Fore-arm.

The accident may take place near the elbow, or wriſt, or at the central part of the limb. The latter ſituation is that in which fractures happen moſt frequently; they alſo often occur towards the wriſt, but ſeldom near the bend of the arm. In this laſt ſituation, the thickneſs and ſtrength of the ulna, and the manner in which the bones are covered and protected by numerous muſcles, neceſſarily render the accident uncommon. We do not wiſh, however, to make the reader imagine that the upper part of the fore-arm is totally out of the danger of fractures. It has, indeed, never been our lot to meet with an example, in which the radius and ulna have been broken together, in this high ſituation; but there can be no doubt that ſuch an accident is poſſible, and might ariſe from the paſſage of the wheel of a cart or carriage over the limb. We have, in two or three inſtances, ſeen the upper end of the radius broken off.

When both the bones of the fore-arm are fractured, the ſolution of continuity generally runs in the ſame line. However, this is not invariably the caſe.

It does not often happen that fractures of this part of the body are either compound or comminuted. Both kinds of caſes may preſent themſelves in a large field of practice; but ſurgeons of circumſcribed experience are not very likely to meet with them. Default had under his care a patient, whoſe radius and ulna were both broken in two places, by the paſſage of a cart-wheel over the limb: the deformity remaining after the cure was exceedingly trivial.

A fracture of both bones of the fore-arm is generally occaſioned by ſuch a force as operates directly on the broken part. The accident hardly ever originates from a fall on the hand; in which occurrence, the external violence generally only affects the radius, which alone becomes fractured.

Fractures of the radius and ulna together are very eaſily diſtinguiſhed. The ſurgeon finds the limb capable of being bent at a part, which was previouſly firm, ſtraight, and unyielding.

unyielding. On taking hold of the limb, he readily feels a crepitus, or grating of the ends of the fracture. In certain caſes, there is a manifeſt depreſſion where the ſolution of continuity has happened; in other inſtances, a prominence formed by the extremities of the fracture. Handling and moving the injured part excite a ſevere degree of pain. The patient is unable to execute the pronation and ſupination of the hand, and is almoſt always found with his elbow-joint half bent.

A miſtake may indeed be made, when both bones are fractured very near the wriſt; in which ſort of caſe, the practitioner may erroneouſly conclude that there is a diſlocation. The way to avoid forming a wrong judgment is to pay attention to the ſituation of the ſtyloid proceſſes, in relation to the deformity. When they are above it, and remain motionleſs on moving the carpus, the caſe is a diſlocation; when they are below the deformed part, and move about with the hand and wriſt, the accident is a fracture. In the latter inſtance, alſo, a crepitus may generally be felt, and the injured part is more moveable than in the example of a luxation.

The deformity attendant on fractures of both bones of the fore-arm can never take place, in any very conſiderable degree, in the longitudinal direction. The manner in which the interoſſeous ligament is connected with the four ends of the fracture, forms an impediment to any material ſhortening of the fore-arm. A tranſverſe kind of deformity is apt to occur, which ariſes from the ends of the broken bones inclining towards the centre of the limb, ſo as to leſſen the breadth of, what might be called, the interoſſeous ſpace.

What the French ſurgeons name an angular deformity is alſo produced, either forward or backward, according to the direction of the force which occaſioned the fracture.

The treatment of a fracture of both bones of the fore-arm is to be conducted in the following manner: The ſurgeon is, in the firſt place, to bend the fore-arm to a right angle with the arm, and put the hand in the middle ſtate between pronation and ſupination. An aſſiſtant is now to take hold of the patient's four fingers, and make the neceſſary degree of extenſion; while another aſſiſtant makes the requiſite counter-extenſion, by fixing the lower part of the os brachii with both his hands. The ſurgeon ſhould now endeavour to put the ends of the fracture in an even ſtate of coaptation; and, above all things, he ſhould try to reſtore the due width of the interoſſeous ſpace, by gently preſſing the ſoft parts into it.

We have to remark on this ſubject, that fractures of the fore-arm may generally be ſet with great facility, and without the exertion of much force in the extenſion.

Engliſh practitioners, as ſoon as they have reduced the fracture, next put a piece of ſoap-plaſter round the injured part, and then apply a roller to the fore-arm, from the hand to the elbow.

In all caſes in which the radius is broken, a roller ought never to be put on with tightneſs, becauſe the preſſure can be of no ſervice, and may do irremediable miſchief, by forcing inwards the extremities of the fractured radius towards the interoſſeous ſpace. Thus the bone may be made to unite in a very deformed way, and the pronation and ſupination of the hand may be utterly deſtroyed.

The fracture having been put in a ſtate of coaptation, and a piece of the emplaſtrum ſaponis applied together with a roller, the next object is to place the fore-arm in ſplints, ſo as to preſerve the broken bones in their right poſition until they have grown together again. The practitioner taking care to have the ends of the fracture as evenly in contact as poſſible, is to apply two ſplints; one is to extend from the bend of the arm to the middle of the fingers, the other is to reach from the outer part of the elbow to the ends of the metacarpal bones. Both theſe inſtruments are to be lined with pads of ſoft materials. What are termed jointed ſplints are not eligible for fractures of the fore-arm, becauſe they tend to preſs the broken bones too much towards the centre of the limb, ſo as to diminiſh the interoſſeous ſpace.

We muſt alſo caution ſurgeons not to employ too long a ſplint on the inſide of the arm; for experience proves that when the fingers are kept completely extended during the whole treatment, they are ſometimes a very conſiderable time in regaining a freedom of motion. The beſt plan is not to let the ſplint extend further than the point above ſpecified, and the fingers will then naturally continue a little bent. When the ſplints have been arranged, they are to be fixed in their reſpective ſituations with a roller, which executes this office much more ſecurely than pieces of tape.

Laſtly, the fore-arm is to be placed in a ſling, which ſhould always ſupport the limb from the elbow to the extremities of the fingers. Although every perſon, whether a ſurgeon or not, fancies himſelf capable of putting on a ſling, the fact is, that many practitioners of extenſive buſineſs are groſsly ignorant of the proper way in which this common and moſt uſeful bandage ought to be arranged. We daily ſee people with broken arms, ſprains of the wriſt, whitlows, &c. walking about the metropolis with ſlings, which juſt ſupport the hand, and leave all the reſt of the limb ſwinging and moving about. Since all the foregoing caſes demand quietude, the neglect to make the ſling ſupport the limb equally from the elbow to the fingers muſt be productive of ſerious harm, independently of the irkſomeneſs which a patient always feels, who has his fore-arm kept for a long while in a ſlovenly bandage of this deſcription.

Fractures of the Radius.

The radius is much more frequently broken than the ulna, on account of its ſituation expoſing it more to external violence, and its having to bear all the ſhocks communicated to the hand.

When a perſon has fallen with his hand upon the ground with conſiderable violence, and immediately afterwards experiences an inability of performing the pronation and ſupination of the hand, there is great reaſon for ſuſpecting that the radius is fractured. The ſurgeon however may eaſily aſcertain the accident by examining the courſe of the radius with his fingers; or, by laying the fingers of his left hand on the upper part, or middle of this bone, while with his right hand he moves the hand and lower portion of the ſame bone alternately in the prone and ſupine direction, ſo as to make the ends of the fracture rub againſt each other, and give the ſenſation of a crepitus or grating.

The diagnoſis in moſt fractures of the radius is plain and eaſy. However, a little obſcurity is apt to prevail, when the bone is broken very high up near its tubercle, becauſe here the fracture lies under the muſcles ariſing from the external condyle. In order to detect the accident, the beſt plan which the practitioner can follow in this circumſtance, is to place his thumb juſt under the external condyle of the os humeri, upon the upper round head of the radius, and then move the hand in the prone and ſupine directions. When the head of the bone continues motionleſs on making the experiment, and the patient complains of a good deal of pain, the ſurgeon may be ſure that the upper part of the radius is fractured. A crepitus alſo may generally be diſtinguiſhed.

Fractures of the radius can hardly be diſplaced in the longitudinal direction, on account of the manner in which the ends of the bone are attached to the ulna by means of the interoſſeous ligament. The derangement is commonly of the tranſverſe kind, which conſiſts of an approximation of the ends of the fracture to the ulna.

In fractures of the radius, it is obſerved, that the hand falls prone with much pain, becauſe the weight of this part of the limb makes the carpal bones and lower head of the radius turn on the ſmall head of the ulna, while the upper portion of the broken bone remains motionleſs, the ends of the fracture conſequently becoming ſeparated, and the ſoft parts injured. C. Bell's Operative Surgery, p. 184. vol. ii.

Fractures of the radius are to be treated in the ſame manner as fractures of both bones of the fore-arm. An endeavour muſt be made to keep the ends of the bone from inclining too much towards the centre of the limb. The fore-arm ſhould be put in the mid-ſtate between pronation and ſupination; and particular care ought always to be taken to employ an inner ſplint of ſufficient length to reach the fingers, keep the hand ſteady, and hinder it from falling into the prone poſition.

Fractures of the Ulna.

Fractures of this bone are much leſs common than thoſe of the radius, and are generally produced by direct violence, that is to ſay, by a blow, a kick, or a fall on the part. The radius, we know, is often broken by a force which is applied to the hand, but when the ulna is fractured, the accident is almoſt always produced by ſome violence which is applied immediately to the injured bone.

The lower end of the ulna is moſt liable to be broken, becauſe it is the moſt ſlender, and the leaſt covered with fleſh.

Fractures of the ulna are not apt to be ſo materially diſplaced as thoſe of the radius. The diagnoſis is alſo not ſo plain as in the latter caſes, and indeed when the ſolution of continuity is towards the elbow, great attention is required to diſcover what has happened. The ſurgeon ſhould trace with his fingers the ſuperficial parts of the bone, in order to find out whether there is any irregularity, and he ſhould preſs with his two thumbs above and below any ſuſpected point, for the purpoſe of feeling a crepitus.

The upper part of the ulna is never diſplaced, the lower one alone can be ſo.

A very little extenſion is generally requiſite for the reduction of either a fractured radius or ulna.

The treatment reſembles what has been adviſed for caſes in which the two bones are broken together.

Fractures of the Carpus, Metacarpus, Fingers, and Thumb.

The ſhape of the carpal bones, and the great quantity of cartilage which is placed around them, are circumſtances rendering them little liable to be broken, except by the effect of fire-arms, and by ſuch external violence as cruſhes theſe bones, as it were, and does infinite miſchief to the ſoft parts.

The metacarpal bones are alſo not frequently fractured; but the accident is every now and then met with in practice.

With reſpect to the treatment of fractures of the carpus, we have little to ſay, becauſe the injury of the bones is of much leſs importance than that miſchief, which the ſoft parts have generally ſuſtained from the violence which produced the accident. Amputation will ſometimes be more proper than any attempt to ſave the limb. In other caſes the fore-arm and hand may be laid on a flat ſplint, lined with a ſoft pad. The wound muſt be dreſſed or poulticed according to circumſtances, and the limb kept quiet in a ſling.

When any of the metacarpal bones are fractured, a cuſhion or pad ſhould be placed in the hollow of the palm of the hand and fingers. A roller is then to be applied from the fore-arm down over the wriſt, the hand, and the pad.

The fingers are alſo liable to fractures. Theſe caſes, under proper treatment, generally terminate very favourably, without leaving behind the leaſt impairment of the parts. After putting the pieces of bone into as even a ſtate as circumſtances will allow, the ſurgeon ſhould take ſome paſteboard ſoftened in vinegar, and accurately encloſe the broken part in it. Some tape may then be applied for the purpoſe of retaining the paſteboard in the proper place. Certain ſurgeons next lay the hand and fingers on a flat ſplint, and put on a roller, ſo as to keep the parts from moving. The fore-arm and hand ſhould be put in a ſling.

After ten or twelve days, the applications ſhould be taken off every day, and the finger bent and extended a certain number of times, in order to prevent anchyloſis.

At the end of three weeks, the paſteboard, bandages, and ſplint may be diſuſed.

In regard to fractures of the thumb, we need only remark, that they are very eaſily detected, and demand the ſame treatment as ſimilar injuries of the fingers.

We have ſeen a fracture of the metacarpal bone of the thumb. The accident occurred to a porter, who fell backward with a load. The hand was kept on a finger-ſplint, on which was put a tow-pad of ſufficient ſize to fill the hollow of the palm. A piece of the emplaſtrum ſaponis was put over the injured part, the limb was confined on the ſplint with a common roller, and the fore-arm and hand kept at reſt in a ſling.

The caſe united very favourably, but the union was not firm before the end of a month.

Fractures of the Thigh-bone.

The os femoris may be broken at any point, from its condyles below, to its round head above. However, experience evinces that by far the greateſt number of fractures happen to the middle third of the bone.

Fractures of the thigh-bone are divided by writers into ſimple and compound, comminuted and complicated, tranſverſe and oblique, &c.

It was an obſervation made by Petit, that the os femoris was much leſs frequently broken into ſeveral pieces than other more ſuperficial bones. We may alſo remark that compound fractures of the thigh, like comminuted ones, are by no means common caſes.

The tranſverſe and oblique directions of the ſolution of continuity are circumſtances which make a material difference in the degree of difficulty attending the treatment, as the reader will preſently underſtand. Tranſverſe fractures are by far the leaſt troubleſome to unite, without any deformity being occaſioned.

The ſymptoms and changes produced in the limb by a fracture of the thigh-bone, are of the following deſcription. A very ſevere pain in the ſituation of the injury greatly exaſperated when the muſcles are ſeized with violent involuntary contractions, or when the member is at all moved by the ſurgeon. Such pain is no doubt excited by the manner in which the rough, ſharp ends of the fracture muſt irritate and injure the ſurrounding ſoft parts. The practitioner may uſually feel a plain crepitus on bringing the extremities of the fracture into contact, and then moving them. He alſo

may

may generally ſee that a part of the limb bends, which naturally is quite firm and inflexible.

However, the principal changes, reſulting from the ſolution of continuity of the bone, are four ſpecies of deformity affecting the limb.

The firſt kind is that which ſhortens the member, and is called longitudinal. It takes place in conſequence of the aſcent of the lower portion of the broken bone, behind the upper piece, in the direction towards the tuberoſity of the ilium. This riſing of the lower piece of the os femoris is immediately cauſed by the contraction of ſuch muſcles as originate from the bones of the pelvis, and are inſerted into ſome part of the limb below the fracture. Computing that the majority of theſe accidents affect the middle third of the bone, it follows that the chief muſcles in queſtion are the triceps, ſemi-membranoſus, ſemi-tendinoſus, biceps, rectus, gracilis, and ſartorius, moſt of the other powers, deſtined to move the thigh bone, being attached to it much above the place where moſt fractures are ſituated.

However, when the fracture happens higher up than the common ſituation, an additional number of muſcles, and a larger quantity of muſcular fibres can act upon the portion of the os femoris below the fracture, ſo as to draw up the leg, knee, and lower part of the thigh with a proportionate increaſe of force. Hence it happens, when fractures of the thigh are high up the bone, there is always more ſhortening of the limb, and the ſurgeon experiences more difficulty in preventing this effect than in other inſtances.

It muſt be obvious, alſo, to every one endued with common ſenſe and an ordinary degree of reflection, that, as the ſurfaces of oblique fractures do not, like thoſe of tranſverſe ones, mutually reſiſt the paſſage of one beyond the other, but glide over each other as ſoon as the muſcles having the above-deſcribed power begin to act, oblique fractures muſt always be much more ſubject than tranſverſe ones to a ſhortening of the limb.

That the muſcles do occaſion the aſcent of the lower portion of the broken bone, muſt be manifeſt to every body who knows that the bones are paſſive parts, capable of no motion of themſelves, and deſtined to be acted upon and moved by other powers. Were it neceſſary to adduce any other argument to convince the undiſcerning and ſceptical, we might advert to the caſe related in "Les Œuvres Chirurgicales de Deſault," where the os femoris was fractured in a man, whoſe lower extremities were paralytic, and conſequently, whoſe muſcles were incapable of action. As long as this ſtate continued, the limb was not at all ſhortened; but no ſooner was the palſy removed by the application of the moxa, than the muſcles reſumed their power, and the lower part of the thigh, together with the knee, leg, and foot, became drawn up towards the pelvis, as in ordinary caſes.

When the limb is placed in the ſtraight poſition, the weight of the pelvis, and the prominence of the buttocks, ſoon make the bedding ſink, in conſequence of which circumſtance, the ſurface of the bed is made to ſlope in ſuch a manner that the patient's body ſlips from above downward, and puſhes before it the upper end of the fracture.

This occurrence augments the firſt kind of deformity often attendant on oblique fractures of the thigh, by ſhortening the limb in the longitudinal direction, and tending to make the ends of the fracture ride over each other.

The ſecond ſpecies of deformity, frequently ſeen in caſes of fractured thighs, is what is termed tranſverſe. It always accompanies the longitudinal deformity; but in certain inſtances it may be preſent alone. We need hardly obſerve that the word tranſverſe here means in the direction of the diameter of the bone, from any one point of the circumference to an oppoſite correſponding one. The tranſverſe diſplacement of a fractured thigh may take place without any longitudinal deformity, when the fracture is tranſverſe, and when one end of it is carried in one direction, while the other is drawn in the oppoſite one; or when one end of the fracture continues unmoved while the other ſeparates from it. In this circumſtance, the upper end of the fracture is not, as in the firſt kind of deformity, unaffected by the contraction of the muſcles; but, by being drawn out of contact with the lower portion of the bone, in conſequence of the action of the pectineus, pſoas, iliacus internus, and upper part of the triceps, it contributes to the tranſverſe kind of deformity.

The third ſpecies of deformity, ſometimes accompanying a fracture of the thigh, is what has been named angular, becauſe the two portions of the broken bone are made to form an angle with each other. It may be produced by the violence which cauſed the fracture, the awkwardneſs of the aſſiſtants in holding the limb, or by laying the member in an improper poſture.

The fourth and laſt ſpecies of diſplacement to which fractures of the thigh-bone are liable, is what may properly be denominated rotatory, becauſe the lower piece of the broken bone is by it turned, either inward or outward, on its own axis. The rotation outward is exceedingly common, and claims the particular attention of the ſurgeon in the treatment. If it is overlooked, the patient is for ever afterwards afflicted with a diſtortion of the toes outward, a turning of the inſide of the foot forward, and a loſs of the proper uſe of the kind of tripod which is naturally conſtructed in our feet, by the os calcis and balls of the great and little toes.

We ſhall now conſider the treatment of fractured thighs, a ſubject highly intereſting, and even at this day involved in controverſies. When we inform our readers that Pott is an advocate for one plan, and Deſault for an oppoſite one; that many Engliſh ſurgeons place the limb in a bent poſition, and that all or nearly all foreign practitioners prefer the ſtraight one; it muſt be manifeſt that prejudice and error influence one ſet of partiſans or the other, as it is impoſſible that one mode of treatment ſhould be exactly as eligible as the other.

In the general remarks at the beginning of this article, we have noticed Mr. Pott's opinions reſpecting the advantages to be derived from the relaxation of the muſcles connected with broken bones. We already know that this eminent ſurgeon conceived that a broken thigh might be laid in ſuch a poſture as would relax the whole of the muſcles belonging to the injured part of the limb.

In enforcing his precepts, and endeavouring to point out what muſt beſt anſwer the purpoſe of incapacitating the muſcles from diſplacing the fracture, he obſerves: "is it not obvious that putting the limb into ſuch poſition as ſhall relax the whole ſet of muſcles belonging to or in connection with the broken bone, muſt beſt anſwer ſuch purpoſe?" Pott's works, vol. i. p. 389. edit. 1783. Alſo, in the next page, it is enquired, "what is the reaſon why no man, however ſuperficially acquainted with his art, ever finds much trouble in ſetting a fractured os humeri? Is it not becauſe both patient and ſurgeon concur in putting the arm into a ſtate of flexion, that is, into ſuch a ſtate as relaxes all the muſcles ſurrounding the broken bone?" Alſo, in page 393, Mr. Pott continues: "change of poſture muſt be the remedy, or rather the placing the limb in ſuch manner as to relax all its muſcles."

That to have all the muſcles relaxed in caſes of fractures,

would be deſirable were it alſo practicable, every one will admit; but, the poſſibility of accompliſhing it, ſo long as different muſcles have different uſes, different ſituations, and different attachments to the bones, every one muſt grant to be no more than viſionary. For inſtance, do not the patient and ſurgeon in the caſe of fractured os humeri, adverted to above, rather concur in putting the fibres of the triceps and anconeus into a ſtate of tenſion, at the ſame moment that they relax the biceps and brachialis internus? The true reaſons why a fractured arm generally unites favourably without much difficulty, might be more properly referred to circumſtances mentioned in our obſervations on this caſe.

The ſmall number of muſcles; the manner in which theſe counteract each other; the way in which the weight of the lower portion of the broken part of the limb makes a permanent, though not a conſiderable, oppoſition to the aſcent of the inferior fragment; the eaſe with which the fore-arm may be kept in a quiet ſtate, in compariſon with the difficulty of maintaining the leg in this condition during the treatment of a fractured thigh, &c. are cauſes ſatisfactorily ſhewing why there ſhould be little trouble in the cure of the former caſe, and often a great deal in the management of the latter.

We have heard ſome perſons, who do not undertake to defend the imperfect explanations of Pott, argue, that the half-bent poſition of the limb is the beſt, and that as it is the poſture which the limbs aſſume during ſleep, it is the moſt eaſy.

Richerand, in his Noſographie Chirurgicale, tom. ii. denies that the bent poſture is the leaſt irkſome; and, as far as our obſervations extend, patients always make more complaint at being compelled to lie, for a long while, in the ſame poſition on their ſide, than of being neceſſitated to continue for an equal length of time on their backs.

With regard to the queſtion, which poſition relaxes the greateſt number of muſcles capable of diſturbing the coaptation of a broken thigh, we ſhould maintain that the bent poſture effects this deſirable object. It more or leſs relaxes the triceps, ſemi-membranoſus, ſemi-tendinoſus, biceps, gracilis, and ſartorius muſcles, which can all contribute in a very powerful degree to draw up and diſplace the lower portion of the broken bone.

However, the moſt ardent advocates for the bent poſition will always be obliged to acknowledge, that it leaves a ſufficient quantity of muſcles unrelaxed, and ſtill capable of diſturbing the fracture. Hence, we are decidedly of opinion, that, eſtimating the good effects of any poſition as highly as poſſible, we ſhall always be under the neceſſity of allowing, that poſition alone will not do what Pott has repreſented, and it will never diſarm and incapacitate the muſcles ſo effectually, as to leave none capable of ſeparating the ends of the fracture.

The preceding remarks tend to the concluſion, that, without neglecting whatever benefits may be derived from poſition, we ſhould endeavour to increaſe the power of ſuch mechanical contrivances as are intended to reſiſt the action of the muſcles on a broken thigh, and are calculated to keep the ends of the fracture in a ſteady ſtate of coaptation.

We ſhall now deſcribe the manner in which Mr. Pott recommended a broken thigh to be ſet and treated. We may premiſe, that he was in the habit of making the extenſion from the lower portion of the fractured bone, in order to accompliſh the reduction. He ſtates, that the poſition of the fractured os femoris ſhould be on its outſide, reſting on the great trochanter; the patient's whole body ſhould be inclined to the ſame ſide; the knee ſhould be in a middle ſtate between perfect flexion and extenſion, or half-bent; the leg and foot, lying on their outſide, ſhould alſo be well ſupported by ſmooth pillows, and ſhould be rather higher in their level than the thigh. One very broad ſplint of deal, hollowed out, and well covered with wool, rag, or tow, ſhould be placed under the thigh, from above the trochanter, quite below the knee, and another ſomewhat ſhorter ſhould extend from the groin below the knee on the inſide, or rather in this poſture, on the upper ſide; the bandage ſhould be of the eighteen-tail kind, and when the bone has been ſet, and the thigh well placed on the pillow, it ſhould not, without neceſſity, be ever moved from it again, until the fracture is united.

Two ſplints are only enumerated by Mr. Pott. The generality of practitioners now invariably employ four. After placing the patient in the moſt eligible poſition, the neceſſary extenſion is to be made. Then the under ſplint, having upon it a broad, ſoft pad, and an eighteen-tailed bandage, is to be laid under the thigh, from the great trochanter to the outer condyle. The ſurgeon, before applying the ſoap-plaſter, and the reſt of the ſplints, muſt take care to make the fracture lie as ſmoothly as circumſtances will allow.

We find that Mr. Pott adviſes the leg and foot to be raiſed ſomewhat more than the thigh. The propriety of this advice, however, is not very intelligible. Indeed, we are decidedly of opinion, that the method is wrong, for the following reaſons. What is the kind of deformity moſt to be apprehended after a fracture of the thigh; is it not a ſhortening of the limb, accompanied with a diſtortion of the foot outward? What is the effect of raiſing the leg and foot more than the broken os femoris? Is it not to twiſt the condyles of the bone in the external direction? And muſt it not therefore be improper, becauſe tending to promote a diſtortion of the lower part of the limb outward, the very kind of deformity which ſo often lames the patient, and throws diſgrace on the art of ſurgery?

Were we to mention one particular circumſtance which is more diſadvantageous than any other, in the bent poſture, we ſhould feel inclined to ſay, it was the unconfined, or rather the moveable condition in which ſurgeons are accuſtomed to leave the leg and foot. Some contrivance ought undoubtedly to be made, with a view of fixing theſe parts in an unobjectionable poſture. Whenever they move, they diſturb the coaptation, and whenever they get out of a particular poſition, they diſtort the limb.

Some practitioners have propoſed to place fractured thighs in a bent poſition, with the patient lying upon his back. The limb is to be laid on two boards, which meet and form ſuch an angle at the back of the knee-joint as will make the thigh and leg bend in the deſired way. The boards are to have two cuſhions placed along them, and the limb is to be prevented from ſlipping to either ſide, by wooden pegs for the purpoſe. Two ſplints are now to be applied to the thigh; perhaps a third one above might alſo be proper. Mr. Charles Bell has given an account of this method in his Operative Surgery, vol. 2, and we think that the propoſal has ſufficient merit to entitle it to a fair trial in practice. We think that we remember having ſeen, ſome years ago, an apparatus which was uſed at St. Bartholomew's hoſpital, and which could be employed in any poſition of the limb, in caſes of both fractured legs and thighs.

We have next to treat of the ſtraight or extended poſition, which was that to which Deſault gave the preference, and to which recourſe is univerſally had on the continent. This plan of treatment alſo cannot be regarded as totally abandoned

abandoned in this country, there being ſome ſurgeons of eminence who ſtill put it in practice.

The reaſons aſſigned by Deſault againſt the bent poſture are the following: the difficulty of making the extenſion and counter-extenſion when the limb is ſo placed; the neceſſity of then applying them to the fractured bone itſelf, inſtead of ſome part at a diſtance from the fracture, as for example the lower part of the leg; the impoſſibility of comparing with preciſion the broken thigh with the ſound one, in order to judge of the regularity of its ſhape; the irkſomeneſs of the bent poſition when long continued; the painful preſſure made on the great trochanter; the diſturbance of the limb, whenever the patient has a motion; the difficulty of fixing the leg ſo ſteadily as to prevent it from moving and diſplacing the fracture of the thigh; the utter impoſſibility of adopting ſuch poſture, when both thighs are fractured; finally, the plan having been attended abroad with little ſucceſs.

Deſault alſo conſiders, that what is gained by the relaxation of ſome muſcles in the bent poſition, is loſt by the tenſion of others.

Perhaps, out of the preceding reaſons, only a few could be ſelected, as carrying any material degree of validity. Theſe appear to us to be the following; the irkſomeneſs of the bent poſture in which the patient is obliged to lie, for a long while, on his ſide; the painful preſſure on the trochanter major; the moveable ſtate of the leg; the ill ſucceſs of the trials in France; the actually tenſe ſtate of certain muſcles, in a poſition which has often been called the *relaxed* one.

Deſault uſed to prefer applying the extending power to the foot, in order to have the advantage of a long lever, and to avoid preſſing and irritating the muſcles of the thigh, ſo as to make them reſiſt the reduction of the fracture with increaſed violence. This mode of making the extenſion, it is obvious, cannot be followed in the bent poſture, in which the thigh and leg are not placed in the ſame direction. However, the common reaſon aſſigned againſt making the extenſion on this principle is, that ſome of the force employed is loſt on the intervening joint, which may likewiſe be injured by the violence. With reſpect to any of the force being loſt, we could never diſcern how ſuch a circumſtance can happen; and the ample experience of Deſault has proved, that the other apprehenſion is deſtitute of foundation.

Deſault took care to put his patients with broken thighs on firm mattreſſes, which would not give way to the weight of the body, and allow a change of poſture to take place. This method is highly deſerving of imitation in all our public hoſpitals, whether the bent or the extended poſition be adopted.

Deſault maintains, that as the object of every apparatus for a fractured thigh ſhould be to keep the ends of the fracture from being diſplaced, every mechanical contrivance employed, ought to be calculated for reſiſting the cauſes producing the diſplacement. Theſe are, firſt, the action of ſuch muſcles as draw upward the lower end of the fracture; ſecondly, the weight of the trunk propelling downward the upper end. The preceding ſtatement naturally leads to the concluſion, that every apparatus for an oblique fracture of the thigh ſhould draw and keep downward the lower end of the fracture, and, at the ſame time, carry and keep upward the upper end of the fracture, and the trunk which is above it.

It is alſo explained by Deſault, that the apparatus ſhould be capable of reſiſting the rotation of the lower portion of the broken bone, which ought to be quite firm and ſteady, even in caſe the limb ſhould be ſuddenly moved.

The only few caſes in which, according to Deſault, the power of the apparatus to keep upward the pelvis and ſuperior end of the fracture, and to keep downward the inferior end, can be diſpenſed with, is, when the fracture is tranſverſe, and not at all diſplaced in the longitudinal direction of the bone.

The ſame diſtinguiſhed ſurgeon enters into a conſideration of the effect of the different pieces of the apparatus for fractured thighs, and he endeavours to ſhew, that little dependence can be put in any of the means, unleſs they are calculated to make permanent extenſion.

Bandages have all one common mode of operating; they preſs the muſcles towards the ends of the broken bone, and make them form a ſort of natural caſe for the fracture. In ſhort, bandages make a kind of lateral reſiſtance to the parts. Upon this principle, they are of material ſervice in preventing any diſplacement of the fracture ſideways, and they are moſt uſeful when the ſolution of continuity is tranſverſe. But, Deſault enquires, what is there to hinder the two inclined ſurfaces of an oblique fracture from ſlipping one over the other? What power is there to hinder the limb from receiving the effects of accidental ſhocks? Is the pelvis kept back? Is the action of the muſcles reſiſted? Deſault, indeed, admits, that the laſt object is ſomewhat fulfilled by the preſſure, and that in this operation the chief utility of the bandage conſiſts; but, he aſks, whether ſuch compreſſion will be adequate to prevent the longitudinal diſplacement of the bone, particularly when the bandage is ſlackly put on, as ſome practitioners recommend?

Theſe remarks apply alſo to compreſſes; "petit moyen contre une grande cauſe."

Splints are uſeful in firmly fixing the limb, and guarding it from the effects of accidental ſhocks, or of contractions of the muſcles. They operate more powerfully than bandages in preventing lateral derangement, and, hence, they ſuffice for tranſverſe fractures, without any permanent extenſion being employed. They can alſo reſiſt the rotation of the thigh outward, or inward. But, when the breach of continuity is oblique, will they hinder the ends of the bone from gliding over each other, and the conſequent ſhortening of the limb? They obviouſly could only do ſo, by the friction of the different pieces of the apparatus, eſpecially the tapes, which faſten it; and then, to make the reſiſtance effectual, they muſt be tied ſo tightly as to create a danger of mortification. Will the ſplints prevent the trunk from deſcending, and propelling before it the upper end of the fracture? Will they paralize the action of the muſcles on the lower end? Will they, in ſhort, fulfil all the above indications? Their uſe is almoſt limited to preventing lateral derangement, and ſteadying the limb. Hence, they ſhould extend along the leg, as well as the thigh, which is diſturbed by the motions of the lower part of the limb.

The pads are chiefly uſeful in keeping the limb from being galled by the ſplints, and tend only trivially to keep the fracture from being diſplaced.

From the above account it appears, that the ordinary pieces of apparatus, which do not execute any permanent extenſion, may perhaps ſuffice for tranſverſe fractures, which are not common; but, that they are always ineffectual, when the diviſion is oblique, becauſe they do not fulfil the two-fold indication of drawing downward the lower end of the fracture, and keeping the other one upward.

Deſault aſcertained, that the object particularly to be

aimed at, was ſuch a diſpoſition as that the foot, leg, thigh, and pelvis, ſhould conſtitute but one whole; ſo that, though the different parts thereof ſhould be drawn in different directions, yet they ſhould ſtill, with reſpect to one another, preſerve the ſame mutual relation. He invented the following apparatus to anſwer theſe purpoſes.

A ſtrong ſplint, long enough to extend from the ridge of the os ilium to a certain length beyond the ſole of the foot, is a principal part of this apparatus: this ſplint ſhould be two inches and a quarter broad, and have each of its extremities pierced in ſhape of a mortiſe, and terminated by a ſemicircular niche. It is applied on the exterior ſide of the thigh, by means of two ſtrong linen bands, each being more than a yard long.

The middle part of one of theſe bands is to be applied to the inſide of the thigh, at its upper part; its ends are brought to the exterior ſide of the thigh, paſſed through the mortiſe, and knotted on the ſemicircular niche. Compreſſes are to be previouſly placed under the middle part of the band, in order to prevent any diſagreeable preſſure; as well as on the tuberoſity of the iſchium, which Deſault conſidered as the principal point of action of this band. The inferior part of the leg is, in the next place, covered with compreſſes, on which the middle part of the ſecond band is placed: the extremities of this band are croſſed on the inſtep and upper part of the foot, then on the ſole, after which they are conveyed outward, and one end paſſed through the mortiſe and knotted with the other on the niche, with ſuch a degree of force as to pull the inferior portion of the femur downward, and to puſh the ſplint upward, and, by this means, the pelvis and ſuperior fractured portion. On the internal ſide of the limb is placed a ſecond ſplint, which extends from the ſuperior part of the thigh to a certain diſtance beyond the foot. A third is placed on the anterior part, and extends from the abdomen to the knee. The ſuperior extremities of the anterior and exterior ſplints are fixed by means of a bandage paſſed round the pelvis. A band, the middle part of which is placed under the ſole of the foot, and the extremities croſſed on its ſuperior ſurface, and faſtened to the ſplints, prevents the motion of the foot, as do alſo the ſplints.

Before applying the apparatus, the whole limb is to be covered with compreſſes, wet with a ſolution of the acetite of lead. Over theſe, Scultetus's bandage is to be put, and a roller round the foot, all moiſtened in the ſame manner.

It ſhould be obſerved, that Scultetus's bandage was made on the ſame plan as the eighteen-tailed one. It conſiſted of an indeterminate number of diſtinct bands, three inches in width, and of a ſufficient length to paſs twice round the limb. It ſhould be applied from below upwards, in ſuch a manner, that two-thirds of the width of one fold may be covered by the ſucceeding one.

Fractures of the inferior Extremity of the Thigh, with Separation of the Condyles.

Some caſes of this deſcription are related in the Pariſian Chirurgical Journal. In one inſtance, the accident was produced by the kick of a horſe on the internal condyle of the left femur. The pain was ſo great, that the patient was obliged to ſit down on ſome ſtraw that happened to be near him. He reached home, leaping on his right foot; which exertion greatly increaſed the pain, in conſequence of the motion making the lower part of the thigh ſwing backward and forward.

The following were the ſymptoms which were noticed: The thigh was found bent, and conſiderably ſhortened; there was not much ſwelling about the knee, but ſome contuſion and ecchymoſis. The joint, when looked at tranſverſely, had a ſtretched appearance, and was more flattened from before backward than the oppoſite knee. The patella did not project ſo much as in its natural ſtate, and, when preſſed, ſunk between the condyles; and, on preſſing the condyles together, was raiſed. The condyles admitted of motion on each other, could be ſeparated or moved in every direction, and were accompanied with a crepitus.

Theſe circumſtances evidently proved that there was a longitudinal fracture of the condyles. The body of the femur was alſo fractured above, an oblique ſolution of continuity deſcending in an oblique direction from about five inches above the external to within two inches of the internal condyle.

The ſtrong action of the muſcles of the thigh had drawn upwards that portion of the femur which was connected with the external condyle, and the upper portion of the bone had deſcended. The pointed edge of the latter piece had made a wound in the integuments, an inch and a half in length, on the inſide of the thigh a little above the condyle.

The patient was put on a ſtraw-bed, with a hard mattreſs underneath. Deſault obſerves, that it was formerly the cuſtom in the Hôtel Dieu to uſe feather as well as ſtraw-beds; but, from the inconveniences ariſing from their heat, and their yielding unequally in caſes of fracture, their uſe is now diſcontinued, and hard mattreſſes ſubſtituted in their room. The dreſſings having been previouſly diſpoſed on the bed, the ſurgeon proceeded to examine the wound; and, after diſengaging a piece of ſplintered bone, he proceeded to reduce the fractures in the following manner.

The counter-extenſion was made by fixing the patient to the head of the bed by proper bandages; and, whilſt one aſſiſtant ſupported him under the axilla, a ſecond kept up an extenſion, by laying hold of the foot with one hand and the heel with the other, whilſt other aſſiſtants ſupported the pelvis and the ſuperior part of the limb, to prevent the parts being ſhaken. A little inconvenience was experienced from the contraction of the muſcles during the extenſion, and the bones were brought in a ſtate of appoſition without any difficulty.

The parts were maintained in their ſituation by two circular compreſſes, and by a bandage, ſimilar to that of Scultetus; and the inequalities of the limb filled up with coarſe linen. The whole was ſupported by two ſtrong ſplints unequal in their length and about three inches in width, and covered with *drap fanon*.

The dreſſings, as before obſerved, being diſpoſed on the bed, were placed on the limb; they were wet with the aq. veg. and applied in the following manner: whilſt the extenſion was kept up by aſſiſtants, the two circular compreſſes were made to croſs each other forwards, one on the knee and the other on the inferior part of the thigh. The bandage was then applied from the ſuperior part of the leg to the upper part of the thigh: the ſides were then filled up as before with ſoft linen. The ſplints were then applied, one on the inſide, and the other externally, in ſuch a manner that the preſſure ſhould be equal at all points. The edges of the *drap fanon* were then brought over the limb, and properly ſecured by means of tapes; care was taken to tighten them ſufficiently near the fractured parts, and to tie the knots on the outſide of the ſplints, to prevent the inconvenience of preſſure. The ſplints deſcended ſufficiently low to be on a level with the ſole of the foot, but the outſide

ſplint

ſplint was conſiderably longer, and reached as high as the criſta of the ilium, whilſt the internal one extended only to the ſuperior part of the thigh. The upper end of the outſide ſplint was tied with a napkin round the pelvis, and properly ſecured by pins. In this manner the fragments of the bone were retained; but, in a fracture ſo complicated and oblique, little hope was entertained that it could poſſibly reſiſt the effect of muſcular contraction.

In the Hôtel Dieu, means have been ſucceſsfully employed to counteract the effect of the contraction of muſcles in caſes of fracture. Deſault here ſpeaks of permanent extenſion; a method reprobated by the generality of practitioners, as ſubject to inconveniences, which Deſault remarks he has never obſerved in the very conſiderable number of patients ſubmitted to the trial.

The patient was already ſo fixed to the head of the bed, by proper bandages round the body and under the axilla, that the trunk could not deſcend. The indication then left was to prevent the thigh bending on the pelvis; which was eaſily effected, by placing thick compreſſes behind the thigh, and paſſing, above the malleoli, the middle of a bandage, the ends of which were croſſed on the back of the foot, then tied at the ſole, and fixed to the foot-board of the bed.

This extenſion, ſo far from producing inconvenience to the patient, afforded him inſtant eaſe. He was fatigued from the jolting he experienced in his way to the hoſpital, but was free from fever: no medicine but a diluting ptiſan was ordered, and he was left to enjoy his reſt, which he ſtood much in need of. The next day, his ſymptoms, in every particular, were remarkably mild; it was only neceſſary to regulate his diet, and to keep the parts moiſt with the aq. veg. The day after, the ſame plan was obſerved; but, on the fourth day, the looſeneſs of the bandage, from the diminution of the ſwelling, rendered its re-application neceſſary. Suppuration began to take place in the wound: it was dreſſed in the ſame way as on the firſt day, and the dreſſings were re-applied with the ſame precautions.

The wound was dreſſed every two days till the ſixteenth, when it was cicatrized. Afterwards, the dreſſings were not renewed but when they were looſe. The parts were kept conſtantly moiſt with the aq. veg. and care was taken that the bandages, which procured the extenſion, were kept always tight.

The bandages, &c. were not totally left off till the ſeventy-fifth day, though the callus was ſufficiently firm ſome time before that period: all the fragments were united without deformity, and the thigh, within a few lines, was as long as the one on the oppoſite ſide; but the ſoft parts, round the articulation, were conſiderably thickened, and the patella ſeemed to form one piece with the femur.

Notwithſtanding this, the motion of the limb was ſoon reſtored, by bending and extending alternately the leg or the thigh, by means of a cuſhion, which, one day, was placed under the ham, and, the next day, under the leg; and by moving the patella, by means of the fingers, in every poſſible direction. The patient was ſoon capable of exerciſing it himſelf, and was able to walk with the aſſiſtance of crutches. The ſtiffneſs of the joint ſoon ſubſided, and, in three weeks, he was capable of bending, at a right angle, the leg on the thigh. He was diſcharged from the hoſpital at this time, with a certain aſſurance of ſoon recovering, by means of exerciſe, the perfect uſe of his joint. Pariſian Chirurgical Journal, vol. i.

Fractures of the Neck of the Thigh-bone.

Theſe caſes are generally conſidered as the moſt troubleſome fractures to which the os femoris is liable. The high ſituation of the ſolution of continuity in the bone confers on a vaſt number of muſcles the power of drawing upward the thigh, the knee, the leg, and the foot. When the bone is broken about the middle, we know that ſome of the triceps, together with the rectus, biceps, ſemi-membranoſus, ſemi-tendinoſus, gracilis, and ſartorius, has the power of pulling up the lower portion of the bone towards the pelvis; but, when the neck of the os femoris is fractured, a multitude of other muſcles alſo acquire this power, as, for inſtance, the upper part of the triceps, the pectinalis, the pſoas magnus, iliacus internus, and many others inſerted into the great trochanter.

A fracture of the neck of the thigh-bone is generally occaſioned by a fall on the great trochanter; but the accident may ariſe from a fall either on the knee or ſole of the foot.

The ſolution of continuity may happen either at the middle of the neck, where the neck joins the head of the bone, or, laſtly, where the neck unites with the great trochanter. In the laſt caſe, the fracture is ſituated on the outſide of the orbicular ligament of the joint.

The trochanter major itſelf is ſometimes broken off, at the ſame time that the neck of the bone is fractured.

In the majority of inſtances, the ſolution of continuity is ſaid to be tranſverſe, with reſpect to the direction of the neck of the bone. It was aſcertained by Deſault, that, in ſome caſes of this deſcription, the internal fragment is wedged in the external one; a circumſtance which is worthy of attention, becauſe it has been mentioned in explanation of the fact, which has often been noticed, of perſons walking home, after having broke the neck of the os femoris. Perhaps, this ability might, alſo, in ſome examples, be imputed to the circumſtance of the orbicular or capſular ligament of the joint remaining entire and unlacerated, while the ſolution of continuity is within it; for, it is plain, that, in this ſtate, the main portion of the thigh-bone cannot be diſplaced far upward.

The diagnoſis of fractures of the neck of the os femoris is not always eaſy. Sometimes the beſt and moſt experienced ſurgeons cannot extricate themſelves from doubt and uncertainty.

The patient always complains of acute pain on the ſlighteſt motion of the limb, and in general he becomes ſuddenly incapable of walking. The limb is ſhortened, but this change takes place in very different degrees in different examples. When the fracture occurs on the outſide of the capſular ligament; or when the fracture is on the inſide of the joint, but the ligament is lacerated; the main portion of the os femoris is likely to be drawn up to a conſiderable extent by the action of the muſcles, and, of courſe, the limb will be ſhortened in a remarkable manner. When the fracture is within the capſular ligament, and this ligament is entire, the aſcent of the thigh-bone will be materially limited and circumſcribed; and the degree of ſhortening of the limb, not being great, can only be found out by a careful compariſon of one limb with the other. Finally, when the ſolution of continuity in the neck of the bone is tranſverſe, and one fragment is locked in the other, there can be no ſhortening of the limb at all, and the patient may even be capable of walking.

The hurt limb may in general be rendered as long as the other by a moderate degree of extenſion; but, no ſooner does the ſurgeon leave off pulling, than the muſcles immediately draw the thigh upward, and ſhorten the limb again.

A ſwelling makes its appearance at the upper and front part of the thigh, proportioned in ſize to the extent to which the member is ſhortened.

When

When the limb is ſhortened, the trochanter major does not project as in the natural ſtate, but is drawn upward and backward toward the criſta of the ilium.

Deſault particularly noticed, that if the ſurgeon puts his hand on the great trochanter, and makes the limb rotate on its axis, this remarkable bony proceſs will be felt revolving on its own axis, as on a pivot, inſtead of deſcribing, as in the natural ſtate, the ſegment of a circle, of which the neck of the bone is the radius. The obſcurity attending this mode of forming a judgment will be in proportion to the nearneſs of the fracture to the head of the bone.

In almoſt all inſtances, the toes are turned outward by the action of the muſcles. Paré, Petit, and Deſault, however, have met with caſes, in which the foot has been turned inward. Perhaps, it may ſometimes happen that the weight of the limb will determine this poſition of the foot, particularly when the patient is old, debilitated, or in a faint condition.

An erroneous and pernicious doctrine has been maintained by ſome eminent men, among whom are profeſſor Ludwig, M. Sabatier, and M. Louis, that fractures of the neck of the thigh-bone cannot be cured without lameneſs and deformity. Theſe evils have been imputed to the deſtruction of the neck of the bone; a circumſtance which was thought to be unavoidable. The truth is, that lameneſs does not neceſſarily follow a fracture of the neck of the os femoris, as may be fully aſcertained by referring to the ſurgical writings of Boyer, Deſault, and Richerand. However, every man of experience will allow, that, probably in ſome very old ſubjects, no union ever takes place, and the lameneſs and deformity muſt then be irremediable.

The French ſurgeons treat fractures of the neck of the os femoris on the principle of permanent extenſion. Boyer executes this purpoſe by means of a machine with a ſcrew. Deſault, we know, was in the habit of making the permanent extenſion by means of a bandage applied to the foot. It becomes unneceſſary, however, to explain here the plan of treatment in the ſtraight poſition, as we have already ſaid enough of Deſault's apparatus in a preceding column, as well as of the principles which influenced his practice. We acknowledge the accuracy of moſt of his remarks on fractures; and we cannot refrain from expreſſing a hope, that we ſhall live to ſee ſome of his plans more extenſively tried by Engliſh practitioners.

In this country, fractures of the neck of the thigh-bone are generally treated in the bent poſition; though there are ſome ſurgeons, who put the limb in the ſtraight poſture with common ſplints.

Fractures of the Patella, Rotula, or Knee-pan.

The patella may be broken by external violence, or by a very powerful contraction of the extenſor muſcles of the leg, which are inſerted into it.

Authors ſpeak of tranſverſe, oblique, and longitudinal fractures; but, although the two firſt caſes are univerſally acknowledged, few writers admit the poſſibility of the laſt, unleſs as a conſequence of gun-ſhot wounds.

It has been remarked by M. Hevin, that a tranſverſe fracture of the patella is moſt frequently occaſioned by outward violence, while the leg is more or leſs in a ſtate of flexion; at which period, that bone is ſituated on the articular ſurface of the thigh-bone, with its two extremities firmly fixed.

The ſame kind of fracture is alſo found to be very often produced by the violent action of the extenſor muſcles of the leg, without any blow or fall upon the knee whatſoever. It is ſaid that theatrical dancers are particularly ſubject to the accident, on account of the ſtrong exertions which they are under the neceſſity of making in their various forced attitudes. Ruyſch mentions a caſe, in his Obſerv. Anat. Chir. in which the knee-pan was broken by the powerful contraction of the muſcles. He ſays, "Viſitavi cum magiſtro Petri Adriani filio, virum ſatis robuſtum, qui e ponte deſcendens, in terram ferè ceciderat; imò pede lubrico, reſiſtens tamen quantum potuit, in terram non fecerit prolapſus; ſed ab illâ reſiſtentiâ tranſverſim fracta eſt ejus patella, adeò quidem evidenter ut inter utramque partem locari potuerit manus, una enim ſuprà, altera infrà genu ſentiebatur." J. L. Petit alſo met with many fractures of the patella, which were cauſed by ſlips and efforts, without any direct application of external violence to the knee. The bone may even be broken in this way into ſeveral pieces.

It frequently happens that patients ſuppoſe the injury of the patella to ariſe from the fall, whether this is the fact or not, as they generally tumble down at the time of the accident; and the ſurgeon, without proper inquiry, would not be led to think that the accident is ſo often the mere effect of the contraction of the muſcles as it really is. The celebrated Camper firſt obſerved the fact, that very often the fall is the conſequence of the fracture, and not the fracture of the fall. By ſome cauſe or another, the line of gravity of the body is thrown backward; the muſcles in front exert themſelves to bring it forward again; the extenſors act on the patella; this breaks, and the fall follows.

Modern ſurgeons are ſo well appriſed of the circumſtance of the patella being very commonly fractured in the foregoing manner, that we are almoſt afraid of being deemed prolix for confirming the account by further facts. However, there are two inſtances, in Deſault's Œuvres Chirurgicales, deſerving inſertion on account of their being particularly ſtriking and convincing. One is the caſe of a ſoldier, who broke his patella in aiming a kick at a ſerjeant, whom, however, he miſſed. The other example is exceedingly curious: a man, on whom lithotomy had been performed, was ſeized, while in the operating theatre of the Hôtel Dieu, with moſt violent ſpaſms of his muſcles; and the extenſors of his legs, among others, acted with ſuch power, that, in the preſence of the ſpectators, they broke both the knee-pans.

In the caſes under conſideration, the pieces of the fractured bone are always more or leſs ſeparated from each other. This ſeparation is occaſioned by the contraction of the extenſor muſcles of the leg, the ſtrong tendon of which is implanted into the upper part of the patella, and even covers all the fore part of this bone in the form of an aponeuroſis. Sometimes the ſeparation is to the extent of four inches: in other examples, the interſpace is hardly perceptible, in conſequence of the patient having remained perfectly quiet from the moment of the accident, and the tendinous expanſion, which covers the patella and connects the fragments, being ſtill in an entire ſtate. Surgical writers adviſe us, in this circumſtance, to be careful not to rupture the aponeuroſis in queſtion, in examining the limb.

It ought to be underſtood, that the interſpace between the two portions of a fractured patella is not produced by a mutual and equal aſcent and deſcent of the upper and lower fragment. The upper piece may be drawn a conſiderable way upward by the action of the rectus, cruræus, and vaſti muſcles; but the lower one is capable of being acted upon by no muſcle, and can only be moved from the other by the flexion of the leg. It is on this account that the ſeparation is leaſt when the limb is extended, the upper fragment being then the only one which can be diſplaced. When the knee is bent, however, the lower fragment moves downward, at the ſame

time that the upper one is drawn upward, and, conſequently, the ſeparation muſt in this ſtate be the moſt extenſive.

Beſides the ſeparation of the two pieces of a fractured patella, there are other ſymptoms pointing out the nature of the accident. When the limb is extended, the upper fragment may be puſhed down into contact with the lower one, and a crepitus be felt on making them touch each other. The caſe is alſo attended with an inability to walk, acute pain, and a quick ſwelling of the joint.

Inſtances have occurred, in which the tendon of the extenſor muſcles has been ruptured juſt above the patella; but a more common accident is the rupture of the ligament of the patella itſelf, below this bone.

The prognoſis, generally delivered by the ancients, in regard to fractures of the patella, was very unfavourable. Ambroiſe Paré remarked that no perſon could recover from an accident of this kind, without a degree of lameneſs. Fabricius Hildanus, in ſpeaking of a man, forty years of age, who fractured the knee-pan, obſerves, "Ab initio, et ſi ex arte curatus fuiſſet æger, nihilominùs tamen dolores acutiſſimi aliaque ſymptomata ſupervenerunt. Tandem dolore reliquisque ſedatis ſymptomatibus, convaluit quidem, ſed claudicatio ac ſumma imbecilitas totius cruris ſecuta eſt, ità ut non niſi maximâ cum difficultate ambulare, et tibiam aſcendendo ſublevare poſſit."

Is it true, that the weakneſs and lameneſs of the limb proceed, as Paré deſcribes, from the callus preventing the knee from bending, and from the difficulty which the patient experiences in getting up riſing ſurfaces? Fabricius Hildanus, who deemed the foregoing opinion admiſſible, ventures, however, to expreſs a degree of doubt concerning it. "An fractâ patellâ," ſays he, "extuberantia calli talis eſſe poſſit, ut cavitatem hancce, quæ inter femur et os tibiæ magna eſt, adeò impleat ut motum actionemque genu impedire poſſit? Videmus enim, ut plurimum in reliquis oſſium fracturis, niſi contuſio oſſis et perioſtei fuerit maxima, naturam tam decenter et eleganter connectere oſſa, ut rarò relinquatur fracturæ veſtigium."

As an author in the Encyclopédie Méthodique remarks, if Fabricius Hildanus had only paid attention to the improper proceedings, followed at that time in the treatment of a broken patella, he would ſoon have diſcovered the true cauſe of the lameneſs, which was formerly a frequent conſequence of the accident. As the fragments of the bone were not put into contact, a large cartilaginous maſs was formed between them, which, not having the firmneſs of bone, permitted the two fragments to move ſeparately for the reſt of the patient's life; a circumſtance which could not fail to impair the motions of the joint. It ſhould alſo be obſerved, that ſometimes the upper fragment was drawn up almoſt as high as the point to which the extenſor muſcles could contract, ſo that, of courſe, the power of extending the leg was nearly deſtroyed.

It is true, that, in the old practice, the knee-joint was kept ſo long without motion, that an anchyloſis ſometimes enſued; but, now that practitioners adopt the plan of habituating the articulation to gentle motion, after a certain period has elapſed, this conſequence is hardly ever known.

Wander-Wiel, Ravaton, Pott, and ſome other writers, have maintained the doctrine, that a moderate interſpace between the two fragments of a broken patella was advantageous, and conducive to the perfect functions of the knee-joint after the cure. Certain it is, that, in the majority of caſes, the fragments are united by means of a ligamentous ſubſtance, inſtead of bone. But the opinion of the preceding authors ſeems to be by no means accurate. The patella is ſometimes repaired by callus, without any ill effects; and Default always found the joint more perfect, the ſmaller the interſpace between the fragments. When they were apart, he always found that the patient could not walk up riſing ſurfaces, or paſs over irregular ground, without conſiderable difficulty.

The indications, in the treatment of a fractured patella, are, firſt, to diminiſh the power of the rectus, cruræus, and vaſti muſcles, by adopting a poſition which will bring their origins and inſertions as near to each other as poſſible, and, alſo, by compreſſing the ſame muſcles with a roller applied over the thigh, from the groin to the knee.

Secondly, The lower fragment of the patella is to be put as near to the pelvis as poſſible, by extending the leg.

Thirdly, The upper fragment is to be puſhed down into contact with the lower one, and fixed in this poſition with a compreſs and a few turns of a roller.

Fourthly, The extended poſition of the limb is to be permanently maintained, by means of a long ſplint, placed either along the back or the outſide of the limb, and by laying the member on a ſurface which forms a gradual aſcent from the tuberoſity of the iſchium to the heel.

The practitioner is firſt to direct the patient to lie on his back, and enjoin him not to bend his knee in the leaſt. The leg is then to be perfectly extended, and the thigh ſomewhat bent on the pelvis. This poſture is then to be preſerved, by laying pillows under the heel, calf of the leg, and thigh. The patient's body and pelvis ſhould alſo be properly raiſed forward, ſo as to approximate the anterior inferior ſpinous proceſs of the ilium to the knee. The ſurgeon is now to apply a roller from the groin nearly down to the knee, obſerving to puſh downward the upper piece of the patella. When this has been brought into contact with the lower portion, it is to be prevented from aſcending again by laying juſt above it a little ſquare compreſs, which is to be fixed with a few turns of the roller.

Some writers have affected to think the application of a bandage to keep down the upper fragment quite uſeleſs, and even hurtful, by bringing on ſwelling, &c. However, experience has fully ſatisfied us of its utility; though we are perfectly convinced, that ſuch ſurgeons as apply another bandage, to keep up the lower fragment, adopt a very wrong and uſeleſs ſtep. For it muſt be allowed, that if the tight circles of a roller fulfil no ſurgical object, (and with reſpect to the lower fragment, which is quite fixed, they cannot,) they muſt be objectionable, on account of the manner in which they impede the freedom of the circulation in the limb.

A long ſplint, lined with a ſoft pad, is next to be applied all along the outſide of the limb; or one, ſomewhat ſhorter, may be put under the thigh and leg. This ſplint, which will ſecurely prevent all flexion of the knee, is to be fixed on with a roller.

It is a very good plan to lay the limb in a fracture box, in which a gradually aſcending ſurface is formed by pillows properly arranged.

When a broken patella is united by means of a long ligament, with the upper fragment of bone very much drawn up, the extenſor muſcles of the leg, not being able to pull the part much further upward, are deprived of a great deal of their original power. In this circumſtance Mr. Hunter uſed to adviſe the patient to ſit on a table, and exerciſe theſe muſcles, by alternately extending and bending the leg for a certain time every day. After this plan had been purſued for ſome while, Mr. Hunter recommended the patient to fix a weight on the foot. No doubt, in this way,

a patient

a patient may regain a good deal of the uſe of the weakened muſcles.

When the knee-pan is fractured by external violence, as by the kick of a horſe, it often happens that the upper fragment is not drawn upward and ſeparated, in conſequence of the parts not being ſufficiently ruptured and lacerated. In this inſtance, a bandage above the knee can anſwer no purpoſe, and, as being likely to have a bad effect on the inflammation of the joint, it ſhould not be employed. Here we muſt truſt to keeping the limb quietly extended. The chief indication is to avert the inflammation of the knee, by general and topical bleeding, the exhibition of mild ſaline purgative medicines, and the application of linen wet with the lotio aquæ lithargyri acetati to the joint itſelf.

Fractures of the Leg.

The leg is more frequently broken than the thigh; for, although it has the ſtrength of two bones, one of which is a very ſtrong one, it is greatly expoſed to external violence. When both the fibula and tibia are fractured, the patient is incapable of bearing his weight on the injured limb; but when the fibula alone is broken, progreſſion may ſtill be executed, though with difficulty and pain. When the tibia is the only bone which is fractured, the patient cannot uſe his leg; for notwithſtanding the fibula is entire, this bone is ſituated out of the centre of gravity, and is too weak to ſuſtain the weight of the body.

Fractures of both bones of the leg may be either tranſverſe or oblique.

When the fracture is diſplaced longitudinally, the lower fragments are generally drawn upwards and outwards, while the upper ones project inwards and forwards. An angular diſplacement may alſo proceed from the action of the muſcles on the back of the leg, or from the weight of the unſupported lower part of the broken limb. In either of theſe inſtances, the angle muſt be ſalient anteriorly. However, if the member be placed in the ſtraight poſition, and the heel be too much elevated, the angle may be ſalient in the direction backward. A ſpecies of diſplacement may alſo ariſe from an inclination of the foot too much inward or outward, the latter faulty poſition being that which is moſt commonly met with.

The longitudinal diſplacement can ſcarcely happen in tranſverſe fractures, becauſe the oppoſite bony ſurfaces reciprocally oppoſe the paſſage of one beyond the other. In oblique fractures, however, circumſtances are different, and the ſurfaces of the broken bones are incapable of preventing each other from gliding upwards and downwards. Hence it happens, that the lower portions of the broken bones, in caſes of oblique fractures, are generally drawn upwards by the muſcles of the calf of the leg, while the ſharp end of the upper piece of the tibia projects forwards, and may eaſily be felt under the ſkin.

Though ſuch is the common diſplacement of an oblique fracture of the leg, Boyer has explained that it is poſſible for a different appearance to preſent itſelf. It may occur, that when the ſolution of continuity runs obliquely downwards and outwards, the lower portions of the fractured bones may produce the projection forward, inſtead of the ſharp end of the upper piece of the broken tibia.

We may readily conceive how eaſy it muſt be for a ſimple fracture of the leg to be converted into a compound one, by the ſharp projecting point of bone making its way through the integuments. In fact, this circumſtance, which materially increaſes the degree of danger, is exceedingly common.

A fracture of both bones of the leg is generally attended with the following ſymptoms; acute pain, which is exaſperated by every kind of motion of the limb; an alteration in the natural figure of the member, in which a kind of angle is formed by the foot and lower fragments being drawn backwards; an inability of walking, or ſtanding on the limb; motion in the fracture, and a plain and manifeſt crepitus on handling the parts.

When the leg is fractured high up, near the knee, the ſurfaces of the tibia are ſo broad, that ſometimes no diſplacement whatever can be diſcerned. But this advantage is more than counterbalanced by the danger of the knee-joint becoming inflamed, and affected with anchyloſis, in conſequence of the accident, and long confinement requiſite for the union of the fracture. In this caſe, particular care muſt be taken to move the knee very tenderly and gently three or four times a week, after the fracture has acquired a certain degree of firmneſs.

Fractures of the Tibia alone.

When the tibia is the only bone broken, the fracture receives a conſiderable degree of ſteadineſs and ſupport from the fibula, which remains perfect, and acts like a ſplint on the limb. Indeed, fractures of the tibia, near the ankle or knee, are ſometimes by no means eaſily detected, becauſe there is no diſplacement, and the manner in which the fibula ſupports the injured bone hinders the fractured ſurfaces from moving ſufficiently on each other to communicate a diſtinct ſenſation of a crepitus. In certain examples, alſo, the degree of pain which patients have ſuffered have not deterred them from making an imperfect uſe of the limb.

In examining a tibia ſuſpected to be fractured, the ſurgeon ſhould trace the anterior ſurface of the bone, commonly called the ſhin, and its ſpine, or anterior ſharp edge. This ſhould be done for the purpoſe of aſcertaining whether any preternatural projection or inequality exiſts; for as ſuch parts of the bone are very ſuperficial, being only covered with ſkin, the leaſt irregularity becomes perceptible to the ſurgeon's fingers. When this method does not diſcover a fracture, the practitioner may put his fingers on any ſuſpected joint, and then move the ankle joint with a little freedom, by which means a crepitus will often be detected.

When the tibia is fractured alone, the accident has generally been produced by ſome violence (ſuch as a blow or kick), which has operated directly on the broken part.

Fractures of the Fibula alone.

The fibula may be broken by a fall, or a blow on the outſide of the leg, in which caſe the bone always gives way at the part to which the force is immediately applied.

Every one, who has the leaſt knowledge of anatomy, knows very well that the fibula does not bear the weight of the body, and that it can never be broken by the impetus of the body on the leg, unleſs the tibia firſt gives way. It is known to every ſtudent that the fibula extends down the outſide of the ankle-joint, and ſuch information makes it manifeſt that the fibula can only be broken by a force directly applied to it, or by a twiſt of the foot. Operative Surgery, vol. ii. p. 206.

The latter kind of caſe was one, of which the celebrated Pott took particular notice, as, when care is not taken to relax the muſcles, conſiderable trouble and difficulty occur in the treatment. It was remarked by this diſtinguiſhed ſurgical author, that when the tibia is forced from its juſt and perpendicular poſition on the aſtragalus, probably the capſular ligament, but always thoſe ſtrong ligamentous fibres, which connect the lower end of the tibia with the aſtragalus and os calcis, muſt be lacerated. Such is the caſe when the fibula breaks

breaks within two or three inches of the malleolus externus; when the inferior end of the fracture falls inward toward the tibia; when the malleolus externus is turned ſomewhat outward and upward; and the tibia, having loſt its proper ſupport, is forced off the aſtragalus inwards. To this perfect fracture, and partial diſlocation, is ſometimes added a wound in the integuments, made by the bone at the inner ankle.

Mr. Pott has ably explained, that in this example the difficulty in reducing the caſe, and maintaining the reduction, and the diſtortion of the foot upward and outward, are cauſed by the action of ſuch muſcles as have tendons paſſing behind the tibia and fibula, under the os calcis, or attached to theſe bones. Mr. Pott thought that the preſent inſtance ſerved as a ſtriking illuſtration of the utility of relaxing the powerful muſcles. If the limb be laid on its outſide, with the knee moderately bent, the muſcles forming the calf of the leg, and thoſe which paſs behind the fibula and under the os calcis, are all put, according to Mr. Pott, into a ſtate of relaxation and non-reſiſtance; all the difficulty and trouble, in general, vaniſh immediately; the foot may eaſily be placed right, the joint reduced, and, by obſerving the ſame poſition, every thing will commonly ſucceed.

In whatever manner a fracture of the fibula is occaſioned, the fragments cannot be diſplaced in the longitudinal direction. Their ends are always forced into the interoſſeous ſpace towards the tibia.

A fracture of the lower portion of the fibula may always be diſcovered with moderate eaſe, on account of the ſuperficial ſituation of this part of the bone, and the facility of feeling both a crepitus and any irregularity. When the fracture is higher up, more attention is neceſſary, becauſe the bone is here covered with a larger quantity of fleſh.

Treatment of Fractures of the Leg.

As in caſes of broken thighs, there are here two different plans of treatment; in one, the ſtraight poſition of the limb being preferred; in the other, the bent poſture. However, as the advocates for the firſt method are not in this country numerous, and the ſame apparatus and ſplints are employed in both ways, it only ſeems neceſſary to explain the mode of ſetting a fractured leg, as commonly followed by the moſt eminent Engliſh ſurgeons. At the ſame time, we wiſh it to be underſtood, that in our opinion the ſtraight poſition may occaſionally be adopted with advantage, when particular reaſons exiſt. Large abſceſſes and ſores, ſloughs, &c. on the outſide of the leg or foot, might certainly render the ſtraight poſture moſt eligible, as removing a good deal of preſſure off the diſeaſed parts, and facilitating the renewal of the dreſſings.

The powerful muſcles of the calf of the leg are to be relaxed by bending the knee and extending the foot, and the limb is to be laid in this poſition on its outſide, with the foot properly ſupported. The ſurgeon is now, with his aſſiſtants, to make whatever extenſion and counter-extenſion may be requiſite for reducing the fracture into an even ſtate of coaptation.

We cannot uſe better ſplints than thoſe employed by Mr. Sharp; only it is adviſable to have them made of tin or wood, inſtead of paſteboard, which is not well calculated for withſtanding the effect of any moiſture, diſcharge, &c. with which theſe inſtruments muſt ſometimes come into contact. Mr. Sharp's ſplints are particularly good, as in one of them a proviſion is made for the more eaſy ſupport of the foot and ankle, and there is a prolongation of the lower, or fibular ſplint, for the purpoſe of keeping the foot ſteady.

The fracture having been reduced, the ſurgeon ſhould carefully raiſe the leg a little way from the ſurface of the bed, by taking firmly hold of the limb, below and above the fracture, and elevating the broken bones together, in ſuch a way as ſhall keep both the upper and lower portions, as nearly as poſſible, on the ſame level. At this moment, an aſſiſtant ſhould put exactly under the leg the under ſplint, which has been previouſly prepared, by covering it with a ſoft pad, and laying over this an eighteen-tailed bandage. The leg is now to be gently depreſſed, till it becomes ſupported on the apparatus. The ſurgeon, before he proceeds further, ſhould once more obſerve, that the ends of the bones are evenly in contact. Being aſſured of this important point, he is to apply a piece of ſoap plaſter over the ſituation of the fracture, and lay down the tails of the bandage. Another ſoft pad, well filled with tow, is next to be put over the upper ſurface of the leg, and the other ſplint applied. The ſtraps ſhould be tight enough to make the ſplints prevent any motion of the ends of the fracture. The preſſure of theſe hard inſtruments is often exceedingly painful, and even productive of ſloughing and ulceration, unleſs the ſurgeon ſkilfully place ſoft materials between them and ſuch parts as ſeem moſt liable to be injured in this manner; for inſtance, the lower end of the fibula; the outſide and inſide of the foot; the inſide of the knee, &c.

Beſides the two ſplints and pads already mentioned, when the fracture is oblique, and the heel has a great tendency to be drawn backward, this effect may be much counteracted by applying a compreſs and longitudinal piece of paſteboard, from the lower part of the belly of the gaſtrocnemius muſcle to the heel, under the ſtraps of the other ſplints. This method prevents deformity in a very powerful manner.

When there is a great deal of contuſion of the ſoft parts, together with the injury of the bones, it is better, at firſt, to keep the leg wet with the lotion of ſal ammoniac and vinegar, by means of linen dipped in this application, and put under the ſplints. The ſplints need not be taken off every time it is neceſſary to wet the linen again; it is quite ſufficient to ſqueeze the fluid out of a ſponge into the interſpaces between the above inſtruments. Nothing is ſo prejudicial, in caſes of fractured bones, as too frequently moving the injured parts.

Mr. Pott acknowledged, that, in the fracture of the fibula only, the poſition is not of much conſequence; becauſe, by the tibia remaining entire, the figure of the leg is preſerved, and extenſion quite unneceſſary. Still even here, he contended, that laying the leg on its ſide, inſtead of on the calf, is attended with one very good conſequence, *viz.* that the confinement of the knee, in a moderately bent poſition, does not render it ſo incapable of flexion and uſe afterwards, as the ſtraight, or extended poſition of it does, and, conſequently, that the patient will be much ſooner able to walk, whoſe leg has been kept in the former poſture, than he whoſe leg has been confined in the latter.

We have juſt to remark, that when the ſtraight poſture is adopted, it is beſt to lay the limb in, what is called, a fracture-box.

Fractures of the Foot, Toes, &c.

The os calcis is now and then fractured, and, in general, by the fall of ſome conſiderable weight upon it.

When the ſoft parts, and the reſt of the foot, are ſeriouſly bruiſed and cruſhed at the ſame time, it may be more proper to perform amputation at once, than try to ſave the limb. If the miſchief, added to the fracture of the os calcis, is leſs alarming, the gaſtrocnemius and ſoleus muſcles ſhould be kept relaxed by bending the knee, and maintaining the foot extended, with the aid of compreſſes and a ſplint applied over the inſtep and front of the leg. If the integu-

ments are wounded, proper care muſt be taken to dreſs the cut part, and change the dreſſings as often as neceſſary. A roller ſhould alſo be put over the foot and leg.

The other tarſal bones cannot be fractured, without the operation of ſuch violence, as muſt infallibly cruſh a great part of the foot to pieces. In moſt of theſe inſtances amputation will be indiſpenſable; but, no more of the foot ſhould be removed than abſolutely neceſſary, as the reſt will be of infinite ſervice to the patient. It muſt be confeſſed, however, that very often the miſchief done is ſo great, that the operation muſt be ſo done as to remove the whole of the foot. The practitioner may then either operate at the ankle-joint juſt above this ſituation, or in the uſual place, a little below the inſertion of the flexor tendons of the leg, as his judgment may direct.

When the metatarſal bones, or toes, are fractured, and the ſkin is unwounded, the foot may be put on a ſplint adapted to the ſole in ſhape; a piece of the emplaſtrum ſaponis applied; and then a common roller. It is almoſt needleſs to add, the patient muſt remain in bed until the ſolution of continuity in the bone is repaired.

Boyer's Lectures on Diſeaſes of the Bones; Pariſian Chirurgical Journal; Encyclopédie Méthodique, Partie Chirurgicale; Richerand's Noſographie Chirurgicale; Cooper's Firſt Lines of Surgery, and Dictionary of Surgery; Ch. Bell's Operative Surgery; Pott's Chirurgical Works; and Les Œuvres Chirurgicales de Deſault, par Bichat.

Fracture, in *Mineralogy*. See Minerals.

FRADES, Dos, in *Geography*, a river of Braſil, which runs into the Atlantic, S. lat. 17°.

FRÆNUM, in *Anatomy*, a name given to ſuch parts as have the effect of confining the organs to which they belong. Thus there are the frænum of the tongue, and the fræna of the lips, ſee Deglutition; the frænum of the epiglottis, ſee Larynx; and the frænum of the prepuce, ſee Generation.

Frænum *Linguæ, Diviſion of*, an operation in *Surgery*, ſometimes neceſſary in order to enable infants to ſuck, and children to form the voice.

The membrane, which lines the mouth, forms underneath the tongue a kind of duplicature, by which this organ is connected with the neighbouring parts. The membranous fold, to which we have juſt now alluded, is ſometimes denominated by anatomiſts the anterior ligament of the tongue; but its common name is the frænum linguæ.

When this part extends further towards the point of the tongue, and particularly, when it is of a denſer ſtructure than ordinary, it may impede the free motion of the tongue in ſuch a manner, that the actions of ſucking, and of articulating words, will be prevented.

The method of removing this defect conſiſts of an operation which has the ſemblance of being exceedingly ſimple, ſince nothing more is requiſite, than to make a trifling cut in a part of very inconſiderable thickneſs. However, it is an undoubted truth, that, if ſuch inciſion be careleſsly performed, very bad and fatal conſequences may be induced. The ſubject, therefore, demands more attention than may be ſuppoſed.

The firſt circumſtance worthy of notice, is never to cut the frænum linguæ of new-born children, unleſs the operation be indiſpenſably neceſſary. A judgment of ſuch neceſſity cannot be formed from merely obſerving that the frænum is preternaturally diſpoſed, and that the child has ſome difficulty in getting hold of the nipple. The prejudices of ſuch perſons as have the care of children often make them find out errors of formation, which do not really exiſt; and every practitioner is frequently conſulted about infants, reputed to be tongue-tied, when there is nothing unnatural in the ſtructure and diſpoſition of the frænum linguæ.

It ſhould be well known by all ſurgeons, that there are ſeveral cauſes which may prevent a child from ſucking, without the frænum linguæ being at all concerned. When the nipple is ſo ſmall that the child cannot get it ſufficiently into its mouth, or on the contrary, when the nipple is ſo large that the infant cannot fix it in its mouth; ſome time muſt elapſe before the child can habituate itſelf to this ſtate of things. There are alſo ſome infants who put their tongues againſt the roof of the mouth, inſtead of embracing with them the lower part of the nipple. Children of this deſcription are quite unable to ſuck, notwithſtanding they poſſeſs all the requiſite conditions for the performance of ſuch function. Sabatier obſerves, that in this laſt kind of caſe, it has been found in ſome meaſure neceſſary to teach the child how to move its tongue, by preſſing this part downward and keeping it in ſuch poſition with a ſpatula, until the nipple has been put into the mouth and properly taken hold of.

An opinion may be formed, whether the infant is defective in any of the conditions requiſite for the performance of ſuction, by introducing a finger into the mouth. When the child can inſinuate its tongue under the finger, which then lies in a kind of concavity on the upper ſurface of that organ; and when the child is alſo capable of drawing its tongue back, ſo as to occaſion an empty ſpace in the forepart of the mouth, the ſurgeon may reſt aſſured, that, in the formation of the parts, there is no cauſe preventive of the action of ſucking. But when the infant is incapable of putting its tongue under the finger, and eſpecially when it is alſo unable to make a ſort of longitudinal groove on the dorſum of that organ, it becomes highly probable that the neceſſary degree of motion is prevented by the frænum, and that a diviſion of this latter part is indiſpenſable. There is no other admiſſible reaſon whatever for performing the operation; not even the apprehenſion, that the ſtate of the frænum may be a future impediment to the perfect production of the voice. For, ſhould this laſt fear be realized, the frænum may then be more ſafely divided than at an earlier period, becauſe the child will now have become more rational, more docile, and conſequently leſs apt to move about too much at the time, when the operator is engaged in making the neceſſary cut.

In ſome inſtances the frænum is found to extend too far forward, to the very point of the tongue, while, in other examples, it is obſerved not to be of ſufficient length to allow the tongue to be properly raiſed from the bottom of the mouth. The firſt kind of defect is ſaid to be that which is moſt commonly met with.

Every ſurgeon may readily inform himſelf by ocular inſpection, whether the frænum reaches along to the apex of the tongue; for, in the natural ſtate, it is well known that about a quarter of an inch of the under ſurface of the tongue, from the apex backward, is quite unconnected with the frænum. Alſo when this part, by reaſon of its ſhortneſs, ties the tongue too cloſely to the bottom of the mouth, the ſurgeon cannot raiſe the tongue to the palate with his own fingers.

The frænum linguæ is to be divided with a pair of very ſharp ſciſſars without points. The ſurgeon is to make the requiſite cut with his right hand, while the fingers of his left are employed in holding up the end of the tongue. The fingers having been found by ſome operators inconvenient on account of their thickneſs, which hinders the parts about to be divided from being well ſeen, ſome have uſed a kind of blunt fork for confining the tongue and rendering the frænum tenſe. Inſtead of ſuch an inſtrument, J. L. Petit was in the habit of employing the common director,

the handle of which was made flat, and with a fiſſure for the reception of the frænum.

Though we have mentioned theſe inſtruments, we have to remark, that modern ſurgeons univerſally prefer the uſe of the fingers of their left hand; and ſince we conſider every ſuperfluous increaſe in the number of ſurgical inſtruments as diſadvantageous to the real improvement of practice, we moſt heartily join in condemning both the blunt fork and Petit's inſtrument as totally unneceſſary.

Another method, undeſerving of recommendation, has alſo been put into practice. The ſciſſars, and one of the latter inſtruments, employed both the hands of the operator, who was obliged to get an aſſiſtant to ſupport the child's head. Now it was conceived, that the ſurgeon might be made to cut more than was required, and do miſchief, if the aſſiſtant failed in holding the head with a due degree of ſteadineſs. In order to avoid this exaggerated inconvenience, another inſtrument was invented, which was calculated for fulfilling all the indications at the ſame time. The inſtrument alluded to was a metallic ſheath, containing a biſtoury, and conſtructed with a fiſſure. The knife was retained by a mechanical contrivance on the right ſide of the fiſſure, in which the frænum was placed. On preſſing a ſort of ſtop, the blade became diſengaged, and moved with celerity acroſs the fiſſure, ſo as to cut the frænum. It was remarked by Petit, that the knife did not always do what was wiſhed, ſince the frænum ſometimes yielded, and was puſhed between the two plates of the metallic ſheath. Here it became entangled, and could not be got out without ſetting the ſpring again, a thing which the motion and crying of the child often rendered very difficult of accompliſhment. The accident depended on the very ſmall ſegment of a circle deſcribed by the knife, which, inſtead of being drawn along the part intended to be divided, as every cutting inſtrument ought to do, fell upon the frænum in a perpendicular manner. Hence Petit ſubſtituted ſciſſars for the biſtoury, and had one blade fixed on one ſide of the fiſſure, while the other blade was moveable, and kept ſeparated from its fellow by a little ſort of lock, which might eaſily be unfaſtened. On this being done, the laſt blade uſed to approach the one which was fixed, croſſing the fiſſure in which the frænum linguæ had been previouſly put.

In regard to any kind of concealed biſtoury, for the performance of the operation under conſideration, we have to ſtate that the ſurgeons of the preſent day invariably diſpenſe with all inſtruments, except a pair of very ſharp ſciſſars, without points.

Before the time of Petit, ſome bad conſequences, apt to be produced by the operation of dividing the frænum linguæ, had been little taken notice of by ſurgical authors. This eminent ſurgeon, however, had been impreſſed by experience with the knowledge of theſe dangers, and he wrote on the ſubject an intereſting paper, which is publiſhed among the Memoires de l'Academie des Sciences for the year 1742. One bad conſequence, to which we have made alluſion, is the ſuffocation of the child by the tongue turning backward. Another danger is an hemorrhage, which occaſionally follows the operation.

The frænum ſerves to confine the tongue, and keep it from being thrown too far backward in the action of deglutition. Now in the operation, if an unneceſſary, or too extenſive an inciſion be made, the tongue may be carried beyond the narrow part of the throat, and ſo engaged in the opening of the pharynx, as not to admit being brought back again into its natural ſituation. The firſt opportunity which Petit had of obſerving this event, was in a child that had died about five hours after its frænum linguæ had been divided, and whoſe body this diſtinguiſhed practitioner was requeſted to examine. Upon paſſing a finger into the child's mouth, he was ſurpriſed at not being able to feel the tongue, and at perceiving, that the poſterior opening of the mouth was completely ſtopped up by a fleſhy ſubſtance. As ſoon as an inciſion had been made through the cheeks, it became evident, that this ſubſtance was the tongue itſelf which had been thrown into the upper part of the pharynx in the effort of ſwallowing.

When M. Petit was ſent for to another infant which had fallen into a ſtate approaching to ſuffocation, about two hours after its frænum linguæ had been cut, he endeavoured to find out the cauſe of the occurrence. When he introduced his finger into the child's mouth, he found that the tongue was half diſplaced backward. There was no difficulty in reducing it; but the accident recurred ſeveral times in the courſe of the day. Petit conceived, that it was now neceſſary to have recourſe to ſome mechanical means for the prevention of the part becoming diſplaced. This purpoſe ſeemed to be anſwered by a thick compreſs, which was placed on the tongue, and retained by a band applied round the lower jaw. Whenever the child had occaſion to ſuck, the apparatus was taken off, and put on again immediately afterwards. The little patient was ſent into the country with a ſtrict injunction, that the nurſe ſhould continue for ſome time the uſe of the compreſs and bandage. The direction however having been neglected, the child was ſeized with ſymptoms of ſuffocation and died.

After the caſe, which we have juſt now cited, M. Petit met with other examples, in which children, affected in a ſimilar way, were ſaved by a perſeverance in the plan above deſcribed.

The ſecond dangerous conſequence, occaſionally reſulting from the operation of dividing the frænum linguæ, is an hemorrhage which takes place when one of the raminal arteries, or veins, is wounded. This kind of accident has long been well known, and all writers who have treated of the operation of cutting the frænum have not failed to notice it. M. Petit however has ſeen the ſame perilous occurrence take place, even when the large veſſels of the tongue were uninjured, and, of courſe, the bleeding proceeded entirely from ſuch ſmall veſſels as are diſtributed to the membrane of the frænum itſelf. The blood, which eſcapes from theſe veſſels, and collects in the child's mouth, induces the infant to make continual endeavours to ſuck, by which means the bleeding is kept up, until the weakneſs occaſioned is extreme. Several examples of ſuch hemorrhages were met with by the above ſurgeon. Unavailing attempts were made to ſtop the flow of blood by aſtringent applications, and badly contrived compreſſes. M. Petit deviſed a ſimple and effectual means of ſtopping the bleeding. The method conſiſts in taking a piece of birch, which is to be cut through below the place where two branches of equal ſize unite. The bit of birch is to reſemble a ſort of fork, the prongs of which are to be about eight lines long, and the handle four. The inſtrument is then to be covered all over with linen, and put under the tongue, in ſuch a way, that the end of the handle is to reſt againſt the middle of the concavity of the arch of the jaw, while the prongs embrace the frænum, and compreſs the bleeding veſſels. The middle of a roller is next to be applied to the dorſum of the tongue, as far back as poſſible, and the ends, after croſſing each other under the chin, are to be pinned to the child's night cap. In this manner, the veſſels are compreſſed from below upward by the prongs of the wooden fork, while the bandage makes preſſure from above downward. Thus the tongue is fixed, and the bleeding is ſtopped. De la Médecine Opératoire, par Sabatier, tom. 3.

FRAGA, in *Geography*, a town of Spain, in Aragon, on the frontries of Catalonia. This is the ancient town of the Ilergetes, called by Ptolemy Gallica Flavia, and was of conſiderable importance under the Moors, and under the kings of Aragon. It had a diſtinct king under the former; but it is now reduced to a population of about 3000 perſons. It is ſituated on the left bank, or eaſt and north of the river Cinca, which bathes its walls, between two mountains, on the ſides of which it is built. The ſtreets are narrow, crooked, hilly, and badly paved with ſharp pebbles. The houſes are badly conſtructed, and appear like huts or ruins, though many of them are decorated with armorial bearings. This town is in the dioceſe of Lerida, belonging to Catalonia, and is the reſidence of a vicar of the biſhop. It has two alcades, eight regidors, three gates, a convent of Grand Auguſtins, and two pariſh churches. A handſome quay has been lately built upon the bank of the river Cinca. This place was formerly a fortified town, and defended by a caſtle, now in ruins. It ſuſtained ſeveral ſieges under the Moors, and reſiſted the armies of Aragon in 1133 and 1134; and Alphonſo I. king of Aragon, was ſlain under its walls. Fraga was at laſt taken in 1147 by Raymond Berenger, count of Barcelona, who had aſcended the throne of Aragon, in conſequence of his marriage with Petronilla, the daughter and heireſs of king Ramirez. At the commencement of the 18th century, in 1705, it was taken by the troops of the archduke Charles, but ſhortly afterwards retaken, and ſubjected to Philip V. The Catalonian language is ſpoken at Fraga, and the manners of its inhabitants reſemble thoſe of the Catalonians. The quay leads to a handſome wooden bridge, of 22 arches, over the river Cinca; and near it is a convent of capuchins, having an immenſe incloſure, with a large and beautiful garden. It is diſtant 53 miles E.S.E. of Saragoſſa. N. lat. 41° 27'. E. long. 0° 17'.

FRAGARIA, in *Botany*, ſo called by the Romans, from *fragro*, to ſmell ſweet or powerfully, on account of the perfume of its fruit.—Strawberry.—Linn. Gen. 255. Schreb. 342. Willd. Sp. Pl. v. 2. 1090. Lamarck. Dict. v. 2. 527. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 546. Juſſ. 338. Tourn. t. 152. Gærtn. t. 73. Claſs and Order, *Icoſandria Polygynia*. Nat. Ord. *Senticoſæ*, Linn. *Roſaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, flat, in ten ſegments; the five alternate ones external and narroweſt. *Cor.* Petals five, roundiſh, equal, ſpreading, inſerted by their ſhort claws into the calyx. *Stam.* Filaments 20, awl-ſhaped, ſhorter than the petals, inſerted into the calyx; anthers creſcent-ſhaped. *Piſt.* Germens numerous, very ſmall, collected into a head; ſtyles ſimple, inſerted laterally into each germen; ſtigmas ſimple. *Peric.* none. A ſpurious berry is formed of the common receptacle of the ſeeds enlarged and become pulpy, ſoft, coloured, of a roundiſh ovate figure, abrupt at the baſe, deciduous. *Seeds* numerous, minute, pointed, ſmooth, naked, ſcattered over the ſurface of the receptacle.

Eſſ. Ch. Calyx inferior, in ten ſegments. Petals five. Receptacle of the ſeeds ovate, pulpy, deciduous. Seeds ſmooth.

Linnæus, diſguſted with the futile diſtinctions of the gardeners of his time, eſpecially in Holland, ſometimes ran into a contrary extreme among plants the moſt generally cultivated; and conſidered as varieties what are really diſtinct ſpecies; differing in their native countries, their qualities, and even their botanical characters when inveſtigated according to his own ſoundeſt principles of diſtinction. This it appears to us he has done among the different kinds of ſtrawberry, reducing them all principally to one ſpecies. On this ſubject very great light has been thrown by the labours of Ducheſne, in his excellent *Hiſtoire Naturelle des Fraiſiers*, printed at Paris in 1766. This is a model of accurate and ingenious obſervation and criticiſm, and Haller juſtly terms it "an excellent little book." In it the author inveſtigates the characters and qualities of all the kinds of ſtrawberries known to him, traces their origin, their relationſhip to each other, and their ſynonyms in books, with the greateſt accuracy and clearneſs. The ſubject is followed up by the ſame writer in an eſſay communicated by himſelf, and ſigned with his name, in Lamarck's *Dictionaire de Botanique*, v. 2. 528. In theſe publications the only error perhaps is an hypothetical idea of the plants in queſtion being, ſomehow or other, all deſcended from a common ſtock; conſequently there is no attempt at a diſcovery of ſolid ſpecific differences; and this poſſibly confirmed Linnæus in his original error reſpecting them, though he was furniſhed by Ducheſne with excellent ſpecimens of all the kinds, which ſtill remain in his herbarium, and which might well lead to a ſuſpicion at leaſt, if not a ready detection, of certain ſpecific diſtinctions. This error has been corrected, in the moſt maſterly manner, by Ehrhart in his *Beiträge*, faſc. 7, publiſhed at Hanover in 1792, who, by attending to the pubeſcence of the ſtalks and its direction, has determined the ſpecies beyond diſpute, corroborating the leading diſtinctions derived from habit, native country, &c. in Ducheſne's works; ſo that we preſume the ſpecies of *Fragaria* can hereafter never be obſcure, whatever new varieties may ariſe, or old ones diſappear. We do not indeed find ſome other characters, derived by Ehrhart from a compariſon of the terminal ſerrature of each leaflet with its next neighbours, ſo much to be depended on, but theſe are not wanted. The direction of the pubeſcence, ſo uſeful in Mints, ſee *Tranſactions of the Linnean Society*, v. 5. 171. and in *Myoſotis*, ſee *Engl. Bot.* t. 1973, and *Introd. to Bot.* 228, is all-ſufficient. Willdenow has very judiciouſly profited by the remarks of Ehrhart, only following Linnæus in erroneouſly conſidering the ſimple-leaved ſtrawberry as a ſpecies. We ſhall try to arrange and define the ſpecies of *Fragaria*, by the lights which theſe writers afford; only as we do not aſſent to Ducheſne's hypotheſis of their common origin, we ſhall diſpoſe them according to our own ideas of their botanical affinities. We ſhall endeavour to refer each variety, as far as we have ſeen any, or can judge by the accounts of Ducheſne, to its proper ſpecies. We cannot however undertake even to enumerate all the evaneſcent varieties of gardeners, whoſe intereſt it is to bewilder the ſubject by extolling the ſlighteſt novelties, or recommending old plants under a new name. This is too much practiſed, not by the intelligent leaders in the trade, but by ſuch as have no other means of exciting notice. If we ſhould ſeem to any perſons, ſkilled in the different merits and qualities of theſe fruits, too ſlight in our notice of ſome of their diſtinctions, we beg leave to remind them of the endleſs varieties of apples and pears, all produced by ſeed, and ſooner or later returning to their common origin. Even in the common crab, wild in our hedges, accurate enquirers may diſcover great differences in flavour and quality, which render the varieties of fruit in wild ſtrawberries, and ſtill more in cultivated ones, perfectly credible, and guard us againſt the erroneous multiplication of ſpecies.

1. F. *veſca*. Wood Strawberry. Linn. Sp. Pl. 708. Fl. Suec. 175. Engl. Bot. t. 1524. (Fragaria; Camer. Epit. 765. Brunf. Herb. v. 2. 35. F. ſylveſtris; Ducheſne 61. Lamarck Dict. n. 2. F. vulgaris; Ehrh. Beitr. n. 1.) Calyx of the fruit reflexed. Hairs of the leaf-ſtalks widely ſpreading; thoſe of the partial flower-ſtalks erect. Native of groves and thickets throughout the colder parts of Europe. Dr. Sibthorp found it in the woods of the Bithynian Olympus,

Olympus, and in ſome parts of Greece. In Sweden and Lapland it is ſtill more abundant than with us, ſo that it is ſcarcely neceſſary to keep Strawberries, except exotic kinds, in a garden. The *root* is fibrous, or rather woody, perennial, encreaſing by buds, as well as by long creeping ſhoots or runners. *Stem* none. *Leaves* ternate, on long hairy ſtalks, ſomewhat ovate, ſtrongly ſerrated. *Flower-ſtalks* longer than the leaves, erect, hairy, ſomewhat cymoſe. *Flowers* white, erect, ſpreading. *Fruit* drooping, ovate, fragrant, highly grateful and aromatic. Such likewiſe is the general habit of the genus; but this ſpecies, which is the ſmalleſt, is diſtinguiſhed by its acid fruit of a deep carmine red, and eſſentially by the ſilky hairs of its partial or ultimate flower-ſtalks being erect, or often cloſely preſſed upward to the ſtalk, which unfortunately is not properly repreſented in *Engliſh Botany*; but the excellent old wooden cuts above quoted, expreſs it by not ſhewing any hairs on that part, while the main flower-ſtalk, as well as the foot-ſtalks, of the leaves, are juſtly drawn rough with prominent or horizontal hairs. This character remains in the dried ſpecimens. Ehrhart has not diſtinguiſhed between the hairs of the general and partial flower-ſtalks. He and Willdenow ought, in all the caſes in queſtion, to have uſed the word *pedicellus*, not *pedunculus*. The Wood Strawberry flowers in May and June. By cultivation the leaves grow larger, but the fruit is little changed. The varieties are

a. With variegated leaves. Ducheſne 69.

b. With white fruit. Ducheſne 71. This writer remarks, that the points of the ſerratures of the leaves alſo are white, though in all red-fruited Strawberries they are red; a curious obſervation, which helps cultivators to diſtinguiſh this variety at all ſeaſons.

c. With a double flower. Ducheſne 74. In this the petals are very much multiplied, but ſo many ſtamens ſtill remain unchanged, that the fruit is generally perfected.

d. With cluſtered fruit, as deſcribed by E. Konig in the Ephem. Nat. Curioſ. for 1685. Ducheſne 79. This was unqueſtionably the mere accident of a faſciculate or cluſtered ſtalk, as happens in the ſtem of the Top-knot Pea, and occaſionally in the Aſh, Holly, Spurge-laurel, and ſeveral other plants. See FASCICULATE.

e. With prickly fruit. Ducheſne 82. Fragaria muricata; Linn. Sp. Pl. 709. Lam. Dict. n. 8. F. veſca *β*. Sm. Fl. Brit. 546. F. elatior *β*; Willd. Sp. Pl. v. 2. 1091. F. ſpinoſo fructu; Barrel. Ic. t. 90. F. arborea con fiore erbaceo; Zannon. Iſt. 95. t. 38. This was obſerved by Tradeſcant in a garden at Plymouth; ſee Gerard's Herbal by Johnſon, 998. Ducheſne ſaw an original ſpecimen of Zannoni's, who cultivated this plant at Bologna. The former reduces it, very ſatisfactorily, to the F. *veſca*, and aſſures us the prickly appearance of the fruit, which is not eatable, is owing to an elongation of the point of each germen. This variety, after having been kept in the botanical gardens of Europe, by way of a curioſity, for three or four ſcore years, has, according to Ducheſne, at length totally diſappeared, having no valuable quality to recommend it.

f. With abortive fruit. Ducheſne 107. Blind Strawberry. F. abortiva; Lam. Dict. n. 11. A ſtronger, more hairy, and darker-coloured variety than the common Wood Strawberry, in which reſpects it approaches the Hautboy hereafter deſcribed. The fruit is for the moſt part abortive, which Haller attributed to a defect in the ſtigmas, and Miller to an exhauſtion of the plant by runners; but Ducheſne now ſeems to doubt the accuracy of both theſe explanations, though without propoſing any in their ſtead. He conſiders it as rather belonging to the next than to this. See F. *collina*, var. *d*.

g. The Monthly or Alpine Strawberry. F. ſemperflorens; Ducheſne 49. Lam. Dict. n. 1. F. veſca *γ*; Willd. Sp. Pl. v. 2. 1091. Differs from the Wood Strawberry in having a rather leſs luxuriant herbage, while on the other hand it produces more abundant flowers and fruit, continuing in bearing to the very end of autumn, which renders it well worthy of cultivation. The fruit differs in nothing from the Wood Strawberry, being like that occaſionally white. This monthly variety is wild on the Alps, eſpecially, as it is ſaid, on Mount Cenis, where, indeed, it has but few months of open weather to bloſſom in. Ducheſne is diſpoſed to conſider this as the parent of the Wood Strawberry, and indeed the head of the whole family, becauſe of the vigour of its vegetation. This to us is rather paradoxical, eſpecially as he ſays it degenerates, which is not a ſymptom of a primary ſpecies, but the true teſt of a variety.

h. Engliſh Forcing Strawberry. Fragaria minor; Lam. Dict. n. 3. A dwarf variety, preferred for forcing in frames, of which there is alſo a ſort with white fruit. Ducheſne had it from England.

i. Freſſant's Strawberry. Fragaria hortenſis; Ducheſne 113. Lam. Dict. n. 4. This appears evidently, by Ducheſne's deſcription and ſpecimens, to be but a ſlight variety of the Wood Strawberry, raiſed accidentally from ſeed, whoſe fruit is 15 or 20 times larger than the wild kind, but of a fainter flavour in proportion. It abounds at Montreuil, where it was firſt raiſed by a man named Freſſant. Tournefort and Vaillant appear to have miſtaken this variety for the Fragaria parvi pruni magnitudine of Bauhin, or Hautboy Strawberry, our F. *elatior*. The fruit is occaſionally white. Freſſant's Strawberry was, according to Ducheſne in Lamarck, the only one to be found in the markets of Paris in 1790. Each root bears fruit but two ſucceſſive ſeaſons, and then periſhes, the preciſe kind being kept up from the runners, as in other caſes.

k. Strawberry without runners. Ducheſne 119. Fragaria efflagellis; Lam. Dict. n. 5. Sometimes called the buſhy ſtrawberry, as it forms luxuriant large tufts, but without runners, or with very few and ſhort ones.

l. Simple-leaved Strawberry. Fragaria monophylla; Ducheſne 124. Journ. d'Hiſt. Nat. v. 2. 343. t. 41. Uſt. Annal. faſc. 14. 40. t. 1. Lam. Dict. n. 6. Linn. Syſt. Veg. ed. 14. 476. Willd. Sp. Pl. v. 2. 1093. Ait. Hort. Kew. v. 2. 212. Curt. Mag. t. 63. Ducheſne moſt explicitly aſſures his readers, in the places here cited, that this is a variety raiſed by himſelf at Verſailles in 1761, from ſeed of the Wood Strawberry, and that when propagated by the ſame means, every generation returns more and more to the original ſpecies. Nothing can be more deciſive, and yet Linnæus, and after him Willdenow, retains it as a diſtinct ſpecies. Its appearance, indeed, is ſtriking, the leaves being ſimple and cordate, and the calyx ſingularly luxuriant and leafy. The fruit is like a fine Wood Strawberry. This variety increaſes very plentifully by runners.

2. F. *collina*. Green Strawberry. Ehrh. Beitr. n. 6. Willd. Sp. Pl. v. 2. 1093. (F. viridis; Ducheſne 135. Lam. Dict. n. 15. Ger. em. 998. Park. Parad. 528. F. veſca *a*; Linn. Fl. Lapp. ed. 2. 175. *β*; Fl. Suec. 175.) Calyx of the fruit erect, elongated, pointed. Hairs of the leaf-ſtalks widely ſpreading; thoſe of the partial flower-ſtalks erect.—Native of Sweden, Germany, and Switzerland. Ducheſne's ſpecimen has very much the habit and characters of the foregoing ſpecies, but differs in the *calyx*, which, after flowering, always remains erect, cloſely embracing the fruit, its ſegments being remarkably narrow, elongated, and pointed. The *fruit* is pale and greeniſh, with a yellow caſt, of a ſweet taſte and high flavour. Miller confounded this with the

the Pine Strawberry hereafter deſcribed, and in the lateſt edition of his Dictionary has left out the Green Strawberry, apparently from thinking it the ſame with the Pine, though nothing can be more unlike. Ehrhart, who ſeems to have known it in a wild ſtate, has eſtabliſhed it as a ſpecies, and Ducheſne's original ſpecimen anſwers to the above characters. The latter had his plants from England. We have not of late met with this Strawberry, but more than thirty years ago it was cultivated in an old garden at Watlington, Norfolk, and called the Pine Strawberry, probably in conſequence of Miller's error. Ehrhart ſeems to have been in doubt whether the Green Strawberry were the ſame with his *collina*, the *Bröſling* of the Germans; but as Ducheſne reckons it the beſt known of that race, or rather ſpecies, which he terms *Breſlinge*, we take it for the leading variety, and range the following under it.

a. German dark-leaved Strawberry. Fragaria nigra; Ducheſne in Lam. Dict. n. 12. F. minor, ſeu nigra; Thal. Harcyn. 43. Bröſsling, Fraga ſerotina; Camer. Kreuterb. 335, 2. Bauh. Hiſt. v. 2. 394. Harbeer; ibid. 395. Fragaria foliis hiſpidis; Rupp. Jen. ed. Hall. 108. F. ε, Preſling; Hall. Hiſt. v. 2. 44. F. β; Hall. Gott. 108. F. fructu majori candicante oblongiuſculo; Volck. Noriberg. 172. Fragum album; Tabern. Kreuterb. 346. f. 2.—This might perhaps, more properly than the Green Strawberry, be deemed the original ſpecies, being certainly in a wild ſtate. It is called *nigra* by Thalius and Ducheſne, on account of the dark hue of the leaves. The latter mentions having had roots from Haller, and that the *fruit* adheres firmly to the calyx. Its colour is green, tinged of a browniſh red on the ſide expoſed to the ſun. The flavour almoſt too highly perfumed. The pulp ſwells much between the ſeeds. The *leaves* are low and very brown, often in five parts. It is late, and a bad bearer, and ſeems to want improvement by culture, yet when raiſed from ſeed for ſome years, Ducheſne found no amendment in its quality. The German writers above quoted in general ſpeak of the fruit as white, but often tinged with red on the ſunny ſide. The only figure we can find is that of Tabernemontanus, which we have cited on account of the erect, narrow, elongated calyx, which conſtitutes the character of the preſent ſpecies and all its genuine varieties.

b. Burgundy Strawberry. Fragaria pendula; Ducheſne in Lam. Dict. n. 13. Called Fraiſier-marteau, or Hammer Strawberry, from the ſhape of its fruit, which is rather more coloured than in the former variety, with a leſs powerful flavour. No ſeeds are produced on that part of the fruit covered by the calyx. It was received from Burgundy in 1768, and is conſidered, even by Ducheſne himſelf, as very near the laſt variety.

c. Rough-leaved Strawberry, Fragaria hiſpida; Ducheſne in Lam. Dict. n. 14. F. foliis hiſpidis; Bauh. Pin. 327. Mapp. Alſat. 110. Fraga partim rubra partim candida; Trag. Hiſt. 500. We cannot clearly perceive how this variety differs from our firſt, *a*, nor can we at all diſtinguiſh their ſynonyms. Ehrhart clearly unites them, and we mention them ſeparately rather out of deference to Ducheſne, who ſays the *leaves* are very rough, the *fruit* more elongated, more coloured, more juicy, and better than in our *a* and *b*; but the plant is often barren in the bois de Boulogne near Paris, where it grows in a ſtate of nature, having poſſibly come out of the adjoining gardens made by Francis I.

d. Fragaria abortiva; Ducheſne in Lam. Dict. n. 11, which we have mentioned, according to that writer's original opinion, under the former ſpecies, variety *f*, ſeems rather, by the calyx of his ſpecimen, to belong to the preſent, as he now ſeems diſpoſed to conſider it. As however it is probable that both ſpecies may be ſubject to the ſame diſeaſe, and therefore we have ventured to indicate it under each.

e. Swediſh Strawberry. Fragaria pratenſis; Ducheſne in Lam. Dict. n. 16. F. veſca β, pratenſis; Linn. Sp. Pl. 709. γ; Fl. Lapp. ed. 2. 176. Fl. Suec. 175. F. fructu parvi pruni magnitudine; Rudb. Act. Suec. ann. 1720. 97, but not of Bauhin. We place this here on the authority of Ducheſne, who informs us he received roots from Linnæus in 1765, which ſucceeded well, and the race remained unaltered when propagated by ſeed, except that the fruit was ſometimes encreaſed in ſize. "It has ſmaller *ſhoots* and more contracted *runners* than any other ſtrawberry, with a low and mean *foliage*, which dies and diſappears entirely in winter, a circumſtance peculiar to this variety. The *fruit*, however, is pretty large, bright green with a very deep red tinge, perfectly round, firmly fixed to the calyx, ſo as to make a noiſe when pulled from it. The pulp is ſolid, friable, very juicy, exquiſitely perfumed, and much ſwelled between the ſeeds, which are very large. It is rather late in ripening, but bloſſoms again directly, and often perfects a ſecond crop of fruit. The firſt bloſſoms come out of the ground like an Anemone, before the leaves are fully grown."—We find in the Linnæan herbarium under *F. veſca*, two ſpecimens anſwering to this deſcription, and their petals are twice as large as the real *F. veſca* or wood ſtrawberry which accompanies them, on another ſheet of paper, and is preciſely our Engliſh kind. The *leaves* of the former are extremely ſilky at the back, and have the ſhort terminal tooth mentioned by Ehrhart as a character of his *F. collina*, but on this laſt mark we would not lay much ſtreſs in this genus. The *fruit* in the Linnæan ſpecimen is unluckily not far enough advanced for us to decide whether the calyx in that ſtate be erect or not, ſo that we can at preſent only rely on Ducheſne for its belonging to this ſpecies and not to the wood ſtrawberry, nor to the Hautboy hereafter mentioned, the calyx of both which, when in fruit, is ſhort and reflexed. Linnæus ſays this plant grows in meadows clothed with ſhort graſs. It is leſs common than the wood ſtrawberry, and not ſo fragrant, but both are eaten promiſcuouſly.

f. Provençal Strawberry, or Majaufe. Fragaria bifera; Ducheſne in Lam. Dict. n. 9. F. in alpibus Bargeis, bis in anno fructificans; Cæſalp. de Plant. 554. This is deſcribed by Cæſalpinus, whom other authors have copied, as bearing fruit which is moderately compreſſed and ſtriated, with the taſte of a raſpberry. Ducheſne procured plants in 1766 from the neighbourhood of Bargemon. In a wild ſtate this kind produces fruit in the ſpring and autumn, but almoſt all the year round in a garden, which renders it very deſirable for cultivation, eſpecially as it laſts five or ſix years without being freſh planted. The *fruit* is rather large, round, often flattened on the ſhady ſide, of a reddiſh yellow, except where the ſun colours it of a deep red. The part covered by the calyx remains whitiſh, repreſenting a ſtar at the baſe. It has a peculiar perfume.

g. Champagne Strawberry. Fragaria dubia; ibid. n. 10. "This variety," ſays Ducheſne, "which is found about Ferté-ſous-Jouarre, upon little hills, not in woods, is much leſs robuſt than the preceding. Its *fruit* is more flattened, higher coloured, and very vinous. It is difficult to diſtinguiſh this kind of Majaufe from the ſtrawberries properly ſo called (*F. veſca* and its varieties), and its exiſtence leads us much to doubt of the diſtinction of theſe two kinds from thoſe. This Champagne Majaufe is leſs fruitful than that of Provence. It bears fewer flowers, and is moreover very ſubject to incomplete, or even total, ſterility. When raiſed from ſeed, very few fertile individuals are produced, and there

were

were ſome ſterile ones among thoſe ſent us from the country in 1767." Theſe remarks render it doubtful to which diſtinct ſpecies of *Fragaria* the variety here deſcribed may belong, but reſpecting the laſt, the poſition of the calyx puts it out of doubt.

3. F. *virginiana*. Scarlet Strawberry. Mill. Dict. ed. 8. n. 2. Ehrh. Beitr. n. 3. Willd. Sp. Pl. v. 2. 1091. Ducheſne 204. Lam. Dict. n. 24. (F. veſca δ; Ait. Hort. Kew. v. 2. 211. F. virginiana, fructu coccineo; Moriſ. v. 2. 186. F. glabra, fructu coccineo majore, ſeminibus in cortice loculoſo altiùs depreſſis, virginiana; Duham. Arb. Fruit. v. 1. 181. t. 5.)—Calyx of the fruit ſpreading. Hairs of the leaf-ſtalks, and of all the flower-ſtalks, erect. Leaves nearly ſmooth on their upper ſurface.—Native of Virginia. *Clayton*. This in our gardens is one of the beſt known and moſt valuable kinds, on account of its plentiful bearing, hardineſs, earlineſs, and grateful flavour, as well as the facility with which it is forced. The *leaves* are larger and ſmoother than thoſe of *F. veſca*. *Flowers* leſs expanded, but more copious, forming a denſe ſort of corymbus, and each ſtanding on an elongated ſlender ſtalk, whoſe hairs are erect, almoſt indeed cloſe-preſſed, as are all thoſe likewiſe on the common flower-ſtalks and on the leaf-ſtalks, affording an excellent ſpecific character. The peculiar ſcarlet colour of the *fruit* is well known. Its ſurface ſwells between the ſeeds, making little cells in which they are lodged. No white, nor any other variety of this ſpecies, except a ſlight variation in the internal redneſs of the fruit, is known in Europe. Linnæus ſeems to have been ſcarcely at all acquainted with the Scarlet Strawberry, not having mentioned it, even as a variety, except in his Hortus Cliffortianus. Ducheſne complains that this Strawberry is too juicy and tender to bear carriage, or be brought to market, but we find no ſuch difficulty in England, though it is certainly more tender than moſt others. Its perfume, when confined or over powerful, becomes intolerable to moſt people, and however grateful this fruit may be to perſons in general, there are perſons to whom one or two Scarlet Strawberries is an actual poiſon. The calyx enfolds the unripe fruit in this ſpecies, without touching it, but becomes ſubſequently expanded.

4. F. *elatior*. Hautboy Strawberry. Ehrh. Beitr. n. 2. Willd. Sp. Pl. v. 2. 1091. (F. moſchata; Ducheſne 145. moſchata dioica; Lam. Dict. n. 18. F. veſca β, pratenſis; Retz. Obſ. faſc. 6. 30. F. fructu parvi pruni magnitudine; Bauh. Pin. 327. F. muricata; Mill. Dict. ed. 8. n. 3. F. et fraga; Lob. Ic. v. 1. 697. Dod. Pempt. 672. Ger. em. 997. f. 2. F. major et minor; Fuchs. Hiſt. 853. Fraga bohemica maxima; Park. Parad. 527. f. 7.)—Calyx of the fruit reflexed. Hairs of the leaf-ſtalks, and of all the flower-ſtalks, widely ſpreading, ſomewhat deflexed.—The native country of this fine ſpecies has been enveloped in great uncertainty. Miller declares it to be of American origin, which Ehrhart copies with a doubt. Some old authors reported that it came from Hungary and Bohemia, which we are diſpoſed to believe, becauſe ſo many of the early writers have figured this ſpecies and not the *F. veſca*; and we are aſſured by Mr. Dickſon, Mr. Jackſon, and Mr. Anderſon, all excellent practical botaniſts, that it is certainly wild near Tring in Hertfordſhire, on the weſt ſide of that town. Mr. W. Borrer alſo finds it in Charlton foreſt, Suſſex. It may therefore be a native of other parts of Europe, though often overlooked for the Wood Strawberry, and not detected even by the indefatigable Ehrhart. No ſpecies of any genus can be better defined than this. The direction of the copious hairs on all the *flower-ſtalks*, both general and partial, as well as on the leaf-ſtalks, being widely ſpreading, or rather pointing downwards, affords a clear ſpecific character, permanent in the dried as well as freſh ſpecimens. The *calyx* of the fruit is ſhort and reflexed, much like that of the Wood Strawberry. The whole *herb* is larger and ſtronger than in any of the foregoing ſpecies. Common *flower-ſtalks* tall, ſtrong, moſtly compreſſed. *Flowers* large, ſpreading, generally but not always imperfectly dioecious, the ſtamens being moſt effective on one plant, the piſtils on another, ſo that the gardeners uſually find it neceſſary to cultivate both ſexes, and hence the produce of the ſame extent of ground is not ſo great as in the *F. veſca* or *virginiana*. This ſexual difference was firſt obſerved by Ducheſne, whom Linnæus cautioned againſt being miſled by flowers rendered abortive by cold in the ſpring; but the former was correct. The *fruit* is large, roundiſh, of a dark dull crimſon, with a high muſky perfume, but leſs of acid pungency than either of theſe juſt mentioned, palling on the palate as that perfume gradually becomes leſs ſenſible, and a mawkiſh flavour ſucceeds. The fleſh is ſolid, firmly fixed to the calyx, without any central cavity. Its ſurface is pitted, but leſs than in the Scarlet Strawberry. M. Ducheſne remarks in his firſt publication, that this ſpecies is not ſubject to any remarkable varieties, but in Lamarck he mentions ſome ſlight ones; in which latter work he moreover corrects his former miſtake, of making the Swediſh *F. veſca pratenſis* of Linnæus, (our *F. collina*) the ſame with the Hautboy, an error in which Ehrhart and Retzius have remained. The failure of the fruit of the Hautboy, which has been obſerved to dwindle away, ſeems owing to a neglect of the cultivation of the male plants, becauſe they were obſerved not to bear fruit. Hence the females were unfruitful for want of impregnation. The old wooden cuts above quoted clearly expreſs the Hautboy Strawberry, and not the Wood or Scarlet, the hairs of the ſtalks, and their direction, being very faithfully delineated.—In the herbarium of Linnæus is a ſpecimen of the ſpecies of which we are treating, without a name, but marked by himſelf as gathered at Lund in Scania. But unfortunately on the ſame paper is one of the Scarlet, ſo that we cannot preſume the former to be wild, as the latter aſſuredly is not. They were perhaps ſent him by Retzius, who has publiſhed a ſhort remark, quoted above, on the dioecious nature of the Hautboy.

a. Royal Hautboy. Fragaria moſchata; Ducheſne in Lam. Dict. n. 17. Of this we know nothing but from the author here cited, who ſuſpects it may be a hybrid production between the Hautboy and ſome variety of the *F. collina*. Of this he had met with another inſtance, in which a very delicious and juicy little ſtrawberry was produced, but the plants ſoon became ſterile. The preſent however proves luxuriant and prolific, bearing two crops in a year, of light-coloured firm fruit. The flowers are not dioecious in this variety.

5. F. *grandiflora*. Pine Strawberry. Ehrh. Beitr. n. 4. Willd. Sp. Pl. v. 2. 1092. (F. Ananaſſa; Ducheſne, 190. Lam. Dict. n. 20? F. veſca ε; Ait. Hort. Kew. v. 2. 212. F. Foliis ovatis crenatis nervoſis, calycibus maximis; Mill. Ic. 192. t. 288.)—Calyx of the fruit erect. Hairs of the leaf-ſtalks, and of the common flower-ſtalks, upright; thoſe of the partial ones rather ſpreading. Leaves ſmooth above; their ſerratures ovate.—We cannot but think Ducheſne's original account of this ſtrawberry more correct than what he has given in Lamarck. He juſtly preſumed it a native of Louiſiana, rather than of Surinam, to which common report has attributed it. It is now not unuſually cultivated near London. In habit this moſt agrees with the Hautboy; but in botanical characters, though not at all in habit or qualities, with the ſcarlet: and thoſe characters are ſo ſpecific,

cific, that we can by no means aſſent to the conjecture of its having originated in a garden at Harlem.

F. *grandiflora* is one of the largeſt kinds, vyeing in that reſpect with the Chili Strawberry, hereafter deſcribed, but differing from that in the greater ſmoothneſs of its herbage. The *leaves* are large, firm, obtuſe, with large, ovate, bluntiſh ſerratures, very unlike thoſe of the Scarlet, though like them they are nearly or quite ſmooth on their upper ſurface; beneath they are ſomewhat pale, and ſlightly hairy. The hairs on their *foot-ſtalks* are long, fine, and upright, not cloſe-preſſed; thoſe of the general *flower-ſtalks* are rather more inclined to ſpread, and thoſe of the partial ones even more ſo, but not in ſuch a degree as to become horizontal. The *flowers* are numerous, large and cymoſe, often having ſix petals, and a correſponding number of other parts. *Fruit* more like the Hautboy than the Scarlet, very large, of a pale red, approaching to fleſh-colour, firm, and adhering to the calyx, but hollow in the centre; its ſurface ſcarcely pitted, very highly poliſhed. The flavour is very fine, and, in our opinion, preferable to the Hautboy. It will readily be perceived by this deſcription how different this ſpecies is from the Green Strawberry, F. *collina*, with which it has in the name of Pine-Strawberry been ſometimes confounded.—The leaves are occaſionally variegated. The hue of the fruit varies a little, but is always of a more or leſs pale crimſon or purpliſh caſt, not verging towards ſcarlet.

a. Bath Strawberry. Fragaria calyculata; Ducheſne in Lam. Dict. n. 21. A rather ſtronger variety than the former with a large *calyx*, and rugged or pitted *fruit*. Ducheſne now quotes Miller's t. 288. under this variety. *b.* Mule Strawberry. Fragaria hybrida; ibid. n. 25. Suppoſed to have been produced between the Pine and the Scarlet. It is early, but a bad bearer.

6. F. *chiloenſis*. Chili Strawberry. Ehrh. Beitr. n. 5. Willd. Sp. Pl. v. 2. 1092. Ducheſne 165. Lam. Dict. n. 19. (F. veſca γ; Linn. Sp. Pl. 709. Ait. Hort. Kew. v. 2. 211. F. chiloenſis, fructu maximo, foliis carnoſis hirſutis; Dill. Elth. 145. t. 120.)—Calyx of the fruit erect. Hairs of the leaf-ſtalks, and of the common flower-ſtalks, deflexed; thoſe of the partial ones horizontal. Serratures of the leaves broader than long.—Native of Chili, where it is called by the Spaniards *Frutilla*, or little fruit. It was brought from that country to France in 1712, or 1716, by M. Frezier, and thence found its way into various European gardens. It flowered in that of Eltham in 1730, where Dillenius made his deſcription and very accurate figure, in which the peculiar direction of the pubeſcence, affording a certain ſpecific diſtinction, is faithfully expreſſed, as well as the true ſhape of the ſerratures of the leaves. This Strawberry is now one of the moſt common, immediately ſucceeding the Scarlet at our tables, and known by the name of Carolina Strawberry, rather than by its true appellation. Some gardeners have attempted to transfer the name of Hautboy to the preſent; that the true Hautboy, being leſs profitable, might become obſolete and be forgotten. The Chili Strawberry is as large in all its parts as any other kind, and rather larger in its *ſtalks* and *bloſſoms*. The *leaves* are of moderate dimenſions, but firm and ſomewhat rigid, veiny; almoſt ſmooth above, paler and very hairy beneath. Their ſerratures are broader, ſhorter, and more rounded than in any other ſpecies, ſo that they might almoſt be called crenate. The copious hairs of their *foot-ſtalks* are all directed ſtrongly downwards, and thoſe of the general *flower-ſtalks* are nearly equally ſo; but the more denſe hairs of the partial ſtalks project horizontally. The *flowers* are often luxuriant in the number of their parts. They appear by the report of Ducheſne to be ſometimes dioecious, but of this we never ſaw any ſigns, the varieties with which we are acquainted being good bearers. The *calyx* is cloſed after flowering, and embraces the ripe *fruit*, which is large, ovate, often compreſſed and abrupt, of a ſcarlet rather than crimſon hue, ſtudded with innumerable ſeeds; its inſide is ſpongy towards the middle, and uſually white. The flavour is gratefully acid, with rather leſs of perfume than the other kinds. Frezier ſays the fruit is ſometimes in Chili as big as a hen's egg. It is remarkable that this kind was ſo ſcarce in France, when Ducheſne publiſhed his book in 1766, though introduced fifty years before, that he tells us he had taſted only a very imperfect and abortive one.

a. Carolina Strawberry. Fragaria carolinienſis: Ducheſne, in Lam. Dict. n. 22. We perceive little in Ducheſne's deſcription, by which this can be diſtinguiſhed from the Chili; nor can we imagine why he has ranged the Pine and Bath Strawberries between them. What we have ſaid above of the Chili anſwers to this; for the ſlight differences which occur in every garden, as to the ſhape or colour of the fruit, are certainly very immaterial and tranſient.

b. Canterbury, or Red-fleſhed Strawberry. Fragaria tincta; ibid. n. 23. Differs from the laſt variety merely in the crimſon hue, with which the fruit is ſtained to the very centre.

Such are all the known ſpecies, and principal varieties of eatable Strawberries. We ſhall finiſh our hiſtory of the genus with one that is altogether unprofitable, as its name imports.

7. F. *ſterilis*. Barren Strawberry. Linn. Sp. Pl. 709. Curt. Lond. faſc. 3. t. 30. Engl. Bot. t. 1785. (F. minimè veſca, ſive ſterilis; Ger. em. 998.)—Stem decumbent. Flowering-branches weak, each bearing one or two flowers. Fruit juiceleſs.—Native of dry gravelly paſtures, throughout the middle and ſouthern parts of Europe; very common in England, flowering in March and April. This is a ſmaller plant than any of the foregoing, and eſſentially diſtinguiſhed from all of them by its decumbent *ſtem*, deſtitute of runners, and by the flowering branches bearing one or two leaves, and only one or two *flowers*. The *leaflets* are obovate, ſharply ſerrated, moſt ſilky beneath. The hairs on their *foot-ſtalks* ſpread horizontally, as do thoſe on the *flower-ſtalks*. The *flowers* are ſnow-white, ſmall and delicate, with a hairy *calyx*. *Receptacle* of the ſeeds ſmall and dry, ſcarcely deciduous as the generic character requires, yet it is preſent. *Seeds* ſmooth, or very ſlightly wrinkled.—Some difficulties attend the generic arrangement of this ſpecies, yet it has the preciſe habit and characters of a *Fragaria*, except the dry receptacle. In this laſt reſpect it agrees with *Potentilla*; and indeed Haller refers the whole of the latter genus, with *Tormentilla*, *Comarum*, and *Sibbaldia* of Linnæus, to *Fragaria*, as Ludwig, Boehmer, Scopoli, and Crantz have done. In this, nature is entirely ſacrificed. We preſume to think that the Linnæan genera, in this natural order of *roſaceæ*, are among the moſt natural and beſt defined of the whole ſyſtem.

In Mr. Andrews's Repoſitory, t. 479, is deſcribed and figured a plant from the north-eaſt part of Bengal, by the name of *Fragaria indica*. This was found on the Nepal mountains, by Dr. Buchanan, from whom we have it. The *ſtem* is creeping, like *Potentilla reptans*; *leaves* ternate; *flowers* axillary, ſolitary, ſtalked, with yellow petals, and a red pulpy *fruit*. The latter, nevertheleſs, is totally different from a *Fragaria*, and is nearly, if not entirely, the fruit of a Rubus, being compoſed of ſeparate juicy grains, in each of which a ſeed is lodged. The *calyx*, however, being in ten ſegments, five larger and five ſmaller, as in *Fragaria* and *Potentilla*, differs eſſentially from that of a *Rubus*,

from

from which alſo the habit is altogether diſſimilar. This plant, indeed, conſtitutes an entirely new genus, and we propoſe to call it *Ducheſnea fragiformis*, in memory of a writer who has thrown ſo much light on its near relation, *Fragaria*. S.

FRAGARIA, in *Gardening*, compriſes a plant of the low, herbaceous, perennial, hardy fruit kind.

Of which the ſpecies moſtly cultivated is the eſculent ſtrawberry (*F. veſca*), of which there are ſeveral varieties in cultivation, but the following are the principal.

The wood-ſtrawberry, which has the leaflets oval-lanceolate, acutely ſerrate; the petioles woolly; the runners ſlender, ſmooth, often tinged with purple; peduncles with two or more flowers. The fruit ſmall, and uſually red; it has commonly little flavour here, from the plants being too much ſhaded in the woods and hedges. The ſub-varieties of which are, the white wood-ſtrawberry, which ripens a little later in the ſeaſon, and is often preferred to it for its quick flavour; but as it ſeldom produces ſuch large crops of fruit as the red ſort, it is not ſo generally cultivated.

The alpine ſtrawberry, which is a larger plant than that which grows in woods, the ſtem higher, the leaves broader, the fruit larger, red, and uſually much pointed, ſometimes white. It is well flavoured, and the plants continue long in bearing, which renders them very valuable. The reaſon of this is, that the runners which it throws out during the ſummer ſhoot up into flower and fruit the ſame year more freely than in the other ſorts. It is ſometimes termed everlaſting ſtrawberry.

The rough-fruited, or prickly ſtrawberry, which Martyn thinks nothing but an accidental variety, has the flower greeniſh; the fruit harſh, rough and prickly, of a greeniſh colour, with ſome ſhow of redneſs.

The hautboy-ſtrawberry is very different from the reſt in leaf, flower, and fruit. The leaves are larger, thicker, hairyiſh, and rough. The fruit very large, and of a pale red colour. It varies with oval, fine-ſhaped, and green fruit; with red bloſſom, with white-ſtriped leaves, and with yellow-ſtriped leaves.

There is alſo an improved ſub-variety of it, called globe-hautboy; the fruit of which is larger, and of a globular form. Martyn has obſerved, that "where theſe are neglected, they degenerate to the common hautboy; but where the ſoil is good, and the culture well managed, the plant will produce a great quantity of large well-flavoured fruit."

But this variety of ſtrawberry is very apt to degenerate, and to produce only dry effete fruit; which, according to Monſ. Duhamel, is owing to there being two ſorts of plants, one bearing male, the other female, or rather imperfect hermaphrodite flowers; the former of which, being reputed uſeleſs, are carefully deſtroyed; hence not only the ſeeds become abortive, but the receptacle, commonly called the fruit, ſmall and juiceleſs. This Martyn thinks "may be remedied, either by planting a few of the male plants, or of the ſcarlet, or pine ſtrawberry, among the hautboys."

The Chili ſtrawberry has the leaves hairy, oval, and of a much thicker ſubſtance than any ſort yet known, and ſtands upon very ſtrong, hairy foot-ſtalks; the runners from the plants are very large, hairy, and extend to a great length, putting out plants at ſeveral diſtances. The peduncles are very ſtrong; the leaves of the calyx long and hairy. The flowers are large, and often deformed; and ſo is the fruit, which is very large. When cultivated in very ſtrong land, the plants produce plenty of firm, well-flavoured fruit; but as it is a bad bearer in moſt places, it has been lately leſs cultivated than formerly.

According to Frezier, the fruit uſually attains the ſize of a walnut, but is ſometimes as large as an egg, of a paler red than the European ſtrawberry, and not ſo quick in its flavour. It deſerves cultivation for the ſingularity and ſize of the fruit. And it varies with round pale red, with globular pale red, with oblong-oval pale red, and deep red fruit. There is alſo the Carolina, ſcarlet, and white-fruited; the royal large red; the large Dutch, Bath, and Devonſhire Chili ſtrawberry.

The ſcarlet ſtrawberry, which is the ſort firſt ripe. The fruit is good, being preferred to moſt others by many. It was brought from Virginia, where it grows naturally in the woods. It is very different from the wood ſtrawberry in leaf, flower, and fruit; the leaves being of a dark green, and of a more even ſurface, the flowering-ſtems ſhorter, the fruit being frequently concealed among the leaves; and it varies with roundiſh leaves and with ſtriped leaves.

The pine ſtrawberry, in which the leaves have a great reſemblance to thoſe of the ſcarlet ſtrawberry, but are larger, of a thicker ſubſtance, and the indentures of their edges blunter; the runners are much larger, and hairy; the peduncles are ſtronger; the flowers much larger; and the fruit approaches in ſize, ſhape, and colour, to the Chili ſtrawberry. It produces a great quantity of fine, large fruit, when the plants are kept clear from runners during the proper ſeaſon.

According to Monſ. Duhamel, it is raiſed from the ſeed of the Chili ſtrawberry. The flower is very large, and the fruit has ſomething of the ſmell and taſte of the pine-apple. It varies in the form of the fruit with ovoid, with oblate-ſpheroid, and with irregular fruit. It is much ſmaller than the Chili ſtrawberry. There are alſo the green, red, and hautboy-fruited, as well as the Chili pine-apple ſtrawberry.

The Carolina ſtrawberry, which greatly reſembles the above, but is much leſs in all its parts, and leſs hairy; the flower-ſtems are ſhorter; the flower-buds more lengthened out, and leſs ſwoln; the fruit ſmaller, more regular in the form, of a higher colour, but the perfume not ſo pleaſant. Martyn remarks, that the pine varies little when raiſed from ſeed, whereas this varies much in the flower, fruits, and other parts.

It is not improbable but that there may be many other varieties and ſub-varieties of this fruit which may be highly deſerving of cultivation.

The wood and alpine ſorts, in general, bear beſt when raiſed from ſeed, and planted in a rich light earth of a browniſh caſt. The ſcarlet, the hautboy, the Carolina, and the Chili, anſwer beſt on ſtrong mellow loams.

Method of Culture.—In order to raiſe this ſort of fruit to the greateſt advantage and perfection, the ſoil ſhould be of the friable loamy kind, with a moderate degree of moiſture, but by no means wet.

All the different varieties and ſub-varieties may be made uſe of where large ſupplies are wanted; but in other caſes, a few of the ſmall and large ſorts may be ſufficient. The ſame varieties ſhould always be planted together in ſeparate beds, or other places; but never any mixture of different ſorts admitted in the ſame ſituations.

The moſt uſual practice, in forming beds of this ſort of fruit, is by planting out the off-ſets taken from the ſides of the old plants, or ſuch as are formed from the rooting of the joints of the runners; but the former are, in general, the better plants. And in chooſing them, they ſhould never be taken from ſuch plants as are old, and which have been neglected in their culture, but conſtantly from ſuch as have been well kept in order, and are in a full bearing ſtate; ſuch

off-ſets as ſtand neareſt to the old plants being preferred to ſuch plants as are formed by the trailing ſtems at a diſtance. Upon a careful attention to theſe circumſtances, much of the ſucceſs of this ſort of culture depends. In ſome of the varieties, as thoſe of the wood kind, the off-ſets are beſt when taken from the wild bearing plants; as they are not ſo liable to run as thoſe taken from the cultivated ſorts.

Theſe off-ſets or plants are moſtly of ſufficiently ſtrong growth the firſt year for being made uſe of; but when this is not the caſe, they may be ſet out in nurſery-rows till they have obtained a full growth, and are in the moſt proper ſtate for being ſet out.

In preparing for plantations of this ſort, the ground ſhould be well trenched over, and effectually cleared from all ſorts of weeds, and, after being laid quite level, formed into beds four feet in width, with paths of two feet or two feet and a half between them, for the convenience of cultivation and gathering the produce. The ſituation ſhould be quite open, and have as much as poſſible a ſouthern aſpect. It is likewiſe a great advantage when the beds can be formed in a ſhelving or ſloping manner towards the ſouth, ſo as to have the full influence of the ſun during the day.

When the beds have been thus made up, they are in a proper ſtate for being planted upon, which ſhould be done as ſoon as poſſible.

The moſt ſuitable time for performing this buſineſs is in the early autumn, as about the latter end of September, or beginning of the following month, in order that the plants may be well rooted before the commencement of the winter froſts. Some, however, plant in the early ſpring; but there is more danger of the plants being deſtroyed by the heat of the ſummer at this ſeaſon.

In executing the work, the plants or off-ſets ſhould be put in by means of a line and dibble, in rows lengthways of the beds, at different diſtances, according to the kinds.

The moſt uſual diſtances are, for the wood ſort, twelve or fifteen inches each way; and eighteen inches for the ſcarlets, hautboys, Chili, alpine, and other large kinds. Much advantage is always gained by letting them have ſufficient room. It is uſual to ſet them out in the quincunx order; and great care ſhould be taken, in the work of planting, to cloſe the mould well to the roots of the plants, as they are ſet out. When the whole has been done, they ſhould have a good watering, to ſettle the earth well about their roots, and keep them ſteady in the ground.

But beſides this mode of planting upon beds, they ſucceed well on the fronts of clumps, borders, and other parts of pleaſure-grounds, eſpecially when ſet ſo as to have a due degree of ſun, and without being too much ſhaded by the trees and ſhrubs.

When new varieties of this ſort of fruit are wanted, the propagation muſt be effected by ſowing the ſeed produced on the fruit, when perfectly ripened, either in the ſpring or autumnal ſeaſon, on a bed of light earth, or in pots placed in the ſhade.

After the plants have been ſet out as above, and taken new root, care is neceſſary, if the winter prove ſevere, to lay ſome old tanner's bark over the ſurface of the bed between the plants, to keep out the froſt. This is abſolutely neceſſary in the Chili ſort, as the plants are frequently killed in hard winters, when expoſed without any covering. Where tanner's bark cannot be eaſily procured, ſaw-duſt or ſea-coal aſhes may be uſed, or even decayed leaves of trees, or the branches of ever-green trees, with their leaves upon them, laid over the beds, or other parts.

And in the following ſummer, the plants ſhould be conſtantly kept clean from weeds, and all the runners be pulled off as faſt as they are produced: as, where this is conſtantly practiſed, the plants become very ſtrong by the following autumn; but when neglected, and the runners are permitted to ſtand during the ſummer, and then pulled off in the autumn, they are not half ſo ſtrong, nor will there be near the ſame quantity of fruit upon them the following ſpring, or ſo large and fine. Where proper care is taken of the plants the firſt ſummer, there is generally a plentiful ſupply of fruit the ſecond ſpring after planting.

When the plants are in bloſſom, if the weather prove dry, good waterings, given occaſionally, prove very beneficial in promoting a plentiful production of fruit; but, in other caſes, it is unneceſſary to be had recourſe to.

But in the general culture of this ſort of fruit, as the old plants are thoſe which produce the fruit, the ſuckers ſeldom affording any till of a full year's growth, it is obviouſly neceſſary to diveſt them of them; as, when ſuffered to remain, they rob the fruitful plants of their nouriſhment, in proportion to their number; and beſides, the ſuckers render each other weak, and thus cauſe barrenneſs. In the alpine ſorts, the ſummer runners ſhould not, however, be removed, as they produce fruit.

After having been thus cut and managed in the ſummer ſeaſon, it will be neceſſary, in autumn, not only again to diveſt them of theſe ſtrings or runners, but of all the decayed leaves, and to clear the beds from weeds; then the paths ſhould be dug up, and the weeds buried, ſome earth being laid over the ſurface of the beds between the plants, which will ſtrengthen them, and prepare them for the following ſpring; and if, after this, there be ſome old tanner's bark laid over the ſurface of the ground between the plants, it will be of great ſervice to them. In the ſpring, when the danger of hard froſt is over, as in March, the ground between the plants in the beds ſhould be forked over with a narrow three-pronged fork, to looſen it and break the clods; and in this operation the tan, which was laid over the ſurface of the ground in autumn, will be buried, and be a good dreſſing to the ſtrawberries, eſpecially in ſtrong land. This ſhould be done whether the plants are in diſtinct bunches or in large beds, being equally neceſſary in all caſes.

And about the beginning of April, Martyn has obſerved, "if the ſurface of the beds be covered with moſs, it will keep the ground moiſt, and prevent the drying winds from penetrating the ground, and thereby ſecure a good crop of fruit, and alſo preſerve the fruit clean, that when heavy rains fall after it is full grown, there will be no dirt waſhed over them, which frequently happens, ſo that it muſt be waſhed before it is fit for the table, which greatly diminiſhes its flavour."

It is of great utility in dry ſeaſons to water occaſionally every ſummer, while the plants are in blow and forming their fruit; but as it approaches maturity, this ſhould be left off, as it injures the flavour of the fruit.

But in ſome of the more fine ſorts, or curious large varieties, when ripening, it is eligible either to tie up the ſtalks with the bunches of fruit thereon to ſticks, or the leaves and ſtalks together; ſo as, in either way, to elevate the fruit from the earth, more out of danger of rotting by wet, if a rainy ſeaſon, and to more effectually enjoy the full ſun to ripen with a good flavour; or, ſometimes place flat tiles on the ground, round each plant of a few particular ſorts, for the fruit to reſt upon, drier, and more ſecure from rotting by the damp of the earth, and to ripen with an improved flavour by ſuch means.

As the fruit ripens in June and the following months, it ſhould be gathered daily; being plucked off in the cup, with about half an inch of the ſtalk adhering, by which

means they are not ſo liable to be bruiſed, and appear more conveniently when ſerved at table, and are more agreeably picked up out of the diſh or baſket for eating. The wood ſtrawberries are, however, very commonly gathered without any ſtalky part, being generally picked clean out of their cups, eſpecially when deſigned to eat with cream, &c.

Method of Culture in Hot-houſes, &c.—Beſides the above method of raiſing this ſort of fruit in the natural ground, it may be brought to perfection at a much earlier period, by forcing in hot-houſes, glaſs-frames, againſt hot walls, and under common dung or bark hot-bed frames, &c.; but they ſucceed beſt in the ſucceſſion pine-apple houſe.

The ſorts moſt ſuitable in this intention are the different ſmaller ſorts, as the ſcarlet, the alpine, and the wood ſtrawberry. The hautboy grows too large for this purpoſe.

In providing ſets, great care ſhould be taken to have them from the moſt fruitful plants, and thoſe which grow immediately on the old plants; they ſhould be taken off in autumn, and each planted in a ſeparate ſmall pot filled with loamy earth, being placed in a ſhady ſituation till they have taken root; after which they may be removed to an open ſituation till the middle or end of November, when the pots ſhould be plunged into the ground up to their rims, to prevent the froſt from penetrating through the ſides. When placed near a wall, pale, or hedge-fence, expoſed to the eaſt or north-eaſt, they ſucceed better than in a warm ſituation, as they are not forced too forward; after this they only require to be ſecured againſt froſt.

In the ſpring following the plants will have filled the pots with their roots by the end of April, when they ſhould be turned out of them and their roots pared, and re-planted into penny pots filled with the like loamy ſoil, and re-plunged into the ground, in a ſhady ſituation, to remain till the following ſummer; during which time they muſt be kept clean from weeds, and have all the runners taken off as faſt as they are produced. And if there ſhould be any flowers produced, they ſhould be pinched off, in order to have the plants as ſtrong as poſſible.

Towards the end of October, or earlier, if the ſeaſon prove cold, the pots ſhould be removed into a warmer ſituation, to prepare them for forcing; as they ſhould not be ſuddenly removed from a very cold ſituation into the ſtove or hot-bed, but be gradually prepared for it. Where they are deſigned for the borders near hot walls, they may then be turned out of the pots and planted, that they may have time to get freſh rooted before the fires are made to heat the walls; and they may be placed very cloſe to each other, as they are deſigned to remain there only till they have ripened their fruit. It is always the beſt way to pot the plants a year before they are forced.

When the fires are lighted about the latter end of December the ſtrawberries in the borders will be ripe the end of March; but if the ſeaſon ſhould prove very cold, it will be the middle of April before they are fit for the table.

When intended to be forced in a pine-apple ſtove, and there is not room to plunge them in the tan-bed, the plants ſhould be tranſplanted into larger pots in September, that they may be well rooted before they are removed into the ſtove, which ſhould not be till December, or later.

If placed under a frame the beginning of November, to be ſcreened from froſt, it will prepare the plants better for forcing. And where wanted early, a hot-bed ſhould be made under the frames, upon which the plants are put in the latter end of October, by which they are brought forward to flower, and then removed into the ſtove, being placed as near to the glaſſes as poſſible, to have the full influence of the ſun and air; as when placed to the back the plants draw up weak, and the flowers drop without producing fruit.

In the management of the plants in the firſt mode there muſt be care taken to ſupply them with water when they begin to ſhew their flowers, otherwiſe they will fall off without producing fruit; and, in mild weather, freſh air ſhould be admitted to them every day. And in the ſtove method, as the earth in the pots will dry pretty faſt when they ſtand upon the pavement of the hot-houſe, or on ſhelves, they muſt be duly watered; but not too much given at a time, which would hurt them.

Where properly managed, they produce ripe fruit in February, or the beginning of the following month.

When the fruit has been wholly gathered from the plants, they ſhould be put out of the ſtove, and from the borders near the hot wall, that they may not rob the fruit-trees of their nouriſhment and ſupport.

There is another method of ripening this fruit early, which is on hot-beds, where there is not the above conveniences. The plants are prepared in pots in the above manner, and placed in a warm ſituation in the beginning of October; about December the hot-bed is made in the ſame manner as for cucumbers, but not ſo ſtrong; and when the firſt violent ſteam is over, ſome old rotten dung, or, what is better, neat's dung, laid over the hot-bed to keep down the heat. The plants ſhould then be plunged in the pots into the bed, as cloſe together as poſſible, filling up the interſtices between them with earth. They muſt afterwards have air admitted to them every day; and, if the heat of the bed is too great, be raiſed up to prevent their roots being ſcorched. But when too cold, the ſides of it ſhould be lined with ſome hot dung. This bed brings them to flower by the end of February, or the beginning of March, when another mild hot-bed muſt be prepared to receive them. Upon the hot dung ſome neat's dung, about two inches thick, being ſpread equally, to prevent the heat from injuring the roots of the plants, and upon this two inches of a loamy mould; when this has lain two days to warm, the plants ſhould be taken out of the firſt hot-bed and turned carefully out of the pots, preſerving all the earth to their roots, and placed cloſe together upon this new hot-bed, filling up the vacuities between the balls with loamy earth: the roots of the plants ſoon ſtrike out into the freſh earth, which ſtrengthens their flowers, and cauſes the fruit to ſet in plenty; proper care ſhould then be taken to admit freſh air to the plants, and ſupply them perfectly with water, that they may produce ripe fruit in April, or before.

By theſe means a ſucceſſion of this fruit may be obtained from March, April, or even earlier; and in the open air, from June to October and November, ſhould the weather prove mild; for not only the alpine, but the white wood ſtrawberry will continue bearing in tolerable abundance until the autumn froſts come on, eſpecially in warm ſituations, and ſoils not too light.

The heat required in bringing ſtrawberries forward at an early period is ſuch as is ſufficient for forcing the cherry and the peach.

In order to have new varieties of the ſtrawberry, ſeed muſt be employed. To obtain theſe, the ripe berries ſhould be put into a veſſel of water, and the pulp broken and rubbed with the hand, ſo that it may be diffuſed in the water and waſhed completely away, leaving the ſeeds behind. They ſhould then be gradually dried, when they may be ſown in the ſpring on a border of rich, light earth, keeping them watered and free from weeds during the ſummer ſeaſon. See STRAWBERRY.

FRAGILITAS OSSIUM, in *Surgery*, is a very remark-

able diſtemper of the bones, which become ſo brittle as to be broken by exceedingly ſlight cauſes.

The commonly received opinion is, that the fragilitas oſſium ariſes from a deficiency of the animal matter of the bones affected, while the diſeaſe, named *mollities*, is owing to a defective quantity of the lime which naturally enters into the texture of thoſe parts of the body. This idea ſeems to be confirmed by ſeveral inconteſtible facts. Firſt, it is well known, that if we take a recent bone and burn it in a ſtrong fire, all the animal matter will be deſtroyed, leaving the earthy texture alone, which, in this calcined ſtate, is exceedingly brittle. Secondly, every one, at all acquainted with oſteology, is aware that the bones of children have a large proportion of organized animal ſubſtance in their ſtructure, that ſuch young bones are peculiarly flexible, elaſtic, and difficultly broken. Thirdly, in old perſons the earthy part of the bones is very abundant, and the animal matter diminiſhed; conſequently, ſuch bones are much more brittle and eaſily fractured than thoſe of young ſubjects.

From the few remarks already made, it appears that a certain degree of fragilitas oſſium is a natural attendant on old age. However, it is not this ſlighter form of the affection, as ſeen in all old perſons, that we particularly wiſh to treat of in the preſent article. Neither is it our intention to tire the reader with a ſerious refutation of the doctrine, that the bones are always more brittle in froſty weather. The increaſed number of fractures which happen in winter time are fully accounted for by the frequently ſlippery ſtate of the ſtreets and roads at this ſeaſon of the year, and the conſequently greater number of falls.

The diſorder known by the appellation of fragilitas oſſium has been taken notice of by ſeveral authors, and ſome very ſtriking examples of the diſeaſe are recorded. Fabricius Hildanus, in his Cent. 2. mentions an inſtance of a gouty man, ſixty years of age, whoſe bones were ſo brittle that the arm and fore-arm were fractured by the patient endeavouring to put on one of his gloves. The ſame writer alſo, in the ſixty-eighth obſervation of his ſecond Cent. ſpeaks of a woman who broke ſome of her bones in merely trying on a new ſhoe. Nicholas Fontano likewiſe furniſhes us with the hiſtory of a man whoſe bones uſed to break even when handled in a very gentle manner. Rœderer, in a diſſertation, "De Oſſium Vitiis," mentions a woman who died of a ſevere attack of the gout, and all whoſe bones were exceedingly light, brittle, and even friable, "univerſali quaſi carie exeſa, ſimilia oſſium calcinatorum, vel acido quodam liquore imbutorum." Although the middle parts of the cylindrical bones had no appearance of caries, yet they were of a light, looſe, thin texture, which was dry and eaſily crumbled. The metacarpal and metatarſal bones, as well as thoſe of the fingers and toes, were ſo attenuated as to be tranſparent. S. viard and M. Louis cite inſtances of the fragilitas oſſium in perſons who had long laboured under cancerous diſeaſes. The laſt author quotes an example of a nun who broke her arm in ſimply leaning on her ſervant. A patient is deſcribed in the London Medical Journal, who could not turn in bed without breaking ſome bone or another.

The latter ſtage of ſyphilis is ſaid to be ſometimes accompanied with this afflicting diſtemper of the bones. The fragilitas oſſium is alſo ſet down by authors as an occaſional attendant on the ſcurvy.

With regard to the treatment of this peculiar affection little can be ſaid, becauſe, at preſent, little is known. We may ſay, indeed, that when the diſtemper originates independently of any other obvious diſeaſe, no plan of cure is known. Some practitioners have thought that it would be rational to try the effect of the muriatic acid, adminiſtered internally, or of any other acid which has the power of diſſolving the phoſphate of lime. This method appears plauſible, ſuppoſing the theory of the diſeaſe to be correct, and that the brittle ſtate of the bones is owing to the redundance of earth in their texture. However, experience has hitherto exhibited no facts in favour of ſuch treatment. Indeed, doubts may be entertained whether the fragilitas oſſium always depends upon the increaſed quantity of earth, and the diminiſhed proportion of animal matter in the ſtructure of the bones which are affected. The diſeaſe may ſometimes be owing to this alteration of texture; but it appears that the diſtemper called *mollities oſſium*, and which is imputed to a deficiency of lime in the bones, is, at a certain unadvanced period of the diſeaſe, accompanied with the fragilitas. Mr. Gooch has related a caſe which ſhews this circumſtance, and he has adverted to ſome other inſtances of a ſimilar nature. (Chirurgical Works, vol. ii. p. 393. edit. 1792.) The example mentioned by Rœderer, and quoted by us above, was attended with a remarkable lightneſs of the bones, which, therefore, in all probability, did not contain a due proportion of the phoſphate of lime.

When fragilitas oſſium ariſes from any pre-exiſting diſeaſe, ſuch as the ſcurvy, old cancers, &c. it is obvious that if any hopes of relief can be indulged, they can only be realized by curing the primary affection.

FRAGMENS, Fr. anſwers nearly to *Paſticcio*, Italian, in *Muſic*; it is a collection of airs from different ballets, brought together without the leaſt connection, but which, with dancing and ſinging between the acts, ſupply an evening's entertainment as long as a regular opera. The paſticcios of the Italians have been much condemned by opera critics for the liberties taken with the drama, by ſubſtituting airs that have no connection with the recitative; but the fable of a regular drama is ſtill preſerved. The airs in Metaſtaſio's dramas are only recapitulations and illuſtrations of the buſineſs of the preceding ſcene, which would be complete without the air; ſo that if the interpolated air is a good one, and well ſung, it makes ſome amends for its want of connection with the drama. But to put into action fragments of different dramas without any plot to intereſt the audience, ſeems no leſs abſurd than it would be to make the performers of a miſcellaneous concert mount the ſtage, and enact all their ſolos, ſonatas, and concertos; and Rouſſeau truly ſays, that none but a man totally devoid of taſte could have ſuggeſted ſuch a performance, or none but a cold and inſipid audience ſupport it.

FRAGOA DE ST. PEDRO, in *Geography*, a town of Portugal, in the province of Beira; 13 miles S.S.W. of Lamago.

FRAGOAS, a town of Portugal, in Eſtremadura; ſix miles N.W. of Santeren.

FRAGUIER, CLAUDE FRANÇOIS, L'ABBÉ, in *Biography*, born at Paris 1666, was the ſon of a captain in the regiment of guards, deſcended from an ancient noble family. His love for the Greek language rendered him ſo ſtudious, that he acquired in it a knowledge ſo profound as to procure him a place in the Academy of Belles Lettres in 1705, and, in 1707, admiſſion into the French academy. This learned academician was unable to perſuade himſelf that antiquity, ſo enlightened, and ſo ingenious in the cultivation of the fine arts, could have been ignorant of the union of different parts, in their concerts of voices and inſtruments, which he calls "the moſt perfect and ſublime part of muſic;" and thinking that he had happily diſcovered, in a paſſage of Plato, an indubitable and deciſive proof of the ancients having poſſeſſed the art of counterpoint, he drew up his opinion into the form of a memoir, and preſented it to the Academy of Inſcriptions and Belles Lettres, in 1716. M. Burette acquaints us that this abbé learned to play on the harpſichord at an advanced

vanced age, and concluding that the ancients, to whom he generouſly gave all good things, could not do without counterpoint, made them a preſent of that harmony, with which his aged ears were ſo pleaſed.

The paſſage in queſtion is in the ſeventh book of Laws, in which Plato determines that the proper time for young perſons to learn muſic is from thirteen to ſixteen years of age; during which period he ſuppoſed they might be enabled to ſing in uniſon with the lyre, and to diſtinguiſh good muſic from bad; that is, ſuch airs as were grave, decorous, and likely to inſpire virtue, from thoſe that were of a light and vicious caſt. This is ſpeaking like a legiſlator, ſays the abbé Fraguier. But as harmonic compoſition was very bewitching to minds ſo remarkable for ſenſibility as the Greeks, and was, beſides, of ſo difficult a ſtudy, as to require infinite time and labour to accompliſh, he thought it neceſſary to caution them againſt too ſtrong an attachment to it, and therefore eſtabliſhed a kind of rule, by which they would be prevented from giving that time to muſical ſtudies, which might be better employed in more important concerns.

This is but the introduction to the paſſage in queſtion, which is the following: "As to the difference and variety in the accompaniment of the lyre, in which the ſtrings produce one air, while the melody compoſed by the poet produces another, (the poet then ſet his own verſes,) whence reſults the aſſemblage of denſe and rare, of quick and ſlow, acute and grave, as well as of *concord* and *diſcord*. Though the abbé Fraguier tranſlates ἀντιφωνον, *diſſonance*, it is not the true acceptation of the word, nor can it be found thus explained in any lexicon, or Greek writer on muſic; its preciſe and technical meaning will be given farther on. Beſides, the knowing how to adjuſt the rhythm, or meaſure, to all the ſounds of the lyre: theſe are not ſtudies fit for youth, to whom three years only are allowed for learning merely what may be of future uſe to them. Such contrarieties of different difficulties in the ſtudy and practice of muſic, are too embarraſſing, and may render young minds leſs fit for ſciences, which they ought to learn with facility."

It does not ſeem neceſſary here to enter into a verbal criticiſm of this paſſage, as it has been underſtood and tranſlated by the abbé Fraguier; nor to inſert two other paſſages, one from Cicero, and one from Macrobius, which this author has given by way of corollaries, in ſupport of his explanation of the paſſage in Plato; as we ſhall conſign him and his fancied proofs in favour of ancient counterpoint to his brother academician M. Burette, the moſt able writer, in many particulars, of all thoſe who have intereſted themſelves in the diſpute concerning ancient muſic. See BURETTE. The ingenious opponent of the abbé Fraguier proves that the famous paſſage in Plato upon which ſo much ſtreſs has been laid, implies no more than a concert of voices and inſtruments in uniſon and octaves, like plain-chant in the Romiſh church. He proves alſo that Plato determines the word harmony to mean no more than a melody in which the grave and acute ſounds are mixed in ſucceſſion, according to the regulation of the muſical ſcale; and adds that Ariſtotle proves by queſtions in his Problems that the Greeks knew no other harmony, in our ſenſe of the word, than uniſons and octaves, when he aſks: 1. Why a monody (a ſingle voice) is more agreeable than when accompanied by a lyre or a flute, though theſe inſtruments are in tune, and form the ſame ſounds as the voice? 2dly. Why a ſingle inſtrument gives more pleaſure than the union or concert of many inſtruments performing in uniſons and octaves? 3dly. Why are uniſons and octaves the *only accompaniments* that can be ſuffered in concerts, and why are the 4th and 5th, though qualified with the name of perfect concords, excluded?

The abbé Fraguier was not convinced, but as firmly adhered to his original opinion as many others have done, and ſtill do, though ſupported with leſs learning; ſo that their obſtinacy is one degree leſs blameable. It ſeems as if the rooted prejudices of wiſe men were harder to eradicate than thoſe of ignorance and imbecility. It is well known that Fontenelle's attachment to Carteſianiſm was never ſhaken; for after the doctrine of Newton had been eſtabliſhed throughout Europe, he publiſhed his "Théorie des Tourbillons Carteſiens," at the age of near a hundred. The abbé Fraguier died in 1728.

FRAIGHT, or FREIGHT, in *Navigation* and *Commerce*, the hire of a ſhip, or of a part of it, for the conveyance and carriage of goods from one port or place to another; or the ſum agreed on between the owner and the merchant, for the hire and uſe of a veſſel.

The word is formed of the French *fret*, ſignifying the ſame thing; or from *fret*, or *fretum*, an arm of the ſea: though others chuſe to derive it from the German *fracht*, or the Flemiſh *vracht*, ſignifying *carriage*.

The fraight of a veſſel is uſually agreed on either at the rate of ſo much for the voyage, or by the month, or per ton, or other weight, or meaſure. The burthen of the ſhip is generally mentioned in the contract, *e. g.* 300 tons or thereabouts; and the number mentioned ſhould not exceed the exact meaſure above five tons. If a certain ſum be agreed on for the fraight of the ſhip, it muſt all be paid, although the ſhip, when meaſured, ſhould prove leſs, unleſs the burthen be warranted. If the ſhip be fraighted for tranſporting cattle or ſlaves at ſo much a head, and ſome of them die on the paſſage, fraight is only due for ſuch as are delivered alive; if for lading them, it is due for all that are put on board.

The principal laws and rules relating to fraighting are, that if a whole veſſel be hired, and the merchant, or perſon who hires it, do not give it its full load, or burthen, the maſter of the veſſel cannot, without his conſent, take in any other goods, without accounting to him for fraight.

That, though the merchant do not load the full quantity of goods agreed on in the charter-party, yet he ſhall pay the whole fraight; and if he load more, he ſhall pay for the exceſs.

If a time be appointed by charter-party, and either the ſhip be not ready to take in, or the merchant to put on board, the parties are at liberty, with remedy by action for the detriment.

If part be on board, and ſome misfortune prevent the merchant's ſending the whole in time, the maſter may contract with another, and have fraight as damage for the time they were on board longer than limited.

On the other hand, if the veſſel is not ready, the merchant may ſhip the remainder of his goods aboard another, and recover damages againſt the firſt maſter or owners: therefore, by the law marine, chance, or other notorious neceſſity, will excuſe the maſter, but he loſes his fraight till he breaks ground. But if the merchant be in fault, he muſt anſwer the damage, or be liable to maintain the crew ten days; and, if after that, the full fraight; if damage afterwards, it is the merchant's riſk: but by the common law, while the goods are on board, the maſter muſt ſee them forth-coming.

If goods are fully laded, and the ſhip hath broke ground, but the merchant afterward declines the adventure, and unlades again, by the law marine the fraight is due: but if he unload before the ſhip has actually ſailed, he will in ſuch caſe be only reſponſible for damages.

If an embargo be laid on the ſhip before ſhe ſails, the charter-party is diſſolved, and the merchant pays the expence

pence of loading and unloading; but if the embargo be only for a ſhort limited time, the voyage ſhall be performed when it expires; and neither party is liable for damages.

If a ſet time be agreed on between the merchant and maſter, to begin and end the voyage, it may not be altered by the ſupercargo, without ſpecial commiſſion: and if a maſter ſhall ſail on his voyage, after the time agreed on for his departure, and damage happens afterwards, he ſhall make it good. If a ſhip be fraighted from one port to another, thence to a third, &c. and ſo home to the port whence ſhe firſt ſailed (commonly called a trading voyage), the whole is one and the ſame voyage, if performed according to the charter-party. If the ſhip be fraighted out and in, no fraight is due till the voyage is performed; if, therefore, the ſhip periſh coming home, the whole fraight is loſt. If a certain ſum be ſpecified for the homeward voyage, it is due, although the correſpondent abroad have no goods to ſend home.

The maſter may ſet aſhore ſuch goods as he finds in his veſſel, which were not notified to him; or take them at a higher rate than was agreed on for the reſt. But if the maſter fraight his ſhip, and afterwards ſecretly take in other goods, he loſes his fraight; and if any of the fraighter's goods ſhould, for the ſhip's ſafety, be caſt overboard, the reſt ſhall not be ſubject to average, but the maſter muſt make it good. (See AVERAGE.) If the maſter transfer the goods from his own ſhip to another, without neceſſity, and they periſh, he is reſponſible for the full value, and all charges; but if his own ſhip be in imminent danger, the goods may be put on board another ſhip at the riſk of the owner.

If a ſhip be ſtopped or detained in its courſe, either through the maſter's or the merchant's default, the delinquent ſhall be accountable to the other. Thus, if the fraighter load the ſhip with prohibited goods, he ſhall anſwer the fraight contracted: but if the ſhip put into any other port than ſhe is fraighted to, without neceſſity, the maſter ſhall anſwer damage to the merchant; but if forced in by ſtorm, enemy, or pirates, he muſt then ſail to the ſtipulated port at his own coſts.

If the maſter be obliged to refit his veſſel during the voyage, the merchant ſhall wait, or elſe pay the whole fraight: if the veſſel could not be refitted, the maſter is obliged to hire another immediately, otherwiſe only to be paid his fraight in proportion to the part of the voyage performed; though, in caſe the merchant prove that the veſſel, at the time it ſet ſail, was not capable of the voyage, the maſter muſt loſe his fraight, and account for damages to the merchant.

Fraight ſhall be paid for merchandizes which the maſter was obliged to ſell for victuals, or refitting, or other neceſſary occaſions, paying for the goods at the rate the reſt were ſold at, where they were landed.

In caſe of a prohibition of commerce with the country whither the veſſel is bound, ſo that it is obliged to be brought back again, the maſter ſhall only be paid fraight for going.

And if a ſhip be ſtopped or detained in its voyage, by an embargo by order of the prince, there ſhall neither be any fraight paid for the time of the detention, in caſe it be hired per month; nor ſhall the fraight be increaſed, if hired for the voyage; but the pay and the victuals of the ſailors, during the detention, ſhall be deemed average.

The maſter ſhall take no fraight for any goods loſt by ſhipwreck, plundered by pirates, or taken by the enemy, unleſs the ſhip and goods be redeemed; in which caſe he ſhall be paid his fraight to the place where he was taken, upon contributing to the redemption. If part of the goods be thrown overboard, or taken by the enemy, the part delivered pays fraight.

The maſter ſhall be paid his fraight for the goods ſaved from ſhipwreck; and in caſe he cannot get a veſſel to carry them unto the place where they were bound, he ſhall be paid in proportion to the part of the voyage already gone. The ſhip's lading, in conſtruction of law, is tacitly obliged for the fraight; this being, in point of payment, preferred before any other debts to which the goods laden are liable, though ſuch were precedent to the fraight, becauſe the goods remain, as it were, bailed for the ſame.

The maſter may not detain any merchandize in his veſſel, in default of payment of fraight; though he may order them to be ſeized any time, or any where, afterwards. If the goods be damaged without fault of the ſhip or maſter, the owner is not obliged to receive them, and pay the fraight, but he muſt either receive or abandon the whole; he cannot receive thoſe that are not damaged, and reject the others. If the goods be damaged through the inſufficiency of the ſhip, the maſter is liable for the ſame; but if it be owing to ſtreſs of weather, he is not accountable. It is the general cuſtom for maſters, on their arrival, to enter their proteſt, and in caſe, on diſcharge of the ſhip, any damage ſhould appear on the loading, to extend the ſame; but this proteſt muſt be ſupported by evidence of collateral circumſtances.

The maſter is accountable for all the goods received on board by himſelf and mariners, unleſs they periſh by the act of God, or the king's enemies.

The maſter is not liable for carriage of liquors, nor accountable for contents of packages, unleſs packed in their preſence. See INSURANCE.

FRAIGHT is alſo uſed for the burthen, or lading of a ſhip, or the cargo of goods, &c. which ſhe has on board.

FRAIL, in *Rural Economy*, a name ſometimes given to a ſort of flat baſket conſtructed of a ſtrong coarſe ſort of ruſh or flag. It is often likewiſe called a flag baſket.

FRAIL-*baſket*, a term ſignifying the ſame ſort of baſket, and alſo that which is employed in packing up figs, raiſins, &c.

FRAILS, in *Geography*, rocks on the ſouth coaſt of the county of Wexford, in Ireland; 12 miles S.W. from Carnſore point.

FRAIN, or WRANOW, a town of Moravia, in the circle of Znaym, with a citadel; 12 miles W. N. W. of Znaym.

FRAISE, in *Fortification*, a kind of palliſade, or ſtake, placed horizontally in the exterior face of ſuch ramparts as have only half revetements, for the purpoſe of preventing the aſſailants from aſcending. When only one row of fraiſes is uſed, it is uſual to fix them on a level with the terre-plein, *i. e.* on a level with the internal area of the place. Should there be no revetement whatever, a ſecond row of fraiſes will be requiſite, at about nine feet from the bottom of the ditch, ſo as to be above that height to which a man ſtanding on the ſhoulders of another could eaſily climb.

Fraiſes ſhould be about ten feet in length, of which nearly half ſhould be buried in the rampart; otherwiſe they may, when the ſoil is not very firm, or when they are partially decayed, be wrenched out of their places, by means of ropes paſſed over their points. The diſtance between the fraiſes ſhould never exceed five inches, but four are better; and they ſhould be ſupported at every ſix feet by very ſtout poſts let into the rampart, full ſix feet or more, if the ſoil demand it. Two ſtout rails ſhould be laid from one poſt to another, not mortiſing into, but lying upon them, ſo as to overlap. By theſe means they will not be ſo ſubject to rot.

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The fraiſes ought to be of a triangular form, ſix inches wide on the flat or under ſide which lies upon the rails, and four inches thick between that flat ſide and the angle that lies uppermoſt. After being firmly nailed down in their places, the whole ſhould be ſmeared with tar, which, while hot, ſhould be ſprinkled with ſand paſſed through a fine ſieve; this will cauſe them to reſiſt moiſture, and to remain well coated during the hotteſt weather, provided care be taken to fill up all the chinks at the joints and over-laps in a proper manner.

Fraiſes add conſiderably to the ſecurity of entrenchments, &c. far more than palliſades, which, being erect, offer the chance of muſket balls paſſing through, and are ſubject to be deſtroyed by heavy ſhot; fraiſes are, by their ſituation, ſecure from the ordinary range of artillery, and oppoſe an abrupt obſtacle, ſuch as can be ſurmounted by eſcalade only, an operation attended with imminent danger in every ſituation, but eſpecially where the ladders are, as in this caſe, kept off from contact with the ramparts, ſo as to place the party in a poſition to be flanked, as well as to be oppoſed directly in front.

FRAISED RAILS are now much uſed as defences againſt the encroachments of cattle by gentlemen who object to having ſtanding rails within view of their ſitting rooms, &c. Theſe are placed about two or three feet below the level of the field, in the interior bank of the ditch or hollow in which they are to ſerve as a boundary. In ſuch caſe they ought to have a very ſlight inclination upwards, juſt ſufficient to throw off moiſture. When intended to keep out horſes and horned cattle, they may be made of three rails attached at every eight feet to proper poſts; but, in contradiſtinction to military fraiſes, the rails ought to be fixed beneath, inſtead of reſting upon the rails, as in the former mode they are capable of greater reſiſtance to ſuch animals as might endeavour to force their way. The firſt rail ſhould be placed at ten inches from the bank, and be about four inches ſquare; the ſecond rail ſhould be fifteen inches from the other, centre from centre, and the third rail ſhould be eighteen inches, in like manner, from the ſecond. If ſheep, pigs, &c. are to be kept out, there muſt be a ſet of lath-fraiſes nailed below the rails, each about two inches wide and an inch and a half thick; theſe ought to ſtand at ſix inches from centre to centre, and have their butts within an inch of the bank. They ſhould reſt only on the firſt and ſecond rails generally, having their points projecting about ſix inches beyond the latter; but every third fraiſe ſhould be long enough to paſs over the third or outer rail, and to project its point ſix inches. This is an expenſive, but a very excellent defence, far ſuperior to upright pales; againſt which cattle are very fond of rubbing; they are beſides unſightly and far eaſier to paſs than a fraiſed rail. Where the bank is not ſufficiently ſteep, and it is deſirable to conceal the fence, it ſhould be placed ſomewhat lower down, and make an angle of about 25 or 30 degrees of elevation from the horizon. If the acclivity is great, for inſtance not more than 30 degrees from perpendicular, leſs protruſion may anſwer; therefore the third or outer rail may be omitted; or, if all three be preſerved, they may be laid rather nearer than the diſtances above given. There ſhould be at leaſt two feet of each poſt ſunk in the bank, but three feet will prove far more ſubſtantial.

FRAISING *of a Battalion*, is the lining it all round with pikes, in caſe of being charged by a body of horſe.

FRAIZE, or FRAISE, in *Geography*, a town of France, in the department of the Voſges, and chief place of a canton in the diſtrict of St. Diè, ſix miles S. of St. Diè. The place contains 1678, and the canton 10,088 inhabitants, on a territory of 212½ kiliometres in 10 communes.

FRAMBŒSIA, in *Medicine*, from the French *framboiſe*, a *raſpberry*, a term applied by the noſologiſts to a diſeaſe, endemic in Africa, and thence tranſmitted to the Weſt Indies with the negro ſlaves, and called by them the *yaws*; the term *yaw*, in their language, being ſaid alſo to ſignify a *raſpberry*. Theſe terms have been applied to this contagious diſeaſe, in conſequence of the appearance of elevated fungous tumours, reſembling that fruit, on various parts of the ſkin, forming one of the moſt characteriſtic ſymptoms of the malady. In many other reſpects it reſembles the leproſy of the Jews, as deſcribed in the ſacred writings. See YAWS and LEPROSY. See alſo Sauvages Noſol. Method. Claſs X. Gen. 22, where it is divided into two ſpecies; 1. *Frambæſia Guineenſis*; 2. F. *Americana*. Edin. Medical Eſſays, vol. v. part 2.

FRAMBOISE, a name uſed by ſome for the *rubus* or black-berry-buſh. See RASPBERRY.

FRAME, in *Architecture*, two or more pieces of timber joined together by mortiſe and tenon, ſo as to include a ſpace, the leaſt number of ſtraight pieces that can be joined ſo as to conſtitute a frame being three. Frames in carpentry are generally divided into triangles, and thoſe of joinery into rectangles, as in doors, ſhutters, and wainſcotting.

FRAME is alſo a machine uſed in divers arts. The printers' frame is a ſtand whereon they place the *caſes*, which ſee.

The founders' frame is a kind of ledge, incloſing a board, which being filled with wetted ſand, ſerves as a mould to caſt their work in. See FOUNDERY.

FRAME is more particularly uſed for a ſort of loom, whereon artizans ſtretch their linens, ſilks, ſtuffs, &c. to be embroidered, quilted, or the like.

FRAME, among *Painters*, &c. is a kind of ſquare, compoſed of four long pieces or ſlips of wood joined together; the intermediate ſpace whereof is divided by little ſtrings or threads into a great number of little ſquares, like the meſhes of a net; and for that reaſon ſometimes called *reticula*.

Its uſe is in reducing of figures from great to ſmall, or augmenting their ſize from ſmall to great. See DESIGNING.

FRAME, *Garden*, a ſort of box furniſhed with glaſs covers or lights at top to ſlide, being uſed in gardens for protecting and forwarding tender and early plants of different kinds.

Frames of this ſort are moſtly formed of inch or inch and quarter deal boards, being made of different dimenſions, the largeſt about three yards and a half long, and one and a half wide, as high again or more in the back as in the front, to give the top a due ſlope to the ſun, and proper declivity to carry off the wet, when covered with the glaſs lights occaſionally, as they are wanted in the culture of the plants.

Theſe common kitchen-garden frames may be of three different ſizes, as for one light, two lights, and three lights; the two laſt of which, however, are the moſt material, and employed for general uſes; but it is neceſſary to have one or more one-light and two-light frames, eſpecially in private gardens, the former as a ſeed-frame for a ſmall hot-bed, particularly the ſeeds of cucumbers and melons for the early crops, and other tender plants, and the latter as a nurſery-frame to the young plants of the ſame kinds, &c. to forward them to a due ſize for the three-light frames.

The one-light frame may be about four feet and a half in width, from back to front, and three feet ſix inches the other way; fifteen or eighteen inches high in the back, and

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from nine to twelve inches high in front, with a glaſs ſaſh or light made to fit the top completely, ſo as to ſlide up and down and remove when neceſſary. And the two-light frame may be ſeven feet long, four and a half wide, and fifteen or eighteen inches high in the back, and from nine to twelve in front, having one croſs bar three inches in width, ranging from the middle of the back at top to that of the front, ſerving both to ſtrengthen the frame and help to ſupport the lights; the two lights to be each three feet ſix wide, made to fit the top of the frame exactly. But a three-light forcing frame ſhould be ten feet ſix inches long, four and a half wide, and from eighteen inches to two feet high in the back, and from nine to twelve and fifteen inches in front; thoſe deſigned principally for the culture of melons being rather deeper than for cucumbers, as they generally require a greater depth of mould or earth on the beds; though frames eighteen or twenty inches in the back, and from nine to twelve in front, are often made to ſerve occaſionally both for cucumbers and melons; each frame ſhould have two croſs bars ranging from the top of the back to that of the front, at three feet ſix inches diſtance to ſtrengthen them and ſupport the lights; the lights ſhould be each three feet ſix inches wide; the whole together being made to fit the top of the frame exactly every way.

They are ſometimes made of larger dimenſions than the above, but they are very inconvenient to move to different parts where they may be wanted, and require more heat to warm the internal air; in reſpect to depth, if they are but juſt deep enough to contain a due depth of mould, and for the plants to have moderate room to grow, they will be better than if deeper, as the plants will be always near the glaſſes, which is an eſſential conſideration in early work, and the internal air be more effectually ſupported in a due ſtate of warmth; as the deeper the frame the leſs the heat of the internal air in proportion; and the plants being further from the glaſſes will be diſadvantaged in their early growth, for which reaſon London kitchen-gardeners have often many of their forcing frames not more than fourteen or fifteen inches high behind, and eight or nine in front, eſpecially thoſe which are intended to winter the more tender young plants, ſuch as cauliflowers, lettuces, &c. and thoſe for raiſing early ſmall ſallad herbs, raddiſhes, and many others.

But when for the protection of taller plants, they ſhould be deeper in proportion. If deſigned as a nurſery-frame for young pine-apple plants, three feet ſix by fifteen or eighteen inches are the proper depth, arranging the largeſt plants behind, the young yearling ones more forward, and the crowns and ſuckers of the year in front of all; a frame of theſe dimenſions may ſerve alſo for any of the hardier kinds of low green-houſe plants, as myrtles, &c. where there is not a proper green-houſe, or as an caſement to it, when too much crowded. It is uſeful alſo as an occaſional winter ſhelter to many ſorts of curious young plants, evergreens, and others of the full grown, which, being tenderiſh in their younger growth, require protection for two, three, or more years, till they increaſe in ſtrength and are gradually hardened to the full air and atmoſphere.

Deep ſorts of frames are ſometimes made uſe of in the culture of particular ſorts of plants, to bring them up to a proper height. See DRAWING *Frame*.

In all ſorts of frames the wood-work of the backs, ends, and fronts ſhould be of ſuch thick deal as has been mentioned, which muſt be all neatly planed even and ſmooth on both ſides, and the joints in framing them together be ſo cloſe that no wet or air can enter; the croſs bars or bearers at the tops for the ſupport of the glaſſes ſhould not be above three inches broad and one thick, and neatly dovetailed in at the back and front even with both edges, that the lights may ſhut down cloſe, each having a groove or channel along the middle to conduct off all wet falling between the lights; at the end of each frame, at top, ſhould be a thin ſlip of board four inches broad, arranged from back to front, joining cloſe up to the outſide of the lights, which is neceſſary to guard againſt cutting winds ruſhing in at that part immediately upon the plants, when the lights are occaſionally tilted behind for the neceſſary admiſſion of freſh air, or other purpoſes. In regard to the lights, the wood-work of the frame of each ſhould be inch and half thick, and two and a half broad; and the bars for the immediate ſupport of the glaſs-work about an inch broad, and not more than inch and half thick, as when too broad and thick they greatly intercept the rays of the ſun. They ſhould only be juſt ſufficient to ſupport the glaſs-work without bending, and be ranged from the back part to the front with exactneſs.

The glaſs-work may either be laid in lead and well trimmed with cement, air and water tight, or in the bars of wood in putty, lapping at the ends; the latter method is by ſome preferred, as being more effectual for the diſcharge of wet, the lapping of the panes being left open or unputtied at bottom, that the rank vapour naturally ariſing in hot-beds, and all condenſed drops againſt the glaſſes, may be diſcharged at theſe places, as well as admit a perpetual moderate current of freſh air, which may be beneficial to the plants; this mode, however, of leaving the lappings open, is by ſome objected to, eſpecially for very early work, on account of the too free admiſſion of air in cold weather.

All the wood-work, both of the frames and lights, ſhould be painted in oil, to preſerve them from decay; a lead colour will be the moſt eligible, and if done three times over, outſide and in, will preſerve the wood exceedingly from the injuries of weather, and from the moiſture of the earth and dung.

Frames for theſe purpoſes are ſometimes made in a ſort of hollow brick-work, ſo as to admit the heat from without. See *Plate on Forcing Frames*.

FRAME-*work*, that ſort of forcing and raiſing vegetable productions at an early period, which is performed by means of frames and artificial heat applied by them. See FORCING.

FRAMERY, NICHOLAS STEPHEN, in *Biography*. This ingenious gentleman is only mentioned by M. Laborde, in his "Eſſais ſur la Muſique," as a French lyric poet, who has furniſhed "Le Theatre Italien" with many ſucceſsful comic operas: adding, "We owe to him "La Colonie," one of the beſt works of its kind, which always fills the heatre, though it has been repreſented perhaps two hundred times." This drama was written in French, and admirably adjuſted to the muſic of Sacchini's Italian comic opera "L'Iſola d'Amore," which was not only the firſt production of that charming compoſer that was heard in France, but the firſt Italian muſic that was ever ſincerely felt in that kingdom. Beſides the favourable account of it by M. Laborde, no enthuſiaſt for Italian compoſition; the late perturbed ſpirit Linguet, ſtill more patriotic in his love of old French muſic, ſpeaking of the comic opera of "La Colonie," in his "Journal Politique et Litteraire" for 1777, ſays: "Among the works that are moſt frequently revived at this theatre, above all others is "La Colonie," which never fails drawing together prodigious crowds. M. Frame-

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ry has rendered the public a real ſervice in parodying this Italian opera :" (that is, ſetting new French words to muſic that has been originally ſung to other words, whether Italian or French.) Linguet continues : " He has at once given us a new piece and a new actreſs. It was in " La Colonie" that the talents of Mad. Colombe were firſt developed, whoſe voice, ſo extenſive, ſonorous, and touching, was ſo calculated to produce great effects in pathetic airs ; effects which were ſtill encreaſed by the beauty of her figure. The Colony is perhaps the moſt beautiful Italian muſic which has been heard in our theatres ; no other, at leaſt, has produced ſimilar enthuſiaſm : it is by tears and ſcreams of extacy that many of the airs have gained applauſe ; all the tones, every accent of grief, love and deſpair, ſucceed each other ſo rapidly, as to imitate the emotions of nature, without a ſingle cry of art eſcaping that is diſpleaſing. There is no leſs perfection in the cheerful and playful airs of Sacchini than in the more ſerious. The melody of the whole is exquiſite, nor is it ever ſuffocated by the orcheſtra. Such maſter-pieces as this will form the national ear and taſte, by the beſt of all leſſons, pleaſure."

The taſk which M. Framery undertook, and ſo admirably executed, manifeſted an equal knowledge of poetry and muſic. To make the accents of the French language correſpond with the accents of Italian melody, to the ſatisfaction of his countrymen, ſo tender of their own language, and ſo hoſtile to Italian muſic, was an Herculean labour. But M. Framery, not truſting to conjecture or report concerning the compoſition and performance of Sacchini's muſic, came over into England in 1774, during the regency of Mrs. Yates and Mrs. Brooke, where he found Sacchini, and not only converſed with that elegant and intelligent maſter, but, we believe, ſaw and heard " L'Iſola d'Amore" performed ; and after the ſucceſs of " La Colonie," repreſented in 1775, he went to work on Sacchini's ſerious opera of " L'Olimpiade," which he had heard performed in England, and in 1777, having tranſlated it into French, preſerving the ſame meaſures in the airs, he had it performed at the French theatre Italien, where it was received with enthuſiaſm, though performed by comic actors, unuſed to heroic muſic or poetry. Luckily for the votaries of Italian muſic in France, M. Framery is one of the editors of the Encyclopedie Methodique, in which capacity he manifeſts as much knowledge in the theory, as good taſte in the practice of the muſical art.

FRAMING, in *Gardening*, the art of raiſing different ſorts of tender plants and vegetable productions to perfection at an early period, by the uſe of frames and hot-beds ; or by heat applied in ſome other way, by means of them. Framing is carried on very extenſively in many ſituations, and with a great variety of different kinds of plants, roots, and fruits. It requires much nice care and attention in order to ſucceed in a perfect manner. See FORCING and HOT-*Houſe*.

FRAMING *of a Houſe*, all the timber-work therein, *viz.* the carcaſe, flooring, partitioning, roofing, cieling, beams, aſhlering, &c.

FRAMINGHAM, in *Geography*, a townſhip of America, in Middleſex county, and ſtate of Maſſachuſet's, containing 1625 inhabitants ; incorporated in 1700, and diſtant 24 miles W.S.W. of Boſton.

FRAMLINGHAM, a town of England, in the county of Suffolk, where the princeſs Mary retired before ſhe came to the crown, after the death of her brother Edward VI. It has a weekly market on Saturday. In 1801 the number of inhabitants was 1854, of whom 704 were employed in trade and manufactures ; 88 miles N.N.E. of London.

FRAMPEN, a town of Pomerelia ; 12 miles S. of Dantzic.

FRAMPOLE FENCE, a privilege enjoyed by the tenants of the manor of Writtel, in Eſſex ; whereby they are entitled to the wood growing on the fence ; and as many trees and poles as they can reach from the top of the ditch with the helve of an ax, toward the repair of their fence.

The chief juſtice, Brampton, whilſt ſteward of this court, acknowledged he could not find out the reaſon why theſe fences were called frampole. It may come from the Saxon, *fremfil, profitable ;* or may be a corruption of *franc-pole*, becauſe the poles are free for the tenant to take.

FRANC. See FRANK.

FRANC, GUILLAUME, in *Biography*, ſuppoſed by Bayle (art. Marot,) to have been the firſt who ſet melodies, in a ſingle part only, to the French metrical pſalms of Clement Marot. To this fact Beza himſelf bears teſtimony in a kind of certificate, ſigned with his own hand, and dated Nov. 2, 1552. One of Bayle's correſpondents informs him that he had in his poſſeſſion a copy of the Geneva pſalms, printed in 1564, with the name of Guillaume Franc in the title-page ; and to this edition is prefixed the licence of the magiſtrates, ſigned Gallatin, and ſealed with red wax, declaring Guillaume Franc to be the author of the muſical notes to which the pſalms in that impreſſion were ſet. Some deduction however muſt be made from this account, as ſeveral of the old melodies ſung to the French pſalms of Clement Marot, as well as to thoſe of Sternhold and Hopkins, are known to be German, and to have been previouſly uſed by the Bohemian Brethren, John Huſs, Jerome of Prague, Martin Luther, and perhaps by our priſtine reformer, John Wickliffe. We have long thought that the moſt elegant pſalmodiſts at the time of the reformation, ſuch as Louis Bourgeois, Claude Gondinel, and Claude le Jeune, were not the inventors of the original melodies to the pſalm-tunes ; and it appears from this account of Franc that they only harmonized them in plain counterpoint. See PSALMODY.

FRANCA, in *Botany*, Mich. Gen. t. 22 ; ſee FRANKENIA.

FRANÇAIS, or FRANÇOIS, *Port des*, in *Geography*, ſo called by M. La Pérouſe, a bay, or rather harbour, on the N.W. coaſt of America, ſituated in 58° 37′ N. lat. and 139° 5c′ W. long. from Paris. The variation of the compaſs is 28° towards the E., and the dip of the needle 74°. On the days of the new and full moon, the tide riſes 7½ feet, and it is high water at one o'clock. M. La Pérouſe ſuggeſts that, notwithſtanding ſome inconveniences attending this harbour to thoſe merchantmen who trade for furs on ſpeculation, it has many advantages which recommend it for the eſtabliſhment of a factory ſimilar to that of the Engliſh at Hudſon's bay. Its entrance, rendered difficult by the currents, is ſo narrow, that it might be defended by a ſingle battery of four cannon, placed on the point of the continent. The fort, the magazines, and the whole commercial eſtabliſhment might be erected on " l'iſle de Cenotaphe," which is about a league in circumference, very capable of cultivation, and ſupplied with wood and water. Cargoes might be collected at one point, and thus prevent the delay of ſhips ; and buoys laid down for the interior navigation of the bay would render it very ſafe and eaſy, and pilots might be formed ſo well acquainted with the currents, as to enſure the ſafety of ſhips coming in and going out, and the otter ſkins are ſo plentiful, that

that a greater quantity, as Pérouſe conceives, could not be collected in any other part of America. The climate of this coaſt is much milder than that of Hudſon's bay in the ſame latitude. The pines that grow here were found to meaſure 6 feet in diameter and 140 in height. Vegetation is extremely vigorous during three or four months of the year, and the ſoil ſeems to be well adapted for all common plants. The woods abound with ſtrawberries, raſpberries, and gooſeberries. The rivers are full of trout and ſalmon, and the bay furniſhes various ſorts of flat-fiſh, and alſo of ſhell-fiſh. In the woods were found bears, martens, and ſquirrels, and the Indians ſold bear-ſkins, both black and brown, and thoſe of the ermine, marten, Canadian lynx, ſquirrel, beaver, mountain rat of Canada, red fox, &c.: but the valuable, and in this place the moſt common ſkins, are thoſe of the ſea-otter, ſea-wolf, and ſea-bear. Although the different ſpecies of birds are not numerous, yet individuals of each are plentiful; even the copſes were full of linnets, nightingales, blackbirds, and water-quails, whoſe ſongs were very agreeable. The primary mountains of granite, or of ſchiſt, covered with eternal ſnows, where no trees nor plants are ſeen, have their baſes in the water, and form a kind of quay along the ſhore. Their ſides are ſo ſteep that wild goats cannot climb beyond the firſt two or three hundred toiſes; and all the ſtreams by which they are divided are converted into immenſe glaciers, whoſe ſummits riſe beyond the reach of ſight, while their baſes are waſhed by the ſea; and at the diſtance of a cable's length from ſhore the water cannot be ſounded with a line of 60 fathoms. The ſides of the harbour are formed of mountains of the ſecond order, eight or nine hundred toiſes high, decorated with pines and verdure, and only covered with ſnow on their ſummits. They ſeemed entirely compoſed of ſchiſt in the commencement of its decompoſition, and though difficult of aſcent, are not quite inacceſſible. The conſtitution and manners of the inhabitants are adapted to the rough and uncultivated ſtate of the ſoil; and waging continual war with every kind of animal, they deſpiſe the vegetable productions that ſpring up around them. Although the arts of life are here conſiderably advanced, and they have made conſiderable progreſs towards civilization, yet that kind of civilization which poliſhes manners and ſoftens ferocity is yet in its infancy; for their mode of life, excluding all ſubordination, expoſes them to be continually agitated by fear or vengeance, and being choleric and prone to violence, they inceſſantly raiſe their poignards againſt one another. Subject to famine in the winter, they enjoy in ſummer the moſt profuſe abundance; for in leſs than an hour they catch fiſh enough for the ſubſiſtence of their families during the day. The reſt of their time is conſumed in idleneſs, or devoted to play, which they purſue with as much ardour of paſſion as the diſſipated inhabitants of a great metropolis, and, like them, they make it the grand inexhauſtible ſource of quarrels. The ſhips of the French navigators were continually ſurrounded by canoes of Indians, who, after a lapſe of three or four hours, would commence an exchange of a few fiſh, or two or three otter-ſkins, ſeize every opportunity of plunder, ſteal every piece of iron that could be carried away, and in the night time, by every means of eluding vigilance, whilſt the principal perſons among them were loaded with preſents, they were never aſhamed of ſtealing a nail or an old rag of cloaths. Theſe people ſeemed to be always quarrelling among themſelves; were indifferent to their children, and tyrants to their wives, whom they condemned to inceſſant and intolerable labour. The navigators never landed without being armed and in a body, for the people greatly dreaded their muſkets; and eight o ten Europeans together might command a whole village. This village conſiſted of three or four pent-houſes, 25 feet long, and 15 or 20 broad, covered only to windward with planks or bark of trees, in the middle of which were ſuſpended ſalmon and other fiſh to dry in the ſmoke. Eighteen or twenty perſons lodged in each of theſe pent-houſes; the women and children on one ſide, and the men on the other. Each cabin appeared to conſtitute a tribe independent of its neighbours, which poſſeſſed each a boat and a ſort of chief, and left the bay, carrying with them their fiſh and wood, whilſt the reſt of the village took no part in their proceedings. This port ſeems to be inhabited only during ſummer; for there was not a ſingle cabin ſheltered from rain, and though there were not at any time more than 300 Indians together in the bay, our navigators were viſited by 7 or 800 others. In their canoes they carried their houſes and furniture, conſiſting of ſeveral little cheſts, containing their moſt valuable effects. Theſe cheſts were placed at the entrance of their cabins, which are more filthy and noiſome than the dens of the moſt loathſome animals. Every thing about them bears the appearance of dirt and filth, indolence and lazineſs. The wooden veſſels in which they cook their fiſh are never waſhed, but ſerve equally for kettle, diſh, and plate; and as they cannot be placed on the fire, they boil their water by throwing in red hot flints, continually renewing them till their food is completely dreſſed. The dog being the only animal with which they ſeem to have made any alliance, there are commonly two or three of theſe in each cabin. The men pierce the cartilage of their noſe and ears, and attach to them various ornaments. They ſcarify their breaſts and arms with a ſharp iron inſtrument, whetting it upon their teeth as on a ſtone. Their teeth are filed down even with the gum; their faces and other parts of their bodies are painted in a frightful manner, with ochre, lamp-black, and black-lead, mixed up with the oil of the ſea-wolf. During their chief ceremonies, their hair is long, powdered, and dreſſed with the down of various ſea-birds, which they count their greateſt luxury. A plain ſkin covers their ſhoulders, whilſt the reſt of the body is left naked. They have great varieties of head-dreſſes, which were formed to render them more frightful, and probably to inſpire their enemies with terror. Some of the Indians had entire ſhirts of otter-ſkins, and the ordinary dreſs of the grand chief was a ſhirt made of the elk-ſkin. The arms of the women only are tattooed; and each of them has the lower lip cut acroſs even with the gums through the whole width of the mouth; and in this inciſion they wear a kind of ladle without handles, which preſſes againſt their gums, to which their cut lip ſerves as a pad outwards, ſo that the lower part of the mouth projects two or three inches. Theſe women, however, the moſt diſguſting on earth, covered with fœtid, and frequently untanned ſkins, excited deſires and careſſes, which, after ſome reluctance, they freely indulged. Theſe people ſeemed to have neither temple nor prieſts, nor any kind of religion. In ſize and figure they differ very little from Europeans; their features are round, but their eyes never communicate one tender ſentiment. The colour of their ſkin is brown, being tanned by conſtant expoſure to the ſun, as their children are born white. They have leſs beard than Europeans, but enough to refute the error that the Americans are deſtitute of beards. Their bodily frame is feeble; ſome of them indicated ſymptoms of ſcurvy; and they arrive at no great age. M. La Pérouſe is of opinion that theſe people are not *Eſquimaux* (which ſee); but that they have a common origin with all the inhabitants of the interior of Canada, and the northern parts of America. Theſe Indians have made much greater pro-

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greſs in the arts than in morals, and their induſtry is more advanced than that of the inhabitants of the South ſea iſlands, agriculture excepted. They are acquainted with the method of forging iron and moulding copper. They ſpin the hair of various animals, and, with a needle, form of that wool a manufacture ſimilar to our tapeſtry. With this web they mingle ſtrips of the otter-ſkins, which gives to their cloaks a reſemblance of the fineſt ſilk-ſhag. They are peculiarly ſkilful in the manufacture of ſtraw hats and baſkets; and they ſculpture men and animals in wood and ſtone. They decorate boxes of an elegant form with ſhell-work, and cut the ſerpentine ſtone into jewels, to which they give the poliſh of marble. Their arms conſiſt of the poignard, a lance of wood hardened in the fire, or of iron, and a bow and arrows uſually pointed with copper. Seven large canoes, found wrecked at the mouth of the harbour, led M. la Pérouſe to conclude that Port de Français was an emporium, inhabited only during the fiſhing ſeaſon; and he thinks it poſſible that the Eſquimaux, in the vicinity of the Shumagin iſlands, and of the peninſula explored by captain Cook, might extend their commerce to this part of America, furniſhing it with iron, and other articles, and taking, with great advantage to themſelves, the otter-ſkins which they ſo eagerly deſire.

The language of this people, ſays M. de Lamanon, who particularly examined it, manifeſts no reſemblance to that of Alaſka, Norton ſound, Nootka, Greenland, or the Eſquimaux, Mexicans, Nadoeſſis, and Chipawas, whoſe vocabularies he collected. Nevertheleſs there ought to be a great affinity of ſound between this language and that of the entrance of Nootka ſound, for K is the predominant letter in each, and occurs in almoſt every word. Their initial conſonants and terminations are very often the ſame; and it is not perhaps impoſſible that this language may have a common origin with that of Mexico: but if this be the caſe, the origin muſt be very ancient, ſince their words have no reſemblance, except in their elements, but not in their ſignification.

No trace of cannibaliſm was perceived among theſe people, though it is ſo general a cuſtom among the Indians of America; but poſſibly it might have been otherwiſe, if they had been at war, or had taken any priſoners, during the ſtay of our navigators among them. La Pérouſe's Voyage, vol. i.

FRANCAISE, La, a town of France, in the department of the Lot, and chief place of a canton, in the diſtrict of Montauban; 7 miles N.W. of Montauban. The place contains 3,203, and the canton 5,808 inhabitants, on a territory of 145 kiliometres, in 5 communes. N. lat. 44° 7′. E. long. 1° 20′.

FRANCAVILLA, a town of Naples, in the province of Otranto. It is large and well built, the ſtreets are wide and ſtraight, and the houſes ſhewy, though in a heavy ſtyle of architecture. In 1734, a conſiderable part of the town was deſtroyed by an earthquake; and ſince that time the inhabitants have erected their houſes to the height of no more than one ſtory above the ground-floor. The avenues to the gates are well planted with trees, which afford an agreeable ſhade. The inhabitants, about 12,000 in number, ſubſiſt by the ſale of oil and cotton, of which laſt they make very fine ſtockings. The tobacco, which is raiſed in conſiderable quantity in the vicinity, is manufactured into a kind of ſnuff, reſembling the Spaniſh in colour and flavour. This town derived its name Francavilla, or Fair town, from a colony planted here in 1310, by Philip of Anjou, prince of Taranto, who granted lands to all comers, with ten years' exemption from taxes, and gave it an olive-tree, the emblem of peace and fertility, for its armorial ſeal. The manſion of the prince is a quadrangular caſtle, ſurrounded by a dry ditch. About the middle of the ſixth century, this and the adjoining manors were purchaſed by the Imperials of Genoa, from St. Charles Borromeo, archbiſhop of Milan, who is ſaid to have diſtributed in one day the whole purchaſe-money to the poor of his dioceſe, afflicted at that time with peſtilence and famine; 15 miles E.N.E. of Taranto.—Alſo, a town of Naples, in the Baſilicata; 11 miles S.W. of Turſi.—Alſo, a town of Naples, in Calabria Ultra; 13 miles W.S.W. of Squillace.—Alſo, a town of Naples, in Calabria Citra; 4 miles N.E. of Caſſano.—Alſo, a town of Naples, in Abruzzo Citra; 9 miles N.E. of Civita di Chieti.—Alſo, a town of Sicily, in the valley of Demona; 12 miles W.N.W. of Taormina.—Alſo, a town of Genoa; 6 miles S. of Novi.

FRANCE, in *Geography* and *Hiſtory*, is ſituated between the fifth degree of longitude weſt, and the eighth degree of longitude eaſt, from Greenwich; or, according to the French calculation, between the thirteenth and twenty-fifth degrees of longitude by the meridian of the iſland of Ferro, and between the forty-ſecond and fifty-ſecond degrees of northern latitude.

From north to ſouth, or from the Maes and the Wale to the frontiers of Catalonia in Spain, its extent is 300 leagues in length; and from eaſt to weſt, or from Straſburgh to Breſt, 250 leagues in breadth. According to Mr. Necker, the whole extent of France, without the iſland of Corſica, was, in the year 1789, computed at 26,950 ſquare leagues, 25 to a degree. The committee of the firſt national aſſembly ſtated it ſoon after at 26,463 ſquare leagues. The preſent extent of France, including the iſland of Corſica, but without Genoa, Tuſcany, and the Papal dominions, lately added to the French empire, is computed at 762,625 ſquare kiliometres, or 30,505 ſquare leagues.

The boundaries of France are, on the north ſide, the Engliſh Channel and the kingdom of Holland; on the north-eaſt ſide, the Rhine, by which it is ſeparated from Germany, or the ſtates forming the new Confederation of the Rhine; on the eaſt ſide, that chain of mountains called the Jura, which ſeparates France from Switzerland; on the ſouth-eaſt ſide, the Alps, by which it is ſeparated from the kingdom of Italy; on the ſouth ſide, the Mediterranean ſea, and that chain of mountains called the Pyrenees, by which it is ſeparated from Spain; and on the weſt ſide, the Atlantic ocean.

France, which by the Romans was denominated Tranſalpine Gaul, or Gaul beyond the Alps, to diſtinguiſh it from Ciſalpine Gaul, on the Italian ſide of the Alps, was probably peopled originally from Italy, to which it lies contiguous. Like other European nations, it ſoon became a deſirable object to the ambitious Romans, and was, about half a century before the Chriſtian era, annexed to their vaſt empire. In their poſſeſſion it continued till the downfall of the empire, when it was ſubdued by the Franks, from whom it received the name of France. Theſe Franks were originally tribes of Germans, who inhabited the diſtricts on the Lower Rhine and Weſer. They aſſumed the honourable name of Franks, or freemen, from a temporary union among themſelves to reſiſt the power of Rome. See Franks.

The hiſtory of few countries is better aſcertained, or more to be relied on, than that of France, from the commencement of the reign of Clovis, A.D. 481. At this period, or very ſhortly after, Clovis (to whoſe article the reader is referred for information peculiar to himſelf) poſſeſſed all the country lying between the Rhine and the Loire, which, though a very extenſive dominion, was nevertheleſs conſiderably

ſiderably leſs than what it now is, as we have above deſcribed its boundaries. One of his firſt acts, after his marriage with Clotilda, daughter of the duke of Burgundy, was to ſeize upon that prince's dominions; the duke himſelf being glad to retire into private life. By his wife he was converted to Chriſtianity, but his zeal for religion had no effect in reſtraining the bounds of his ambition. He employed the remainder of his life in the aggrandizement of himſelf, and in extending his dominions, without any regard to the means by which he could accompliſh his projects. In his attacks on Armorica [Bretagne], he did not prove ſucceſsful; and, as we have ſeen, this part of the country was not united to the crown of France till the cloſe of the fifteenth century. (See ARMORICA.) The ſucceſsful oppoſition introduced an equal and honourable union: the Franks eſteemed the valour of the Armoricans, and the Armoricans were reconciled to the religion of the Franks. The king now turned his attention to the reduction of the northern provinces, which, inſtead of being decided by the chance of a ſingle battle, appears to have been ſlowly effected by the gradual operation of war and treaties; and Clovis acquired each object of his ambition by ſuch efforts as were fully adequate to its real value. "His ſavage character," ſays Mr. Gibbon, "and the virtues of Henry IV. ſuggeſt the moſt oppoſite ideas of human nature; yet ſome reſemblance may be found in the ſituation of the two princes who conquered France, by their valour, their policy, and the merits of a ſeaſonable converſion." The Burgundians, at this time, poſſeſſed all the country from the foreſt of Voſges to the ſea of Marſeilles on the one ſide, and to the Alps on the other. This vaſt tract of country Clovis attempted to ſubdue; but, after all his efforts, he was obliged to give up the enterpriſe, and reſt for the preſent contented with forming an alliance with, and accepting military ſervice of, the king of Burgundy. The next expedition of Clovis was againſt the Viſigoths, whoſe territories extended to conſiderable diſtances on each ſide of the Pyrenean mountains, under the pretence of contending with the errors of Arianiſm. Alaric, the king of the Viſigoths, a young man deſtitute of military experience, though very brave, determined to contend for his country and the altars of his people. His army was defeated, himſelf ſlain, and Clovis was enabled, as the reſult of this victory, to eſtabliſh himſelf in winter-quarters at Bourdeaux. Toulouſe ſurrendered the next ſpring, and the royal treaſures of the Viſigoths were tranſported to Paris. Other conſiderable places fell into the hands of Clovis, who was ſoon after ſtopped in his career of victory by Theodoric, king of the Oſtrogoths, who had overturned the dominion of Odoacer in Italy. About the year 509, Clovis aſſumed the title of Roman conſul, by which the people of Rome were inſenſibly led to pay peculiar regard to the French monarchs; and the king was now ſuppoſed to be inveſted with a juſt title to all his conqueſts, in whatever manner they had been acquired. He was ſolemnly inveſted with his new dignity in the church of St. Martin, in the city of Tours; after which, he entered the cathedral cloathed in all the badges of office. Clovis, as we have ſeen in his article, died in 511; and his vaſt dominions were divided among his four ſons, who were perpetually at war with each other. A ſeries of weak and wicked princes ſucceeded, under whom France was reduced to more than its ancient barbariſm. The whole power of the kingdom was inveſted in the captains of the king's guard, who were commonly called "Maires du Pálais," and who, for many generations, held the French ſovereigns in abſolute ſubjection, leaving them but little more than the title of king. Of theſe mayors, Pepin and Charles Martel are the moſt celebrated. The latter bequeathed the government of France to his two ſons, Pepin the younger and Carloman; and, on the reſignation of the latter, Pepin ſucceeded to the ſole adminiſtration: and in this exalted ſtation he acquitted himſelf ſo well, as to render his name illuſtrious to ſubſequent generations. When he had ſubdued his foes, both foreign and domeſtic, he determined to aſſume the title of king, after having ſo long enjoyed the regal power; and his deſire, in this reſpect, ſeemed to correſpond with the unanimous wiſhes of the nation. The nobility were, however, bound by an oath of allegiance to Childeric, the nominal monarch at that time; and this oath they could not diſpenſe with but by the authority of the pope. Ambaſſadors were accordingly diſpatched from the nobility and Pepin to pope Zachary, the reigning pontiff. His holineſs replied, that it was lawful to transfer the regal dignity from hands incapable of maintaining it, to thoſe who had ſucceſsfully preſerved it, and that the nation might unite in the ſame perſon the authority and title of king. On this Pepin was crowned in 751, and was the firſt monarch of the ſecond race of French ſovereigns; having driven from the throne of his anceſtors Childeric III. whom he confined for the remainder of life in different monaſteries, and ſet aſide the line of Clovis.

The attention of Pepin was firſt claimed by the revolt of the Saxons; but they were ſoon reduced to ſubjection, and obliged to pay an additional tribute. The ſubmiſſion of the Saxons was followed by the reduction of Britanny, and this again by the recovery of Narbonne from the infidels. His next exploit was the protection of pope Stephen III. againſt Aſtolphus the king of the Lombards. The pope, unable to contend with ſuch a powerful rival, croſſed the Alps to implore the aid and protection of Pepin, who received him with all the reſpect due to his character. He was lodged in the abbey of St. Dennis, and attended by the king in perſon, during a dangerous illneſs. On his recovery, Stephen ſolemnly placed the diadem on the head of his benefactor, beſtowed the regal unction on his two ſons Charles and Carloman, and conferred on the three princes the title of "Patrician of Rome." Pepin was not deficient in duty and reſpect; in return for theſe high honours he accompanied the pontiff into Italy at the head of a powerful army, and reduced Aſtolphus to obedience. Scarcely, however, had Pepin left the country, when Aſtolphus broke the treaty which he had been forced to ſign with every mark of ſolemnity. The pope was again reduced to diſtreſs, and again applied to Pepin for ſuccour, which he received moſt readily. After this Aquitaine was once more annexed to the crown of France; but Pepin had ſcarcely time to indulge himſelf with a view of his new conqueſt when he was ſeized with a ſlow fever, which put an end to his life in the year 768.

Pepin was ſucceeded in his authority by his two ſons, Charles and Carloman; the latter very ſoon died, and left Charles ſole maſter of France, whoſe conduct and actions were ſo brilliant that he juſtly obtained the title of the Great, or CHARLEMAGNE, which ſee. This prince took poſſeſſion of Lombardy in Italy, carried on a war with the Saxons, and brought the whole of Germany under his dominion. He likewiſe took a great part of Spain from the Saracens, and was ſo much feared in the Eaſt, that the king of Perſia ſent him preſents, gave him a title to Jeruſalem, and the Holy Land, calling him his lieutenant, and he was at length proclaimed emperor, in the year 800. It may be worthy of obſervation that Pepin had introduced the ſyſtem of annual parliaments, in which the clergy and nobles were called on to deliberate on public affairs, and the wants of

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the people. Charlemagne carried this meaſure one ſtep farther; he appointed theſe aſſemblies to be held twice a year, to which he invited the people as a party, by admitting from each province twelve deputies. The aſſembly now conſiſted of three eſtates, each forming a ſeparate chamber, that diſcuſſed apart the concerns of its own order, and afterwards united to communicate their reſolutions, or to deliberate on their common intereſts. The empire of Charlemagne, raiſed and ſupported ſolely by his authority and great talents, fell to pieces under his poſterity. His ſurviving legitimate ſon Lewis (Le Debonnaire) was conſecrated emperor and king: and as almoſt the firſt act of his reign, he divided the kingdom among his ſons, who were perpetually engaged in violent quarrels with one another, and who ſeemed to agree in no one thing but in a joint hoſtility to their father, in which they were ſupported by pope Gregory IV. At length Lewis was compelled to ſurrender himſelf priſoner to his own children, and finiſhed an inglorious reign in the year 840. The diſſentions of the brothers ſtill continued. Lotharius, now emperor, and Pepin, his brother's ſon, took up arms againſt the two other ſons of Lewis le Debonnaire, Lewis of Bavaria and Charles the Bald, and were defeated by them in a pitched battle, in which it is ſaid 100,000 were left in the field. Lotharius was at firſt depoſed by an aſſembly of biſhops, but ſoon ſo far aſſuaged the reſentment of his enemies as to become a party in a new partition of the empire. By this the weſtern part of France was aſſigned to Charles the Bald. Lotharius, with the title of emperor, had the nominal ſovereignty of Italy, and the real territory of Lorraine, Franche Compte, Provence, and the Lyonnois: the kingdom of Germany fell to the ſhare of Lewis, who was hence denominated Lewis the German. By this partition, Germany and France were ſo disjoined, as never afterwards to be united under one head. From the year 845 the provinces were much haraſſed by the inroads of the Normans, till at length leave was granted to them to ſettle in Frieſland. During the reign of Charles the Gros theſe piratical invaders failed up the Seine with a fleet of 700 ſhips and laid ſiege to Paris. They were induced to abandon their undertaking by the bribe of a very large ſum of money, and not by the power of the exiſting government. The money not being readily raiſed, they were allowed to remain in the neighbourhood of Paris during the winter; and they requited this indulgence by plundering the country, and amaſſing immenſe wealth, independently of the ſum which had been promiſed by the king. After this ignominious tranſaction Charles returned to Germany, where he was ſo far abandoned by his friends, as not only to be depoſed, but reduced likewiſe to a ſtate of abſolute penury, and muſt literally have ſtarved but for the charitable aid of the archbiſhop of Mentz. On the depoſition of this abject prince, Eudes, count of Paris, was choſen king during the minority of Charles, afterwards ſtyled "Charles the Simple." He defeated the Normans and repreſſed the power of the nobility, which occaſioned ſo much oppoſition that he was obliged to reſign the crown, and the greater part of the kingdom to the young prince, and conſented to do him homage for that part which he ſtill held as ſovereign. Shortly after this Eudes died, and Charles ſucceeded to the whole power. During his reign the French government declined. By the introduction of fiefs thoſe noblemen who had got poſſeſſion of governments, having theſe confirmed to them and their heirs for ever, became, in a manner, independent ſovereigns: and as theſe great lords had others under them, and they again had others under them, and even theſe had their vaſſals; inſtead of the ſimple and equal government that prevailed before, a vaſt number of inſupportable little tyrannies was erected. The Normans, too, ravaged the country in the moſt terrible manner, and deſolated ſome of the fineſt provinces of France.

At length, in the year 912, Rollo, a chief of the Normans, compelled Charles the Simple to yield him a large portion of his territory, and to give him his daughter in marriage. The new kingdom was called Normandy, of which Rouen was the capital. Rollo, on this occaſion, became a Chriſtian, and changed his own name to Robert, in the ceremony of inveſtiture. Rollo rejected with diſdain the ſervile indignity of proſtrating himſelf before and kiſſing the feet of the ſovereign, and one of his guards was accepted as his ſubſtitute; the rude Norman, unpractiſed in the arts of courts, handled the royal foot ſo rudely, as nearly to overturn the chair, and endanger the ſafety of Charles. In this reign the imperial dignity was transferred from France to Germany. During the remainder of the reign of Charles the Simple, and the next three or four reigns, the power of the Carlovingian race continually declined: no great man roſe up among them to redeem the character of the monarchy, and to inſpire the people with new vigour, and at laſt they were completely ſupplanted by Hugh Capet, who was already, by creation, a prince of France. This revolution happened in the year 987, and was brought about in the ſame manner as the former one had been by Pepin. He was acknowledged at Rheims, A. D. 988. The character of Hugh Capet was not marked with any of thoſe commanding features which generally diſtinguiſh the founder of a new dynaſty; but his policy, his talents and moderation, were well adapted to the times in which he lived. Under him Paris became the ſeat of government, and to prevent the incurſions of the Normans, he fortified ſeveral advantageous ſtations, and eſtabliſhed a magazine of arms at Abbeville. The greater part of his reign was paſſed in ſtrict tranquillity, and he died in October 997, having been on the throne ten years, leaving his crown to his ſon Robert.

The new king inherited the good qualities of his father, and in his reign the kingdom was enlarged by the death of Henry, duke of Burgundy, to whom he was the natural heir. This acceſſion of territory was not obtained without a war of ſeveral years continuance, on account of ſome perſons who laid pretence to a ſuperior right. As Robert thought peace and tranquillity were preferable to widely extended dominions, with a precarious tenure, he refuſed the kingdom of Italy, and the imperial crown of Germany, both which were offered him. His own prudence, juſtice, and moderation, contributed greatly to ſecure the public happineſs, which had ſo honourably diſtinguiſhed his adminiſtration; and at his death, which happened in July, 1030, his ſubjects exclaimed, as with one voice, "we have loſt a father who governed us in peace; beneath whoſe authority we dwelt in ſecurity; who ſuffered not in others that oppreſſion which he himſelf diſdained; who commanded our affections, and who baniſhed our fears." Paſſing over ſeveral reigns, in which there is nothing very remarkable to diſtinguiſh them, we come to Philip I., who is celebrated for having undertaken an expedition to the Holy Land. This expedition, known by the name of the Cruſades, Philip and his adherents were urged to make by Peter the Hermit. Both clergy and laity impreſſed on their garments the ſign of the croſs, and ſolicited the pope to march at their head. This dangerous honour the prudent ſucceſſor of St. Peter declined, recommending, however, to the faithful, who were diſqualified by ſex or profeſſion, by age or infirmity, to aid with their prayers and alms the perſonal ſervices of their more robuſt brethren. After confeſſion and abſolution the champions of the croſs were diſmiſſed, and their departure

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for the Holy Land was fixed for the feſtival of the aſſumption, the 15th of Auguſt 1096. That day was anticipated by a thoughtleſs crowd, who to the number of ſixty thouſand perſons of both ſexes preſſed with clamorous importunity Peter the Hermit to lead them to the holy ſepulchre. The hermit, aſſuming the character without the talents or authority of a general, impelled or obeyed the forward impulſe of his votaries along the banks of the Danube and the Rhine. The footſteps of Peter were followed by the monk Godeſcal, whoſe ſermons had ſwept away 20,000 peaſants from the villages of Germany. The rear was cloſed with two hundred thouſand of the refuſe of the people, who mingled with their devotion a brutal licenſe of rapine, proſtitution, and drunkenneſs. Of this vaſt crowd, the greater part ſunk beneath the fatigues of their march and the accumulated preſſure of hunger and thirſt: the remainder, who had endured and ſurmounted the difficulties and diſtreſs of their long and tedious pilgrimage, had ſcarcely refreſhed their waſted bodies with the hoſpitable plenty of Conſtantinople, before their impatience urged them headlong, as it were, againſt the Turks. This imprudence betrayed them into the ſnares of the ſultan of Nice; and Peter the Hermit, ſecurely ſheltered in the Byzantine court, might lament the fate of his improvident companions, and expect the arrival of their more grave and noble brethren. Among theſe, the firſt rank both in war and council was juſtly due to Godfrey of Bouillon, who in the hour of victory was elevated to the tranſient throne of Jeruſalem. With him were joined in the holy enterprize Hugh, count of Vermandois, the brother of the king of France, and Robert duke of Normandy, who for the trifling ſum of ten thouſand marks mortgaged Normandy, during his abſence, to Rufus, who had already defrauded him of the crown of England. (See CROISADE.) It was at the diſtance of nearly a century from this time that Philip II. in conjunction with king Richard of England, unfurled the ſacred banner of the croſs, and embarked, the former at Genoa, and the latter at Marſeilles; but animoſities ariſing between them, Philip returned and poſſeſſed himſelf of ſeveral provinces in France that belonged to the Engliſh. Philip died in 1223, and was ſucceeded by his ſon Lewis VIII. who reigned three years, when by death he made way for Lewis IX. afterwards ſtyled Saint Lewis. In theſe and ſome other following reigns the war was carried on with vigour againſt the infidels, but in this ſketch it is impoſſible to do more than notice the various revolutions that have occured in the country, and the circumſtances which are ſuppoſed to have given riſe, or at leaſt very much contributed to them. One of the moſt remarkable tranſactions that took place at the cloſe of the fourteenth century, was the expulſion and confiſcation of the eſtates of the Knights Templars, who at that period enjoyed immenſe poſſeſſions in France. Theſe confiſcations were levied, according to the ſpirit and practice of the times, without any form of trial, and upwards of fifty of them were put to death in the moſt cruel manner. The grand maſter, with three of the principal officers, were burnt by ſlow fire in the preſence of the king himſelf. The whole body of the knights had been accuſed of the moſt immoral practices, of which, indeed, confeſſions had been extorted, but it was aſſerted that the horror of impending and cruel deaths had forced from their lips confeſſions which they afterwards retracted; and it has been generally thought that king Philip, in theſe ſevere and brutal meaſures, conſulted his avarice rather than his juſtice. He died in 1395, and his ſucceſſor, Lewis the Boiſterous, followed him in a few months to his grave, leaving the throne to Philip the Long, who ſubdued the Flemings, and ſummoned Edward II. of England to do him homage for his poſſeſſions in France; but that monarch, finding himſelf involved in difficulties which rendered a journey to France highly inconvenient, ſent excuſes to Philip which he readily accepted. As the French ſovereign had formerly taken the croſs during the life-time of his father, he now propoſed to put his vow into execution, but was diſſuaded from it by the pope himſelf, at whoſe inſtance he ſent an army into Italy to put an end to the contending factions of the Guelphs and Gibbelines, who for ſo long a time filled the country with blood and ſlaughter. The event proved highly unfortunate, and the diſgrace was rendered more mortifying by a contagious diſtemper which ſwept off many thouſands of the French ſoldiery. This fatality in the army was imputed to the Jews, who were ſuppoſed to have poiſoned the ſprings: a perſecution was inſtantly commenced againſt theſe unfortunate men, and numbers, without any other pretence than the madneſs of popular ſuſpicions, were burnt alive; while the Jews in general were abandoned to the rage of the populace, who inſulted their perſons and plundered their houſes without remorſe. The remaining part of this reign was ſpent in attempting to regulate the internal concerns of the country. A deſign had been formed by his predeceſſors of eſtabliſhing a certain ſtandard for the coin, weights, and meaſures, throughout France; this was adopted by Philip, who, in order to carry it more effectually into execution, purchaſed from the counts of Valois, Clermont, and Bourbon, their right of coinage within their own dominions; but notwithſtanding all his endeavours, he never could bring the ſcheme to bear. He was embarraſſed by new and unexpected difficulties: a report was induſtriouſly circulated, that to ſurmount theſe he intended to levy a fifth on every man's eſtate, and the public diſcontent was increaſed by the diſaffection of the clergy, whom the king by a law had excluded from ſitting in parliament. The mind of Philip was too ſenſibly wounded by the injurious ſuſpicions of his ſubjects; he beheld his honeſt endeavours productive of jealouſy and diſappointment, which he was unable to bear, and he died in the year 1322. His ſucceſſor, Charles IV., was the laſt of the royal race of Capet: the character of this prince was not diſtinguiſhed by any very eminent virtues, nor ſtained by groſs vices; his regard to juſtice was ſteady and impartial, of which there are inſtances on record. He died in 1328, leaving his queen pregnant; and as the ſucceſſion depended on the event, a regent in the mean time was neceſſary. Two candidates inſtantly appeared for this important poſt, urging at the ſame time their right to the crown as well as the regency. Theſe were Philip de Valois, couſin to the late king, and Edward III. king of England, who aſpired to the throne in right of his mother. His pretenſions were eaſily ſet aſide, and Philip was confirmed in the regency, from which he ſoon ſtepped into the throne on the queen being delivered of a daughter; from which circumſtance he acquired the ſurname of "Fortunate." Thus the crown of France had deſcended in the Capetian family from father to ſon for eleven generations, and the ſucceſſive reigns had all contributed to extend the dominion and authority of the monarchs: they had ſhaken off their dependance on the clergy; they had reduced the power of the barons, and had eſtabliſhed the royal revenue on a more permanent foundation. After almoſt three centuries and a half, the immediate poſterity of Hugh Capet, as we have ſeen, expired in Charles IV. and the ſceptre was placed in the hands of the race of Valois.

Philip was almoſt immediately involved in a war, yet he boldly ſummoned his rival, Edward of England, to yield him homage for the lands which he held in France. The Engliſh monarch paſſed the ſeas, and appeared bare-headed without

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arms or ſpurs, before a prince whoſe equal he conſidered himſelf: but his mind, indignant at the humiliating act, revolted, and war was immediately kindled between the two nations; and he who had been ſeen in France as a vaſſal, marched into it at the head of a numerous army. His moſt conſiderable ally was James d'Arteville, a brewer of Ghent, under whoſe auſpices the Flemings had acquired a degree of independence unknown in an age when the common people were almoſt univerſally enſlaved by feudal inſtitutions. With d'Arteville, therefore, as a leader, they were very ready and anxious to oppoſe the power of Philip. They adviſed the king of England to aſſume the title of king of France. A long and bloody conteſt enſued, in which the Engliſh were very generally ſucceſsful. Philip was under the neceſſity of ſecuring himſelf againſt the power of his rival by new alliances, and at length was reduced to that exhauſted ſtate that for ſome time he was incapable of making any oppoſition. To recruit his finances he laid a heavy duty on ſalt, which cauſed ſo much offence as nearly to excite a rebellion; but having aſſuaged the diſcontents, he found his hands ſtrengthened, and was ſoon enabled to bring into the field 100,000 men, whoſe proweſs was farther raiſed by the preſence of the dukes of Normandy and Burgundy. The Engliſh were therefore compelled to ſtand upon the defenſive. One fortreſs after another ſurrendered to the French, till nothing appeared but a total extinction of the power of England upon the continent. In this ſituation Edward reſolved to bring relief in perſon to his diſtreſſed ſubjects and allies, and embarked for that purpoſe in 1346 at Southampton, with a large army on board of one thouſand ſail of different bulks and burdens. He carried with him the chief, and indeed the flower of the nobility and great men of the country, and his eldeſt ſon the prince of Wales, a youth of fifteen years of age, ſince celebrated in hiſtory as the "Black Prince." The army which the king now took with him conſiſted of 4000 men at arms, 10,000 archers, 10,000 Welch infantry, and 6000 Iriſh; all of whom he landed ſafely at La Hogue, a port of Normandy, which country he determined to make the ſeat of war. The Engliſh had no ſooner landed than they ſpread terror and devaſtation all round them, and an univerſal conſternation reached the French court. The city of Caen was taken and plundered by the invaders, and all the villages and towns, even to Paris, ſhared the ſame fate; and the French had no other reſource but by breaking down their bridges to attempt a ſtop to the career of the Engliſh. Philip was not, however, idle or negligent in making preparations: he had ſtationed an army on the oppoſite ſide of the river Somme, over which Edward was to paſs; while he himſelf, at the head of 120,000 fighting men, advanced to give the Engliſh battle. Thus expoſed to the danger of being incloſed and ſtarved in an enemy's country, the king publiſhed a reward to any that ſhould bring him intelligence of a paſſage over the river. This was diſcovered by a peaſant of the country, and Edward had juſt time to get his whole army over the ſtream when Philip appeared in his rear. The famous battle of Creſſy was now fought, in which the French were completely defeated with the loſs of thirty thouſand ſoldiers, eleven princes, eighty barons, and twelve hundred knights. Edward immediately beſieged the town of Calais, which ſurrendered, and remained in poſſeſſion of the Engliſh 210 years. From the commencement of this war Philip had invariably ſhewed himſelf deſirous of peace, and the victory obtained over him at Creſſy increaſed his anxiety in this reſpect; and fortunately for him, the expences incurred by his opponent were ſo great that he could no longer ſuſtain the conteſt. A truce of three years was accordingly concluded through the mediation of the court of Rome: at the ſame time Philip met with ſome recompence for the loſſes which he had ſuſtained, by the acquiſition of Dauphiny, which had been bequeathed to him by the duke on condition that the eldeſt ſons of the kings of France ſhould take the name of Dauphin. Soon after this event the king himſelf, who had been ſome time a widower, was married to Blanch, the daughter of Philip count of Evreux, and Jane queen of Navarre. But he died within a year of this union, in the fifty-ſeventh year of his age, and the twenty-third of his reign. On the death of Philip, his eldeſt ſon John took poſſeſſion of the kingdom; but ſcarcely was he ſeated on the throne, when he diſguſted his nobility by an unſeaſonable act of ſeverity. Robert de Brienne, count of Eu and Guiſnes, had been taken priſoner by the king of England at Caen, and under pretence of negociating his ranſom had paſſed ſeveral times between France and England; but being accuſed of a treaſonable correſpondence with Edward, he was, by order of his ſovereign, ſuddenly arreſted, condemned, and beheaded, without the form even of trial. Having been conſtable of France, the ſword, the badge of office, was delivered to Charles de la Carda; but his fate was equally unfortunate with that of his predeceſſor, being ſoon after aſſaſſinated by Charles king of Navarre. On the expiration of the truce Edward renewed hoſtilities, being perfectly intent upon the conqueſt of France; but having, by means of his ſon, made an unſucceſsful attempt, he recalled his army. After the departure of which, John aſſembled the ſtates at Paris, explained to the deputies the diſtreſſed ſituation of his finances, and exhibited ſo fully and ſatisfactorily the neceſſity of aſſiſting him in the defence of the kingdom, that they conſented to maintain an army of 30,000 men during the war. To raiſe the neceſſary ſupplies, the ſalic law, as it was called by way of ridicule, or the duty on ſalt, was revived, and many other impoſts that bore heavy on the people; but at the ſame time they appointed a committee of their own number to take care that the money was ſolely appropriated to the public ſervice. The ſatisfaction which John received from theſe grants was ſoon damped by the news that the prince of Wales had invaded his country, and taken ſome important places. Though alarmed, he did not ſit down in deſpair, but aſſembled an army of 60,000 men to ſtop his progreſs, and with the hope of intercepting him. Edward at firſt thought of retreating, but finding that project impoſſible, he determined calmly to wait the approach of the enemy; and notwithſtanding the diſparity of forces, to commit all to the hazard of a battle. At Maupertuis, near Poictiers, the armies came in ſight of each other. The French monarch might, with a common ſhare of prudence, have ſtarved the enemy into any terms he thought proper to impoſe; but ſuch was the impatient valour of the French nobility, and ſuch their certainty of ſucceſs, that he was forced to act in the aggreſſive. While both armies were drawn up in order of battle, and waiting only for the fatal ſignal to commence the bloody attack, they were ſtopped for a moment by the appearance of the cardinal Perigord, who attempted to be a mediator between them. John, however, who felt certain of victory, refuſed to liſten to any terms, unleſs the baſis was the reſtitution of Calais. The Black Prince, exaſperated at the propoſal, boldly declared he was ready to hazard every thing rather than ſeek ſafety on ſuch degrading terms. The onſet was deferred till the next morning, for which both ſides waited with anxious and awful ſuſpence. At length the trumpet ſounded, and a horrible carnage enſued; and in the end the French monarch

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was made priſoner, and conducted as ſuch to the metropolis of England. The government of France now fell into the hands of the king's eldeſt ſon, Charles, who was afterwards king under the title of Charles V. a prince now but fifteen years of age. This youth poſſeſſed great talents, and amidſt the moſt dreadful conteſts he gained the aſcendancy by his wiſdom and activity; opened the eyes of the people to their true intereſts; brought them back to moderation, and after a time negotiated a peace with the Engliſh, by which king John was permitted to return to his native country. The king, however, finding the affairs of the ſtate ſo well conducted by his ſon, left them in his hands, and rarely interfered with his authority, or even advice, but on very important occaſions. After the peace was accompliſhed, the diſbanded ſoldiers, having no regular employment to which they could turn their attention, united under chiefs of their own election, and committed all kinds of atrocities. When by plunder their leaders had acquired ſufficient riches, they retired to enjoy their wealth, but ſtill there remained many wandering ſoldiers, who were eſteemed the beſt, but the moſt profligate in Europe. Theſe the king would have aſſembled in a body, and made another cruſade, but the treachery of one of his ſons obliged him to become a ſecond time a captive in England, where he died. He obtained the ſurname of "Good," which, notwithſtanding his imprudence and misfortunes, he ſeems to have juſtly merited. By his actions, as well as his words, he declared "that if honeſty and honour were loſt on the earth, it ought to be found again in the hearts of kings."

Charles V. the ſucceſſor to John, delivered France from the banditti by whom it had been ravaged, by driving the plunderers into Spain under the command of Gueſelin. At Avignon, this leader, pretending that he was at the head of 30,000 cruſaders, going to make war upon the infidels, demanded of the pope full abſolution from their ſins, and 200,000 francs to defray the expences of their journey. The former, as it coſt nothing, was readily granted, and the money was, after a little delay, raiſed by a tax on the people, which, however, Gueſelin refuſed to accept, inſiſting that the whole ſum of money, as well as the ſpiritual benediction, ſhould be furniſhed by the pope and cardinals. Having thus delivered his kingdom from theſe plunderers, Charles eſtabliſhed in it a proper police and good order, recovered ſome of the provinces from the Engliſh, and though he rarely appeared in perſon at the head of his troops, yet Edward ſaid of him, "No king, who interfered ſo little with military operations, ever did me ſo much injury. This monarch, who obtained the title of "Wiſe," did every thing in his power to baniſh ignorance from his kingdom, and to diffuſe through it a taſte for learning. He ſhewed great reſpect for thoſe by whom it was cultivated, and who were denominated "clerks." "Theſe," ſaid he, in the true ſpirit of patriotiſm, "cannot be too much honoured; while wiſdom is honoured, the kingdom will proſper; when it is baniſhed, it will fall to ruin." This monarch was the founder of that immenſe library that is now the glory of the French empire, and it is ſaid the moſt gratifying preſent that could be made him was a book. He took delight in the ſciences as far as they were then known, which was the only relaxation that he allowed himſelf from the cares of government. He died too ſoon for his country, at the age of forty-four, and was ſucceeded by his ſon Charles VI. who proved himſelf utterly incapable of the management of public affairs. Being a weak prince, the nobility contended for the adminiſtration, and convulſed the kingdom. Every ſpecies of miſery that ambition, avarice, diſcord, and rebellion could produce, combined to ruin the ſtate. The hiſtory of this period is a ſeries of dire and calamitous events. Contempt of the laws, alienations of the funds, acts of injuſtice and violence, are the ſignal exploits of this reign.

In the beginning of the next, Charles VII. was ſo much inclined to diſſipation, that he nearly loſt the whole of his kingdom; but either his own misfortunes, or the timely reproof of a general, on whoſe judgment he greatly relied, excited in him a conduct more worthy of his character, and he occaſionally was ſeen foremoſt among the ranks of his ſoldiers, and was more than once almoſt the firſt to mount a breach, and rallied in his own perſon troops ready to abandon their colours. He was, however, unfortunate, though brave, and borne down by the ſuperiority of the Engliſh arms. After a war of ſeven years, when Orleans, the only town left him by which he might ſupport his power in the centre of the kingdom, was beſieged, a country-girl, of the name of Joan of Arc, and ſince celebrated by the title of the maid of Orleans, preſented herſelf to the governor, requeſted that ſhe might be ſent to the king, becauſe God had revealed to her, that under her command the ſiege ſhould be raiſed. She obtained her deſire, was preſented to Charles, headed his troops, and nobly performed all that ſhe had promiſed. Crowned with victory, and thinking herſelf ſuperior to misfortune, ſhe propoſed a journey to Rheims, although at that time it was in the hands of the enemy. Nevertheleſs, ſhe ſurmounted every obſtacle, entered the city, cauſed the king to be conſecrated, and then requeſted leave to retire, having accompliſhed her miſſion. At length the fortune of war, and the treachery of a French governor, threw her into the hands of the enemy, who, after inflicting upon her many cruel inſults, cauſed her to be burnt alive in the market place of Rouen. After the conſecration of Charles VII. his reign was a continued ſeries of victories; he expelled the Engliſh from France, and rendered himſelf highly uſeful to the intereſts of his country. He died in the ſixtieth year of his age, and was ſucceeded by Lewis XI. in the year 1460, who had been long ambitious of taking the reins of government. He was reckoned one of the greateſt politicians that ever exiſted, but his moral character was deteſtable, and as a king, he was inſidious, abſolute, and tyrannical: he was frequently diſturbed by the factions of the nobles; but, in dividing, he was enabled to diſconcert and defeat their beſt plans: and notwithſtanding all the attempts of his ſubjects to the contrary, he ſecured himſelf on the throne, and extended the royal prerogative by policy and rigour. He acted, however, more like a conqueror than the legitimate ſovereign of good and faithful ſubjects. He cauſed ſeveral thouſands of them to be deſtroyed without the form of trial, and committed, or cauſed to be perpetrated, inhumanities and cruelties that are ſcarcely to be credited. By theſe he broke the ſpirits of the French nobility, and gradually extended the power of the crown beyond all bounds; ſo that at laſt it was only limited by the ſovereign's pleaſure. From this time the people were accuſtomed to ſubmit entirely to the voice of the king as the only legiſlator; and being always obedient in matters of the greateſt conſequence, they cheerfully contributed whatever ſums were required to fulfil the king's pleaſure. This king died deteſted by his ſubjects; and during his laſt illneſs he was ſo much alarmed at the proſpect before him, that he was ſurrounded by relics, and a ſaint was brought from Calabria to reſtore him to health: but neither medicine, nor prayers, nor pious proceſſions, could avail or avert the impending ſtroke. He expired in the year 1483, after a reign of 23 years. His ſucceſſor Charles VIII. made an expedition

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to Italy in order to ſecure the conqueſt of Naples, which he claimed as his right: with his army he overwhelmed the country like a torrent, aſtoniſhed the natives with the unuſual arms which they bore, and with which they could cleave a man aſunder, almoſt with a ſingle blow. In ſix weeks the king traverſed the whole country, and made himſelf maſter of the kingdom of Naples. Such an inſtance of extraordinary good fortune ſeemed miraculous; and he was, in thoſe times, reckoned an inſtrument raiſed by God to deſtroy the execrable tyrants with which Italy was at that time infeſted. Had Charles made uſe of this prepoſſeſſion in his own favour, and known how to turn it to his account, he might have raiſed himſelf to the higheſt pitch of celebrity. But he abandoned himſelf to pleaſure, of which ſurrounding princes took the advantage, combined againſt him, and diveſted him of his new kingdom in as ſhort a time as he had employed in the acquiſition of it. He died at the age of 28.

Louis XII. the ſucceſſor to Charles, rendered himſelf formidable to the republics of Genoa and Venice: he had however to contend with pope Julius the Second, who was ſaid to be a better ſoldier than eccleſiaſtic. This holy father at one period was ever on the march, took cities, and won battles, till he met with a defeat from the French: hearing that his enemy had obtained an important victory in which his own intereſt was concerned, he threw away a book which he held in his hand, and indignantly ſcoffed at his maker on account of his partiality, as he deemed it, for the French. Lewis put an end to much oppoſition, and converted many dangerous enemies into faſt friends by the marriages which he negociated. To Ferdinand of Spain he offered his daughter for either of his grandſons, and propoſed to renounce in favour of the marriage his claims on Milan and Genoa. This propoſal was accepted, and Louis himſelf married the princeſs Mary, ſiſter to Henry VIII. of England: after this he ſurvived but a very ſhort time, and was ſucceeded by Francis I. early in the year 1515. This prince had great abilities and many defects, which proved the ſources of heavy and long continued misfortunes. After the example of his predeceſſors, he invaded Italy without ſucceſs. When he aſcended the throne, he was young, ambitious, and a candidate for the imperial crown in oppoſition to Charles V. which was the cauſe of hatred between the rival princes. Charles deprived Francis of ſeveral of his allies, among whom was Henry VIII. of England. The French and Engliſh monarchs, at an interview at "Le Champ du drap d'Or," had ſworn to maintain a ſincere friendſhip, but enticed by Charles, Henry forgot his oath, and took part againſt his friend. Francis, in an attack upon Pavia, was beaten and taken priſoner. The conqueror did not exhibit towards the fallen monarch that generoſity and frankneſs which he promiſed: he, it is true, after two years' confinement, ſet him at liberty, but it was on ſuch conditions as could not fail to produce a new war. A league, formed with the pope, the Venetians, and Henry VIII. againſt Charles, was ſoon diſſolved by the peace of Cambray. Several negociations with the Proteſtants in Germany having proved fruitleſs, hoſtilities were renewed; but by the intervention of the pope, a truce for ten years was concluded; war however broke out before half that period was elapſed: the emperor obtained the aid of ſeveral neighbouring princes, and penetrated into the heart of France, but, notwithſtanding his ſucceſs in the outſet, he was conſtrained to propoſe terms of accommodation, which were readily accepted by Francis. New ſchemes of ambition were formed by the one, and new meaſures, for rendering theſe ineffectual, were adopted by the other. In the midſt of theſe plans and operations, a lingering illneſs ſeized on Francis, which put a period to his life in the thirty-third year of his reign. He was ſucceeded by Henry II. of whom no memorable acts are recorded; but during his reign the people of Guienne rebelled againſt the government on account of the oppreſſive conduct of the officers who levied the ſalt tax, and were with difficulty brought to ſubmiſſion. After this, the king began to execute the edicts which had been made againſt the Proteſtants with the utmoſt ſeverity, to cauſe multitudes of them to be burnt, and he is ſaid even to have taken pleaſure in the ſavage ſpectacle. Towards the concluſion of the reign peace was re-eſtabliſhed in Europe, by the famous treaty of Chateau-Cambreſis, in which almoſt every prince of Chriſtendom was comprehended; and ſoon after the king was killed at a tournament by count de Montgomery, who was reckoned one of the ſtrongeſt knights in France, and who had done all in his power to avoid this encounter with the monarch. The reign of Francis II., ſucceſſor to Henry II., was remarkable only for the perſecution of the Proteſtants, which became ſo grievous, that they were obliged to take up arms in their own defence. This occaſioned ſeveral civil wars, of which the firſt commenced in the reign of Charles IX. who ſucceeded to the crown in 1560. Theſe conteſts were all memorable in ſome way or other, and have been noticed in hiſtory by the circumſtances that preceded or attended them. The maſſacre of the Proteſtants at Vaſſi in 1562 by the duke of Guiſe's attendants was the ſignal of the firſt:—the intrigues of Catharine, and the cruelty of the duke of Alva, proved the occaſion of the ſecond:—an attempt to ſeize the prince of Condé and Coligny, the leaders of the Proteſtants, paved the way to another rupture:—the infamous maſſacre of St. Bartholomew, 1572, brought on a fourth civil war;—and laſtly, a powerful faction was formed againſt the houſe of Guiſe, and hoſtilities were renewed, but at the commencement of this war Charles was removed by a violent diſorder. He lingered indeed for ſome time under the moſt terrible agonies both of body and mind: and it is ſaid that after the dreadful maſſacre of St. Bartholomew's day he had a perpetual fluſh and fierceneſs of countenance which he never had before. His ſleep was of ſhort duration, and perpetually interrupted. He waked frequently in the utmoſt agonies, and no arts could be invented to give him reſt. He died at the age of 24.

Henry III. brother to Charles, ſucceeded to the crown, but, being immerſed in pleaſures, he left the ſole direction of the public affairs to his mother. A new faction, called the ſacred league, was formed for the defence of the Catholic religion, which was animated by the duke of Guiſe, and ſupported by the court of Spain. They united their force, and combined with one mind to ſuppreſs it, and the moſt terrible conſequences enſued. Hoſtilities and pacifications quickly ſucceeded one another, till at length the king was nearly depoſed by the Guiſes, whom he cauſed to be aſſaſſinated, when the party were in the act of driving him from the kingdom. This murder inflamed the confederates with the utmoſt reſentment, who publicly declared that Henry had, by the atrocity of the act, forfeited the crown, and was an enemy to religion: they cauſed his name to be eraſed from the public prayers, and openly declared that it would be a meritorious act to put him to death. James Clement, a Dominican friar, engaged to perpetrate the deed, and actually ſtabbed the monarch as he was reading ſome letters at St. Cloud. Thus died Henry III. a man endowed with ſuch qualities as would have been judged worthy of a throne had he never been called to that high ſituation. In him the family of the Valois ended.

Before the king's death, he had nominated as his ſucceſſor Henry Bourbon king of Navarre; to this honour he had a

title which he derived from Lewis XI. who had been dead more than 300 years; nevertheleſs, he was oppoſed by the party of the Guiſes, on account of the ſupport which he had uniformly given to the reformed religion: this was the only obſtacle to the acknowledgment of Henry's claims by the greateſt part of his ſubjects, and in the end it gave riſe to a civil war. Henry encamped before Paris, of which he might have made himſelf maſter by famine, had he refuſed to grant a paſſage to a multitude of old men, women and children, who were ordered to depart the city to ſave proviſions. For this act of generoſity the king was blamed by his generals, but he nobly replied, "That he would rather endure the reproaches of the whole world than thoſe of his own heart." At length, perceiving that the Catholics were ſeeking foreign aid, and that there would be no termination to theſe evils unleſs he renounced the proteſtant religion, he, by the advice and earneſt perſuaſion of his miniſter the great duke of Sully, declared himſelf a catholic, and accordingly abjured his former faith at St. Dennis, and was crowned king at Chartres in 1594. This change put him in poſſeſſion of the whole kingdom, but the proteſtants were at firſt indignant at his converſion; nevertheleſs they were appeaſed by the celebrated edict of Nantes, which re-eſtabliſhed, in a moſt ſolid and effectual manner, all the favours that had ever been granted to the reformed by other princes, and adding ſome which had not been thought of before, particularly the allowing them a free admiſſion to all employments of truſt, profit and honour, the eſtabliſhing chambers in which the members of the two religions were deemed equal, and the permitting their children to be educated without conſtraint in any of the univerſities. Having concluded a peace with Philip II. of Spain, he beſtowed all his attention on the improvement of his kingdom, by reforming its laws, regulating its finances, encouraging agriculture and manufactures, enlarging and embelliſhing cities, and finally reconciling, in a great meaſure, the partiſans of contending religions. In all his beneficial ſchemes he found an able and faithful aſſiſtant in his miniſter the duke of Sully. Theſe two great men, ſays the hiſtorian, ſeemed to have been born for one another; greatneſs and true glory were the conſequences of their united endeavours to promote the public good. The ſchemes of reformation, projected by this king and his miniſter, were intended to be carried far beyond the boundaries of France: they were anxious to new-model the whole of Europe, and reduce all its powers into a kind of Chriſtian republic, by rendering them as nearly as poſſible of equal ſtrength. That this republic might be maintained in perpetual peace, they propoſed to bring all their differences to be decided before a ſenate of wiſe, diſintereſted, and able judges, and then they ſuppoſed it would be no difficult matter to overturn the Ottoman empire. With a view probably of executing this project, but under the pretence of reducing the exorbitant power of the houſe of Auſtria, Henry made immenſe preparations by ſea and by land, when he was aſſaſſinated at the age of 57 by Ravaillac, an inſane fanatic. The life and character of this monarch have been tranſmitted to poſterity by the pen of his miniſter, to which we ſhall again have recourſe in the article HENRY.

On the death of Henry IV. the queen-mother, Mary de Medicis, aſſumed the regency during the minority of Lewis XIII., which was only remarkable for cabals and intrigues of the courtiers. France, which under Henry had riſen from a ſtate of miſerable anarchy to the higheſt pitch of glory, ſunk now into a wretched ſtate of weakneſs. In 1617 the king aſſumed the government himſelf, baniſhed the queen-mother, cauſed her favourite Marſhal d'Ancre to be killed, and choſe for his miniſter the celebrated Cardinal Richelieu. This wiſe miniſter reconciled the contending parties, and re-eſtabliſhed the dignity of the monarchy. The proteſtant party attempted to throw off their allegiance, and eſtabliſh an independent ſtate, of which Rochelle was to be the capital. The Dutch vigorouſly aſſiſted Richelieu in ſubduing the proteſtants, while the Engliſh ſent out a fleet in aid of the inhabitants of Rochelle, who maintained their ground for a whole year againſt the French with the cardinal at their head. At length, however, they were forced to ſurrender, and this, with all the proteſtant cities of France, were ſtripped of their privileges, and their religion effectually cruſhed. Lewis XIII. entered completely into the views of his miniſter, who influenced the politics of all the courts of Europe: the talents of Richelieu were equally and ſucceſsfully diſplayed in active war, in foreign negociations, and in his domeſtic arrangements; yet at this time a conſpiracy was forming againſt him. Mary de Medicis was jealous of the man ſhe had raiſed, and was deſirous of deſtroying the idol ſhe had formed. The duke of Orleans ſought to ſupplant the miniſter; but, with aſtoniſhing intrepidity of mind, he repreſſed the conſpiracy, ſeized the Marſhal de Marillac, one of his moſt dangerous enemies, at the head of his army, and put him to death. Orleans, apprehending a ſimilar fate, fled the kingdom. Mary was arreſted, and ended her days in a voluntary exile at Bruſſels. Amidſt this turbulence, both of foreign war and domeſtic cabal, Richelieu cultivated the purſuits of literature; he was, as we have ſeen in many of our biographical articles, a liberal patron of the ſciences, and of thoſe who devoted their lives to the extenſion of knowledge. His adminiſtration advanced the glory of France as a monarchy. He died in 1642, victorious, it is ſaid, over the enemies and the liberties of his country. He expired almoſt immediately after his arrival at Paris, where a breach was made in the walls to admit his litter in a ſort of triumph. The death of the miniſter was ſhortly after followed by that of his ſovereign in 1643. He was ſucceeded by

Lewis XIV. who was only five years of age when he came to the crown of his father. The queen-mother, Anne of Auſtria, was appointed regent during the minority, who choſe for her miniſter Cardinal Mazarine, whoſe violence excited new diſorders in the ſtate, which cauſed his baniſhment from Paris; but though retired to the imperial dominions, he influenced and over-ruled the meaſures of the court of France. In 1652 Mazarine reſumed his ſtation as miniſter, which he continued till his death in 1661, when the monarch began to act completely for himſelf, and entered on a vigorous diſplay of his talents. The finances, which had long been in extreme diſorder, were admirably regulated by Colbert; and the commerce and manufactures of the kingdom, wiſely encouraged by government, were ſoon in the moſt flouriſhing ſituation. The famous canal that joins the Bay of Biſcay with the Mediterranean was cut; all the ſea-ports were fortified and enlarged, and the internal police ſtrictly enforced by the monarch. The arms of France aided at the ſame time England againſt the Dutch, Germany againſt the Turks, and Portugal againſt Spain. On the death of Philip IV. Lewis, who had already acquired the addition of *Grand* to his other titles, under pretence that Spain had failed in payment of the dowry of his queen, beſieged and took Liſle with ſeveral fortified cities in Flanders. The king marched himſelf at the head of his armies, but the glory of the conqueſts was owing to Turenne and Vauban. The ſtrength and proſperity of the kingdom were ſtill augmented under the adminiſtration of Colbert. The parties in Holland between the Stadtholder and thoſe who eſpouſed the ſide of the virtuous DE WITTS (which ſee), tempted Lewis to undertake the conqueſt of that country, and England,

land, Germany and Sweden favoured his project. He over-ran ſeveral of the provinces, and advanced almoſt to the gates of Amſterdam, when the Dutch overflowed the country by letting in the ſea, and the French were obliged to retreat. At length the confederate powers began to be jealous of the aſcendancy of France, and the prince of Orange had ſufficient influence with England and the houſe of Auſtria to obtain an alliance in aid of the republic. The arms of Lewis, however, ſtill continued ſucceſsful, and the peace concluded at Nimeguen in 1678 was in favour of France. The armies which France kept on foot, either foreſeeing or meditating a new war, enabled the ſovereign to humble the pretenſions of Algiers and Genoa. The former was forced to releaſe, without any remuneration, all the French ſubjects whom they had made ſlaves, and promiſed to exerciſe that power no more: the latter, more than half demoliſhed by bombs, could not ſuſpend the ardour of the beſiegers but by ſending its doge and other principal officers to make humble excuſes. Having annexed ſeveral principalities to his vaſt dominions, having obtained very important ſucceſſes in a new war, and having laid the Palatinate waſte, and in ruins, and having likewiſe revoked the edict of Nantes, the whole continent of Europe, with England at the head, became violent againſt the towering ambition of Lewis. Nevertheleſs he maintained his ground, though he experienced ſome ſevere checks; his navy was deſtroyed at La Hogue, the coaſts were infeſted by the Engliſh ſhips, which deſtroyed Havre, and reduced Dieppe to aſhes. Victory was, however, the companion of Lewis by land; but the numerous armies which he kept in the field depopulated the kingdom, and occaſioned a famine. The people ceaſed to admire, and feeling the dire effects of war, they began to murmur. To famine was added the calamity of civil war. The proteſtants revolted, becauſe their worſhip was ſuppreſſed, their churches demoliſhed, and their miniſters baniſhed. France loſt half a million of its beſt and moſt induſtrious ſubjects, and the name of Lewis the Great was execrated all over Europe. Now the united forces of England and Auſtria, under the command of Marlborough and Eugene, (ſee CHURCHILL and EUGENE,) prevailed, and rendered the concluſion of this reign as miſerable, as at the commencement it had been fortunate. From the year 1702, till nearly the cloſe of his reign, which happened in 1715, Lewis ſuſtained a ſeries of defeats and calamities. As a patron of literature and learned men, he yielded to none of his contemporaries. It was his higheſt honour, that he diſcerned and recompenſed merit wherever he found it; and France was in his time equally illuſtrious by the military talents of her generals, and by the progreſs which ſhe made in the arts and ſciences. See LEWIS.

By the laſt will of Lewis XIV. the government of the country devolved on his great grand-ſon, who was at the deceaſe of the monarch only five years old, and the regency was ſeized by Philip duke of Orleans, whoſe authority was ſanctioned by the parliament of Paris. This prince gave a turn to the manners of the court. Inſtead of that grave and auſtere appearance which had prevailed in it, nothing was now ſeen but levity and diſſipation. Lewis XIV. never formed any connection with the Engliſh, but ſuch as was indiſpenſably neceſſary; the regent abandoned himſelf to them entirely, and was guided by their councils, with the hope, no doubt, to ſecure their protection and favour, in caſe the young king ſhould die, whoſe health was exceedingly precarious. The regent himſelf, however, died ſuddenly, and was ſucceeded by the duke of Bourbon Condé, who endeavoured to enrich himſelf by the ruin of the ſyſtem at the head of which he was placed. The people murmured at his depredations, but he diſregarded their complaints, expecting the ſupport of the king. In this he was diſappointed; Lewis, when he was capable of acting for himſelf, diſmiſſed and diſgraced him, and he was ſucceeded by cardinal Fleury, who was a man of a moſt amiable diſpoſition, and who took the reins of government at an age when moſt men retire from the world. (See FLEURY.) About this time an artful adventurer, Riperda, raiſed himſelf from obſcurity to the government of Spain, by ſecretly negociating a treaty between the courts of Madrid and Vienna. To counterbalance this treaty, an alliance was formed between France, England, and the king of Pruſſia. Theſe diſſentions gave but little interruption to that general tranquillity which Europe enjoyed from the peace of Utrecht till the year 1734. At that period a flame broke out, in conſequence of the death of Auguſtus II. the king of Poland, and ſoon ſpread itſelf through every part of Europe. Lewis wiſhed to place on the throne of that country his father-in-law Staniſlaus, but the Ruſſians and the houſe of Auſtria eſpouſed the cauſe of the elector of Saxony. A war was commenced, and after it had been carried on with various ſucceſs, peace was concluded at Vienna, by which it was agreed that Staniſlaus ſhould retain the title, but renounce the authority of king of Poland, and ſhould be put in poſſeſſion of Lorraine and Bar. By this treaty the act regulating the ſucceſſion to the empire, called the "Pragmatic Sanction," was guaranteed by France, as it had formerly been by Holland, England, and other European powers. On the death of Charles VI. his daughter Maria Thereſa was not allowed to remain long in quiet poſſeſſion of that vaſt inheritance which her father had been ſo anxious to ſecure for her. A number of princes laid claim to different parts of her dominions, and the confuſion which had been thrown by the feudal ſyſtem over the right of ſucceſſion to kingdoms, enabled each claimant to give the appearance of juſtice to his pretenſions. Charles Albert, elector of Bavaria, laid claim to the ſucceſſion of Bohemia, in virtue of the will of Ferdinand I., but while he and other princes were labouring to eſtabliſh the juſtice of their demands, the ſucceſsful invaſion of Sileſia by the king of Pruſſia, at the head of 30,000 men, invited other powers to take up arms, and ſhewed the ſeveral competitors that the logic of war could effectually maintain their pretenſions. Notwithſtanding the pacific diſpoſition of cardinal Fleury, France did not long remain an idle ſpectator of theſe conteſts. This miniſter had the mortification, juſt before his death, to ſee the kingdom involved in calamities, from which it had been the great object of his life and adminiſtration to preſerve it. To check the ambition of the houſe of Auſtria, France united with Pruſſia, Saxony, and Poland, in ſupport of the pretenſions of the elector of Bavaria, and conceived the deſign, not only of putting this weak prince in poſſeſſion of Bohemia, but of raiſing him to the imperial throne. Charles Albert accordingly took the field at the head of the French army, and quickly penetrated into Auſtria, but inſtead of conducting his troops to Vienna, or of purſuing the queen, who had fled for ſhelter to Hungary, he was induced, by his impatience to obtain the titles of ſovereign power, to croſs the Danube, and invade Bohemia. This was in the autumn of 1741. Prague immediately ſubmitted, and at this city the conqueror was crowned, who then marched to Frankfort, where his vanity was amply gratified by receiving the imperial crown under the name of Charles VII. While this prince was ſoaring to the ſummit of greatneſs in Bohemia and Germany, the king of Pruſſia conquered Moravia, but the ſituation of Maria Thereſa was more deplorable than can well be imagined. She did not however deſpair; the ſpirit of the brave Hungarians was rouſed by her magnanimity; her diſtreſs excited the com-

paſſion of the Engliſh; diſſentions among her enemies, who were too numerous to agree long in any general plan, and who were already intoxicated by the ſplendour of their victories, ſoon gave a turn to her apparently deſperate affairs. In 1742 ſhe ſent into the field a formidable army, recovered Auſtria, and even penetrated into Bavaria, and the new emperor, who ſeemed to have obtained a ſecure poſſeſſion of the imperial crown, ſaw himſelf, in a moment, ſtripped of his hereditary dominions. The marſhal de Belleiſle and marſhal Broglio, who commanded the French and Bavarian troops, were prevented, by mutual jealouſy, from forming any concerted enterprize, and being continually haraſſed by the army of prince Charles, brother to the grand duke, found themſelves gradually exhauſted, without coming to any deciſive action. The defection of the king of Pruſſia from the alliance with France, and his treaty with Maria Thereſa in the ſummer of 1742, completed the ruin of the emperor's fortune, and threw the whole burden of the war on the French. The French generals, unable to keep the field againſt a ſuperior army, retired under the walls of Prague; and as a refult, the marſhal Belleiſle was obliged to make a retreat, in which he obtained ſignal honour, it having been compared to the celebrated retreat of Xenophon. The queen of Hungary was crowned at Prague, on the 12th of May 1743; and the emperor was wholly unable to ſave Bavaria; but by a revolution as rapid as that which had placed him on the imperial throne, he ſaw himſelf deprived of all his dominions, reduced to the condition of a fugitive, and a miſerable penſioner on the bounty of France.

The two moſt powerful ſtates, which had hitherto acted as auxiliaries, now became the principal parties in the conteſt, and the war, which had originated in a diſpute about the ſucceſſion to the empire, became a violent ſtruggle for ſuperiority between France and England. They tried their ſtrength at the battle of Dettingen in 1743, and the Engliſh were decidedly victorious. France began now to tremble for her own ſafety, and feeling that energy which, in nations, as well as in individuals, is roufed by the appearance of extraordinary danger, ſhe employed all the arts of policy and warfare to avert the ſtorm with which ſhe was menaced. Among other powers, ſhe gained over to her ſide the king of Pruſſia, who began to dread that the rapid ſucceſs of the queen of Hungary might deprive him of all his conqueſts. The firſt ſymptom of the reſolute ſpirit which actuated the French councils was in a ſea fight off Toulon in 1744, in which the Engliſh were victorious, though no very deciſive advantage was gained over their opponents. But the exertions of France by land were more reſpectable. She fitted out four great armies in one year; of theſe the moſt conſiderable was deſtined for Flanders, and with it, Lewis himſelf made the firſt campaign, in which he obtained many ſignal victories, till he was ſtopped in his career by diſaſtrous news from his own country. Leaving therefore his conqueſts in Flanders, he flew to the protection of France, and when he arrived at Metz he had the ſatisfaction to hear that Frederic had poured an immenſe army into Bohemia, and another into Moravia; that he had forced Prague to ſurrender, and made 15,000 men priſoners of war. Here he was taken ſeriouſly ill, and his indiſpoſition filled the court and people with conſternation and grief; and his recovery cauſed the moſt rapturous joy throughout his widely extended kingdom. Charles VII. recovered Bavaria, but died ſoon after; war was however maintained by the oppoſing parties. Marſhal Saxe opened the campaign by the ſiege of Tournay, the ſtrongeſt of the barrier towns, which produced, as might have been expected, a general engagement. The event was glorious to France. The king and dauphin had their vanity gratified, by ſeeing their troops gain a complete victory at Fontenoy over the allied army of Engliſh, Dutch, and Hanoverians, conſiſting of nearly 60,000 men. In conſequence of this ſucceſs, Tournay, Ghent, Oudenarde, Bruges, Dendermond, Aeth, and even Oſtend itſelf, ſurrendered to the French king. The arms of France and Spain were no leſs ſucceſsful in Italy. But in a few months they were obliged to abandon their Italian conqueſts. In the Low Countries they were ſtill ſucceſsful; marſhal Saxe took Bruſſels in the middle of winter: Antwerp was taken by the king in perſon; Mons, Namur, and other places ſurrendered to the arms of France, till at length the entire conqueſt of Dutch Flanders was effected. The allies, every where unſucceſsful, ſolicited peace, which was readily granted by Lewis, who never ſeems to have felt the ardour and enthuſiaſm which form the conqueror and hero. A treaty was ſigned at Aix-la-Chapelle by the plenipotentiaries of England, France, Spain, Sweden, the queen of Hungary, the States-general, the duke of Modena, and the republic of Genoa. The baſis of this treaty, which was ſigned April 30, 1748, was the reſtitution, on both ſides, of all the places taken during the war. The articles of this peace were ill calculated to produce a permanent tranquillity. The vague and indefinite manner in which the boundaries of the ſettlements of both countries in America were fixed by the treaty of Aix-la-Chapelle, and the continual diſſentions and quarrels which this circumſtance naturally tended to produce, furniſhed the one nation with abundant occaſion for cenſure, and the other for recrimination; and, at laſt, produced an open rupture. Other powers ſoon became parties in this conteſt. The world ſaw with wonder England forming an alliance with Pruſſia; and France and Auſtria, thoſe powers whoſe mutual jealouſies had diſtracted Europe for two centuries, now connected themſelves by an union as intimate and cloſe as their former animoſity had been violent and implacable. The early events of this war were glorious for France in every quarter of the globe. Nothing was heard of in England, from all parts, but loſſes and misfortunes. Minorca was taken, admiral Byng was defeated at ſea, and conſtrained to take refuge under the walls of Gibraltar. In India and Canada they were equally unſucceſsful. The military genius of the nation, as well as the ſpirit of patriotiſm, ſeemed to be drowned in the clamour of faction. And the people, almoſt driven to deſpondency, ſaw a contempt of their arms gradually inſinuating itſelf among foreign powers, which was more mortifying to the national pride than all their calamities. About this time the parliaments fell under the diſpleaſure of the king by their perſecution of thoſe who adhered to the bull UNIGENITUS, which ſee. They proceeded ſo far in this oppoſition as to refuſe to regiſter certain taxes abſolutely neceſſary for the carrying on the war. By this the king was ſo irritated, that he ſuppreſſed the fourth and fifth chambers of inqueſts, the members of which had diſtinguiſhed themſelves by their oppoſition to his will. This created the moſt grievous diſcontents, and many of the principal members of the different parliaments reſigned their offices. An attempt was made by Damien to aſſaſſinate the king, who was ſlightly wounded, in the preſence of his ſon, and ſurrounded by his guards. The aſſaſſin was put to the moſt exquiſite tortures, in the midſt of which he perſiſted in declaring that he had no intention to kill the king, but that his deſign was only to wound him, in order that God might touch his heart, and incline him to reſtore peace to his dominions. This attempt upon his majeſty is ſuppoſed to have had ſome effect upon him, for he immediately altered his method of government, and accommodated matters with

his parliament. The peace concluded at Paris in the year 1763, though it freed the nation from a deſtructive, bloody, and, towards the concluſion, unſucceſsful war, did not reſtore its internal tranquillity. The parliament, eager to purſue the victory they had formerly gained over their religious enemies, now directed their efforts againſt the Jeſuits, who had obtained and enforced the bull unigenitus. That once powerful order, however, was now on the brink of deſtruction. A general deteſtation of its members had taken place throughout the world. A conſpiracy, formed by them againſt the king of Portugal, and from which he narrowly eſcaped, had rouſed the indignation of Europe; this was ſtill farther encreaſed by ſome fraudulent practices of which they had been guilty in France. Prejudices running very high againſt them, every miſchief, even to the attempt of Damien, was imputed to their contrivance or influence. Their ruin ſeemed to be certain, when the king interfered, and ſuſpended all proceedings againſt them for a year; a plan of accommodation was drawn up, and ſubmitted to the pope and general of the order, but the latter, feeling the degradation to which his party muſt be expoſed, entirely overthrew, by his own hauteur, the hope of reconciliation. The king now withdrew his protection, the parliament redoubled their efforts againſt them, and the ſociety was finally diſſolved, its members declared incapable of holding any clerical or municipal offices: their colleges were ſeized, their effects confiſcated, and their order annihilated.

The parliament next made an attempt to ſet bounds to the power of the king himſelf. They refuſed to regiſter an edict which Lewis had iſſued for the continuance of ſome taxes which ſhould have ended with the war, and likewiſe to agree to another by which the king was enabled to redeem his debts at an adequate price. The court attempted to get the edicts regiſtered by force, but the parliaments every where ſeemed inclined to reſiſt to the laſt. In 1766, the parliament of Britanny refuſed the crown a gift of 700,000 livres, in conſequence of which they were ſingled out to bear the weight of royal vengeance: the king, however, yielded his rights as he was pleaſed to conſider them, and publiſhed a general amneſty. The parliaments increaſed their claims, and affected to deſpiſe the royal clemency, which exaſperated Lewis ſo much that he ordered the counſellors of the parliament of Britanny, who had refuſed to reſume their functions, of which he had deprived them, to be included in the liſt of thoſe who were to be drafted for the militia; and thoſe upon whom the lot fell were obliged immediately to join their reſpective regiments; the reſt being employed in forming the city-guard. The parliament of Paris remonſtrated ſo freely upon this conduct of the king, that they fell under his cenſure; and the monarch, aſſuming the authority of his anceſtors, explicitly declared that he would ſuffer no earthly power to interfere with his will; and the parliaments were for the preſent intimidated into ſubmiſſion. Lewis next engaged in a conteſt with the pope, and claimed as his own hereditary right the territories of Avignon and Venaiſſin, and while the pontiff denounced his unavailing cenſures againſt him, one of his generals, with a ſingle regiment of ſoldiers, drove out the troops of the pope, and took poſſeſſion of the territories in queſtion. He now engaged in the reduction of the iſland of Corſica, which had been transferred to the crown of France by its ancient maſters the Genoeſe. The iſlanders, little diſpoſed to comply with the wiſhes of thoſe who ſold and who purchaſed their country, reſiſted with the utmoſt bravery the French power; and it was not till the termination of a ſecond campaign, and after the loſs of many thouſands of the beſt troops in France, that the iſland ſubmitted: little was it imagined that at this moment, the future maſter of France, and conqueror of almoſt the whole continent of Europe, was a nurſling of an undiſtinguiſhed and mean Corſican family; he who has torn kings from their thrones, and ſupplanted, or overthrown the ancient dynaſties of the world, was then overlooked and probably deſpiſed for the lowneſs of his condition, and the poverty of his progenitors.

The finances of France were at this time in a moſt deplorable ſtate; many of the great commercial companies of the country were involved in bankruptcy, which brought a ſimilar calamity on moſt of the principal merchants and traders. The miniſter, the duc de Choiſeuil, by one deſperate ſtroke, reduced the intereſt of the funds to one half, and at the ſame time took away the benefit of ſurvivorſhip in the tontines, by which the national credit was greatly affected; the diſputes between the king and his parliaments revived, and became more bitter than ever. Lewis again proved victorious, expelled his parliaments, cauſed others to be appointed who were more ſubſervient to his will, and thus every appearance of oppoſition was ſilenced by the abſolute authority of the king. In the midſt of this plenitude of power, his health declined, and his end was evidently approaching; but the immediate cauſe of his death, which happened in 1774, was the ſmall-pox, which he had taken from one of his miſtreſſes. He was ſucceeded by Lewis XVI. who was then twenty years of age, and to ſecure himſelf againſt the diſeaſe which had proved fatal to his predeceſſor, he ſubmitted to inoculation, as did other branches of the royal family, which rendered this proceſs not only faſhionable among the great, who are ever ready to imitate the court, but tended more than any other circumſtance to remove the prejudices of perſons in the inferior ranks and ſtations of ſociety. The king, as ſoon as he had recovered his health, applied himſelf moſt diligently to the reconciliation of the differences which had ſubſiſted between the court and the people. He removed miniſters whoſe conduct had been marked by arbitrary and illegal acts, and he recalled the old parliaments who had been ignominiouſly diſmiſſed by the late king. He declared, in one of his firſt ſpeeches, that while it was his determination to maintain his royal prerogatives entire, it was his wiſh and moſt anxious deſire to bury in oblivion all paſt grievances. Still it was evident that he meant to reduce the power of the parliaments to a mere cypher; he ſuppoſed that, under his wiſe management, they would be contented with the name without the reality; but his ſubjects were now too enlightened to ſubmit to the decrees of a ſovereign, when they interfered with the rights of the people. He, by his own authority, aboliſhed ſome oppreſſive taxes; and ſhortly after, the parliaments contended that they, by right, had, and ought to have, the ſole power of judging what ought and what ought not be impoſed on the ſubject.

At this time the finances of the country being in a deplorable ſtate, M. Turgot, a gentleman poſſeſſed of ſingular integrity and induſtry, had been appointed to the management of this branch of government; but notwithſtanding his zeal and induſtry, united to other qualities more highly to be appreciated, though more rarely to be found in a miniſter of finance, he had not been able to command the confidence of the country. He was accordingly obliged to reſign his office, and was eventually ſucceeded by M. Neckar, by birth a Swiſs, and a Proteſtant in religion. This able financier had been choſen in the preceding reign to adjuſt ſome differences between the Eaſt India company and the crown, and had diſcharged the truſt in a manner which had gained him the approbation of both parties. Poſſeſſed of very extraordinary talents, his appointment would have excited no ſurpriſe, had it not been contrary to the conſtant policy of

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France, which carefully and uniformly excluded the aliens of her country and faith from the controul of her revenue. It now ſtood forward as a new inſtance of enlargement and liberality of ſentiment, worthy the mind of an enlightened monarch.

In the war between Great Britain and the American colonies, Lewis, by the advice of his miniſter, heartily engaged; he afforded effectual aſſiſtance to the oppreſſed acroſs the Atlantic. The principles of their oppoſition to the mother-country were diſcuſſed in all ways and under all ſhapes; every day and hour produced new arguments in favour of their common liberty. The French officers and ſoldiers who had enliſted under their banner heard their reaſonings, felt the generous flame, and at length became patriots inſtead of mere machines wrought into obedience by the force of ſevere diſcipline. It would be needleſs in this article to repeat the events of the American war, which have already been noticed in our work. In the year 1780 ſeveral new changes took place in the French miniſtry, and the ſame year was rendered memorable by the abolition of the inhuman cuſtom of "putting the queſtion," as it was called, by torture, a cuſtom which had been ſo eſtabliſhed by the practice of ages, that it ſeemed to be an inſeparable part of the conſtitution of the courts of juſtice in France. The king likewiſe, at whoſe ſpecial inſtance the torture had been for ever done away, began, with regard to himſelf, and his own expenditure, to inſtitute an economical reform; he readily and cheerfully ſacrificed his own magnificence to the eaſe of his people, and diſmiſſed at once more than four hundred officers belonging to his court. But notwithſtanding theſe attempts at reform, Lewis was obliged to ſubmit to a diſadvantageous peace, on account of the derangement of the public finances. His own example of prudence and economy introduced no public reformation in the manners and habits of thoſe who were rioting on the labours of the poor and induſtrious. Retrenchment in the expenditure became abſolutely neceſſary: an aſſembly of notables was convoked, and diſmiſſed without effecting any material good. Diſappointed of the advantages which the king had flattered himſelf he would have drawn from this body, he was obliged to recur to the uſual mode of raiſing money by the royal edicts. Meaſures were immediately propoſed to double the poll-tax, and to reſort to other impolitic and unpopular impoſts. The parliament of Paris, however, refuſed to regiſter the edicts; and Lewis was obliged to apply, as the laſt reſort, to his abſolute authority, and, by holding what is called "a bed of juſtice," compelled them to enrol the taxes. The parliament, though defeated, were far from being ſubdued; and on the day after the king had held his bed of juſtice, they entered a formal proteſt againſt the edict; declaring, "that it had been regiſtered againſt their approbation and conſent, by the king's authority alone; that it neither ought nor ſhould have any force; and that the firſt perſon who ſhould preſume to attempt to carry it into execution ſhould be adjudged a traitor, and condemned to the galleys." The authority of the ſovereign was now oppoſed to that of the parliament. Paris was already overwhelmed with ſoldiers; and in a few days after the proteſt had been made and promulgated, a French officer of the guards, with a party of ſoldiers, went at break of day to the houſe of each individual member of the parliament, to ſignify to him the king's command, that he ſhould immediately get into his carriage and proceed to Troyes, a city of Champagne, without writing or ſpeaking to any perſon out of his own houſe before his departure. The orders were all ſerved at the ſame inſtant; and before the citizens of Paris could poſſibly be acquainted with the tranſaction, their magiſtrates and protectors were far on the road to their place of baniſhment. The confidence and attachment of the people roſe in proportion to the ſacrifices which had been made in their behalf. Their murmurs were openly expreſſed in the ſtreets of the capital; and the general diſſatisfaction was augmented by the ſtop that was put to public buſineſs, by the exile of the parliament. The cabinet, at the ſame time, was apparently weak, diſunited, and fluctuating; and continual changes took place in every department of the ſtate. Nor was it only in the capital that the flame of liberty burſt forth: it blazed with equal ſtrength in the provincial parliaments, and extended from the centre to every part of the kingdom. Among other inſtances of this nature, the parliament of Grenoble paſſed a decree againſt "Lettres de cachet," the moſt odious engine of arbitrary power; and declared the execution of them within their juriſdiction, by any perſon, and under whatever authority, to be a capital crime.

Previouſly to the baniſhment of the parliament of Paris, they had declared, that, in their opinion, neither the parliaments, nor any other authority, except that of the three eſtates of the kingdom collectively aſſembled, could warrant the laying of any permanent tax on the people; and they ſtrongly enforced the renewal of thoſe national aſſemblies, which had rendered the reign of Charlemagne ſo great and illuſtrious.

In the year 1789, the ſtates-general were convened for the arrangement of public affairs: they aſſumed the name of the national aſſembly, and among its earlieſt labours was that of forming a new conſtitution. The ſpirit of diſcontent and diſorganization ſeemed to pervade all ranks of the people. They did not wait for leaders of known and tried talents; inſpired with a ſenſe of the wrongs that they and their fathers had long endured from the government, they attacked and deſtroyed what they denominated the great fortreſs of deſpotiſm, the Baſtile. Encouraged by this inſtance of ſucceſs, they proceeded farther, and even reſtrained the actions of the monarch. In a ſhort time, the aſſembly, emboldened by the ſupport given them by the people, proceeded to the abolition of titles, and to the deſtruction of that power which the church had for a long ſeries of years aſſumed. Theſe acts drove from the kingdom a multitude of the higher orders of ſociety, who ſought for the honours of rank and diſtinction in a foreign clime which was denied them at home. Theſe were the emigrants, who for a long time employed all their arts in the various courts of Europe, to induce their reſpective ſovereigns to arm againſt France. The hope of ſucceſs excited ſeveral powers to coaleſce, in order to invade the country. The effect of theſe meaſures rebounded on the head of the monarch, who was ſuſpected of having invited the enemy to make war upon his ſubjects. The firſt ſucceſſes of the allied armies enraged the French almoſt to madneſs, and the neceſſity they were under of defending themſelves inſpired them with an energy which in a ſhort time produced the moſt aſtoniſhing victories. Theſe encouraged the leaders of the public mind to meditate exceſſes, which would otherwiſe ſcarcely have been attempted; and the monarch, foreſeeing the ſtorm, reſolved upon flight, but he was arreſted on his road, and brought back with ignominy amidſt the execrations of the infuriated populace. To avoid the ſentence of abdication he accepted and ratified the conſtitution, before the deputies of France, who were preſent on the occaſion. Different parties were very differently affected by this ill-conducted and unfortunate flight of the king. A republican band had already begun to appear, and during the king's abſence attempts were made to induce the public at large to conſider the royal authority as no neceſſary part of the conſtitution, an idea which, at firſt,

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was ſcouted by every moderate Frenchman, who had been accuſtomed to believe that the glory of the king was eſſential to the very exiſtence of the nation. The flight of the ſovereign was unqueſtionably a deep laid plan, as well with reſpect to the nobility of France, as with foreign courts who were preparing to take advantage of the approaching event. Many of the chiefs among the ariſtocratic party ſent in reſignations of their ſeats in the national aſſembly. Troops were even levied on the frontiers in the king's name: Bouillé, a great general, emigrated, and afterwards ſent to the aſſembly a furious letter: "You ſhall anſwer," ſays he, "for the lives of the king and queen to all the monarchs of the univerſe. Touch but a ſingle hair of their heads, and not one ſtone ſhall be left upon another in Paris. I know the roads. I will conduct the foreign armies. This letter is but the fore-runner of the manifeſto of the ſovereigns of Europe." A conſiderable calm throughout France followed theſe events, and it might be regarded as in a ſtate of tranquillity: but the calm was deluſive, and in the midſt of it thoſe projects were formed which were afterwards to prove ſo fatal to the peace of the world. Towards the cloſe of the ſummer a convention took place at Pilnitz in Saxony, between the emperor Leopold and the king of Pruſſia. Its object at the time was unknown, but it was gradually developed, and it has generally been underſtood to have been intended for the purpoſe of concluding a league for the invaſion of France, the new modelling of its government, and the partition of ſome of its faireſt provinces. The national aſſembly were not deficient in exertions on their part: they formed a new conſtitution, and on the 13th of September the king announced his acceptance of it. This event was ordered to be notified to all the foreign courts, and the aſſembly decreed a general amneſty with reſpect to the events of the revolution. On the 30th of the ſame month the aſſembly, which had been known under the name of the "Conſtituent aſſembly," diſſolved itſelf, and gave place to the ſucceeding legiſlative body that had been elected according to the rules preſcribed by the new conſtitution.

From this period ſocieties and clubs began to be formed in all parts of the metropolis; but that of the Jacobins, ſo called from the name of the place where the members aſſembled, inſenſibly abſorbed all the reſt, and for ſome conſiderable time dictated the politics of France, and even influenced, if not actually commanded, the deciſions of the legiſlature. Being at length reſolved to extort by violence what they were not able to obtain voluntarily, the Jacobins, in conjunction with the municipality of Paris, collected a large concourſe of people of all deſcriptions, and appeared with cannon before the palace. This commotion was unexpected: the king ordered the gates to be opened, and, to calm the violence of the populace, he accepted and placed on his head the red cap, an emblem of the new principles: they retired appeaſed and apparently ſatisfied. This was in the month of June, and after that, events ſucceeded each other with ſuch rapidity, that it would be fruitleſs in this ſketch to attempt an enumeration of them. The legiſlative aſſembly was quickly diſſolved, and early in Auguſt it was determined to elect a National Convention. On the tenth of that month, the ſovereign was driven from his palace, and the Thuilleries became the ſeat of action; a dreadful battle was fought on the very ſpot from which the royal family had fortunately eſcaped but an hour before: the king's guards were overpowered, and every human being that could be found in the palace, attached to the court, were inſtantly put to death. The royal family had taken refuge in the aſſembly, where for many hours they ſat liſtening to diſcuſſions in which themſelves and office were treated with every mark of contempt and inſult. From this place they were ſent to the old palace of the Temple as priſoners, under a ſtrict guard, and all perſons attached to them were ſeized and committed to different priſons.

On the 20th of September the French national convention aſſembled. It contained men of all characters, orders, and ranks, but the general aſpect of it ſhewed moſt decidedly that the republican party had acquired a vaſt ſuperiority, and on the firſt day of their meeting, Collot d'Herbois, who had formerly been an actor, aſcended the tribune, and propoſed "The eternal abolition of royalty in France." The queſtion was carried by acclamation, and the houſe adjourned. On the next day it was decreed that public acts ſhould be dated by the year of the French republic, and all citizens were declared eligible to all vacant offices and places.

It was now determined to bring the king to trial, and on the 11th of December he was conveyed to the bar of the convention, to hear the charges exhibited againſt him; and though he had no previous intimation reſpecting their nature, he replied to them with clearneſs and preciſion, and with a full conſciouſneſs of his own innocence. The trial came on the 26th, when the king appeared for the laſt time at the bar of the national aſſembly. The diſcuſſion was, however, continued to the 18th of January, when, after a ſitting of thirty-four hours, the puniſhment of death was awarded by the ſmall majority of five. Upon this one of the counſel ſolemnly invoked the aſſembly to conſider by what a ſmall majority the puniſhment of death was pronounced againſt the dethroned monarch. No eloquence could, however, avail; the ſentence was ordered to be carried into execution in twenty-four hours. On the 21ſt of January 1793, the bloody deed was perpetrated, and with Lewis ended the third dynaſty of the kings of France, and a monarchy which had laſted without interruption for the long period of eleven centuries. The queen and the king's ſiſter ſhortly after fell victims to the ſame ferocity. A mere chronological table of events that have occurred in France from that time to the preſent would occupy more ſpace than can be devoted to this article: revolution ſucceeded to revolution, till at length Bonaparte contrived to get himſelf elected a conſul, and then chief conſul, in imitation of the office under the ancient republic of Rome. At firſt this office was to be held for a limited time only, but during that period he contrived to make it not only an office for life, but hereditary in his own family for ever. Not contented with this, he, by degrees, cauſed the people, who had contended for liberty with infinite ſlaughter for many years, to proclaim him emperor, with unlimited powers. Inveſted with this high authority, and having under his controul immenſe armies and a mighty population, he has gone on from victory to victory, till at length he has ſubjugated almoſt the whole continent. The kings of Bavaria, Saxony, and Wirtemberg, have all been raiſed to that high honour ſolely by his influence. On the thrones of Weſtphalia, Holland, and Spain, he has placed three of his own brothers, and on that of Naples, his creature and general, Murat, the late grand duke of Berg. The court of Portugal he has driven for an aſylum to South America, and over the republic of the Seven Iſlands he has placed a preſident. Pruſſia has been ſubdued by the armies of France, and Ruſſia is kept in awe of the ſame power. Over Italy Bonaparte himſelf claims the title and power of ſovereign, as well as emperor of France, with a population of more than thirty millions of people; and in the courſe of the laſt year he annexed the papal territory to his own dominions, and aboliſhed for ever the terrors of the inquiſition. With reſpect to Auſtria, ſhe has

again and again contended with the power of Napoleon, but has always proved unſucceſsful in the arduous conteſt. Her proweſs, however, was not to be deſpiſed by the conqueror, and when he found that he could not completely reduce her to ſubjection, he thought upon other meaſures to effect his purpoſe. With this view, and with the hope of obtaining an heir to his vaſt dominions, he, in the month of December 1809, divorced himſelf from the empreſs Joſephine in the preſence of ſeveral of the crowned heads of Europe, and during the preſent month (April 1810) he has married, with the conſent, real or feigned of all parties, the daughter of the emperor of Auſtria, with whom, of courſe, he has made an alliance of perpetual peace and amity.

Such has been the conduct of the emperor Napoleon Bonaparte, by birth a poor Corſican, but by his fortune or talents he has rendered himſelf the firſt man that has ever lived in the world. To attain this exalted ſituation he has not been very particular in the choice of means to effect his ambitious projects. He has never ſcrupled to reſort to deſpotic meaſures when thoſe were likely beſt to anſwer his ends; but in no inſtance has the tyrant ſhewn itſelf more than in one of his lateſt acts. The French nation in 1789 were contented to ſhed their beſt blood to deſtroy the accurſed baſtile; in March 1810 they have ſeen, without a murmur, their emperor erect eight baſtiles to confine perſons avowedly, "whom it is not convenient to bring to trial or to ſet at liberty." Yes, theſe infernal dungeons are ſcattered about the empire to keep the people in awe of a power, which already they dare not openly oppoſe, and to ſhut the mouths of thoſe from whoſe hands the pen has long ſince dropped. The vile decree indeed, aſſerts, "that many of theſe ſtate priſoners might be condemned by the tribunals to capital puniſhments, but that ſuperior conſiderations oppoſe their being brought to trial; that ſeveral are men accuſtomed to crimes, but who cannot be condemned by our courts, though they have the certainty of their culpability; that ſome belong to different countries, which have been united to France, but that they cannot be tried, becauſe their offences are either political or anterior to the union of theſe ſtates." To ſo low, ſo degrading a ſtate, is perſonal liberty brought in France; how debaſed muſt a people be to ſubmit to ſuch a decree, and under ſuch frivolous pretences! Univerſal Hiſtory. Playfair's and Blair's Chronology. Hiſtoire de France. Gibbon's Hiſtory. Rabaut's Hiſt. of the Revolution, &c.

France is ſituated within the eighth geographical climate. The length of the longeſt day at Paris is of ſixteen hours. Its temperature is, generally ſpeaking, healthy and moderate. The moſt careful meteorological obſervations give for the centre of France an average of 27 degrees of Reaumur's thermometer for the greateſt heat, and ſeven for the leaſt. The greateſt height of mercury in the barometer is 28° 5′ 7″, the leaſt 27° 3′ 3″. The quantity of rain 20° 2′ 4″. There are 164 rainy days. The prevailing winds are the ſouth-weſt and north-eaſterly wind.

In the north of France the greateſt heat is 23° 2′, the leaſt 6° 6′; the greateſt height of mercury in the barometer 28° 8′ 3″, the leaſt 27° 1′ 4″. There are 126 rainy days. The prevailing wind blows from the ſouth-eaſt.

In the eaſt of France the greateſt heat is 24° 3′, the leaſt 9° 5′. The greateſt height in the barometer 27° 10′ 10″, the leaſt 26° 8′ 5″. There are 145 rainy days. The north and ſouth-weſt are the prevailing winds.

In the weſt of France the greateſt heat is 24°, and the leaſt 6°, the average height of mercury in the barometer is 28° 3′. There are 150 rainy days, and the north-eaſt is the prevailing wind.

In the ſouth-eaſt, at Montpellier, the greateſt heat is 28° 1′, the leaſt 3° 7′; the greateſt height of mercury in the barometer 28° 5′ 3″, the leaſt 27° 5′ 5″. The quantity of rain 27° 8′. There are 74 rainy days, and the north and north-eaſt are the prevailing winds.

At Marſeilles the meteorological obſervations of nine ſucceſſive years give an average of 25° 3′ for the greateſt heat, and 3° 1′ for the leaſt. The greateſt height of mercury in the barometer is 28° 7′ 2″, the leaſt 27° 3′ 7″. The quantity of rain is 21° 10′ 2″. There are 57 rainy days. The prevailing winds blow from the ſouth-eaſt and north-weſt.

The ſoil of France varies very much in different parts of that extenſive country. Mr. Arthur Young, in his journey through France in the years 1787, 1788, 1789, and 1790, obſerved ſeven different kinds of ſoil, *viz*:

a, a fat and rich ſoil, prevailing chiefly in the departments of Mont Tonnerre, of the Lys, the Scheldt (l'Eſcaut), the Pas de Calais, the North, the Aiſne, Seine and Marne, Seine, Seine and Oiſe, Eure and Loire, Eure, Lower Seine, Somme, l'Oiſe, Lower Rhine, Aude, Tarn, Lot, Upper Garonne, Hérault, Vendée, Two Sèvres, Loiret, Pô, Marengo, Tanaro, and Seſia.

b. Heath and downs (landes), prevailing in the departments of the Two Nethes, the Roër, Lower Loire, Morbihan, Finiſterre, Côtes du Nord, Ille et Vilaine, Mayenne and Loire, Orne, Calvados, La Manche, Gironde, Dordogne, Lot and Garonne, Arriège, Upper Pyrenees, Lower Pyrenees, Landes, Gers, Aveyron, and Gard.

c. Marl (Terres à craie), prevailing in the departments of the Marne, the Ardennes, Aube, Upper Marne, Loire and Cher, Indre and Loire, Charente, Lower Charente, and Vienne.

d. Gravel (Terres de gravier), prevailing in the departments of the Nièvre, and the Allier.

e. A flinty ſoil (Terres pierreuſes), prevailing in the departments of the Sarre, the Forêts, Rhine and Moſelle, Moſelle, Voſges, Meurthe, Meuſe, Upper Rhine, Côte d'Or, Upper Saône, Doubs, Saône and Loire, Jura, Ain, Yonne, Rhône, Loire, and Jemmapes.

f. A rocky ſoil (Terres de montagnes), prevailing in the departments of the Ourte, of the Sambre and Meuſe, Lower Meuſe, Eaſtern Pyrenees, Lozère, Cantal, Corrèze, Upper Loire, Ardêche, Drôme, Upper Alps, Lower Alps, Maritime Alps, Var, Mouth of the Rhône, Vaucluſe, Puy de Dôme, Mont Blanc, Léman, Iſère, Liamone, Dolo, Stura, and Doire.

g. A ſandy ſoil, prevailing in the departments of the Indre, Cher, Creuſe, Upper Vienne, Sarthe, and Mayenne.

Or, taking the whole ſuperficies of France, without Genoa, Tuſcany, and the former papal dominions at 61,258,782,06 hectares, there may be reckoned,

For arable lands -	33,219,437,40 hectares
Vine lands - -	2,434,365,64.
Woods - -	8,134,716,26.
Meadows - -	3,302,033,92.
Artificial meadows -	3,745,303,84.
Heaths, downs, waſte lands, Rivers, ponds, marſhes, &c.	10,422,925,00.

Before the revolution of 1789, France was divided into thirty-two governments, *viz*. Picardy, Artois, Flandres, Normandy, Iſle de France, Champagne, Lorraine, Alſace, Bretagne, Maine, Anjou, Touraine, Orléanois, Berry, Nivernois, Bourgogne; Franche Comté, Poitou, Aunis,

La

La Marche, Le Bourbonnois, Saintonge et Angoumois, Limoſin, Auvergne, Lyonnois, Dauphiné, Guienne et Gaſcogne, Béarn, Comte de Foix, Rouſſillon, Languedoc, and Provence. Beſides theſe thirty-two governments; which were ſtyled great governments, there were eight leſſer ones of ſmall extent, *viz.* Paris, the Boulonnois in Picardy; the Havre de Grace in Normandy; Saumur, between Anjou, Touraine, and Poitou; Metz and the Pays Meſſin; Verdun, and the Verdunois; Toul and the Toulois, all three ſituated in Lorraine, and known by the name of the three biſhoprics; and laſtly Sedan, between Lorraine and Champagne in the north.

In financial and civil matters, France was divided into twenty generalties for the Pays d'Election, and five for the Pays d'Etat, and eight intendancies, making in all thirty-three financial and civil departments, with only thirty-two intendants, becauſe there was only one intendant for the two generalties of Languedoc.

The eccleſiaſtical diviſions of France, at the ſame period, were eighteen archbiſhoprics and 112 biſhoprics, beſides the archbiſhopric of Avignon for the comtat Venaiſſin, which belonged to the pope, and which counted three biſhoprics. There were alſo ſix biſhops ſuffragans of two German archbiſhops, *viz.* Straſburg ſuffragan of Mentz or Mayence, and Metz; Toul, Verdun, Nancy, and Saint Diez ſuffragans of Treves. The number of pariſhes in France at that time was 40,000. There were 800 convents of monks, 281 nunneries, and 679 chapters.

The decree of the national aſſembly of the 12th of July 1790, reduced the archbiſhoprics to 10, and the biſhoprics to 83. But in conformity with the concordat concluded on the 25th of July 1801, between the French conſular government, and the pope Pius VII., a new eccleſiaſtical diviſion was adopted by the law of the eighth of April 1802, which eſtabliſhed 10 archbiſhops and 51 biſhops, *viz.* 1. The archbiſhop of Paris, who has under him the biſhops of Troyes, Amiens, Soiſſons, Arras, Cambray, Verſailles, Meaux, and Orleans. 2. The archbiſhop of Malines, who ſuperintends the biſhoprics of Namur, Tournay, Aix la Chapelle, Treves, Gand, Liege, and Mayence. 3. The archbiſhop of Beſançon, who has under him the biſhops of Autun, Metz, Straſburg, Nancy, Dijon. 4. The archbiſhop of Lyons, who ſuperintends the biſhoprics of Mende, Grenoble, Valence, and Chambéry. 5. The archbiſhop of Aix, who has under him the biſhops of Nice, Avignon, Ajaccio, Digne, and Vintimille in the principality of Piombino annexed to France. 6. The archbiſhop of Toulouſe, who ſuperintends the biſhoprics of Cahors, Montpellier, Carcaſſonne, Agen, and Bayonne. 7. The archbiſhop of Bourdeaux, who has under him the biſhops of Poitiers, La Rochelle, and Angoulême. 8. The archbiſhop of Bourges, who ſuperintends the biſhoprics of Clermont, Saint Flour, and Limoges. 9. The archbiſhop of Tours, who has under him the biſhops of Le Mans, Angers, Nantes, Rennes, Vannes, Saint Brieux, and Quimper. 10. The archbiſhop of Rouen, who ſuperintends the biſhoprics of Coutances, Bayeux, Séez, and Evreux. To theſe muſt be added for the countries that have ſince been annexed to France; 11. The archbiſhop of Turin, who has under him the biſhops of Acqui, Aſti, Caſal, Ivrée, Mondovi, Saluces, Verceil. 12. The archbiſhop of Genoa with the biſhops of Albenga, Borgo ſan Donino, Brugnetto, Parma, Plaiſance, Sarzanne, Savonne, and Pontremoli; and, 13. The archbiſhop of Rome.

The firſt national aſſembly of France, by its decrees of the 15th of January, and 16th and 26th of February 1790, divided France into 83 departments, ſubdivided into 544 diſtricts. But the conqueſts of France having conſiderably increaſed its territory, the number of departments was extended to 102, by a law of the year 1800, and that of diſtricts reduced to 417; when a prefect was placed at the head of the civil adminiſtration of each department, and a ſub-prefect eſtabliſhed for every diſtrict.

In 1807 the number of departments, owing to the annexation of the Ligurian or Genoeſe republic and other territories, was 110, *viz.* 1, Lower Alps; 2, Mouth of the Rhône; 3, Var; 4, Vaucluſe; 5, Upper Alps; 6, Drôme; 7, Iſere; 8, Doubs; 9, Jura; 10, Upper Saône; 11, Lower Rhine; 12, Upper Rhine; 13, Meurthe; 14, Meuſe; 15, Moſelle; 16, Voſges; 17, Ardennes; 18, Aube; 19, Marne; 20, Upper Marne; 21, North; 22, Pas de Calais; 23, Aiſne; 24, Oiſe; 25, Seine; 26, Seine and Oiſe; 27, Somme; 28, Seine and Marne; 29, Calvados; 30, Eure; 31, Manche; 32, Orne; 33, Lower Seine; 34, Côtes du Nord; 35, Finiſtère; 36, Ille and Vilaine; 37, Lower Loire; 38, Morbihan; 39, Indre and Loire; 40, Mayenne; 41, Mayenne and Loire; 42, Sarthe; 43, Two Sèvres; 44, Vendée; 45, Vienne; 46, Eure and Loire; 47, Loire and Cher; 48, Loiret; 49, Indre; 50, Cher; 51, Nièvre; 52, Ain; 53, Côte d'Or; 54, Yonne; 55, Saône and Loire; 56, Loire; 57, Rhône; 58, Allier; 59, Corrèze; 60, Creuſe; 61, Upper Vienne; 62, Charente; 63, Lower Charente; 64, Dordogne; 65, Gironde; 66, Landes; 67, Lot and Garonne; 68, Gers; 69, Lot; 70, Aveyron; 71, Lower Pyrenees; 72, Upper Pyrenees; 73, Arriège; 74, Eaſtern Pyrenees; 75, Ardêche; 76, Aude; 77, Gard; 78, Upper Garonne; 79, Herault; 80, Lozère; 81, Tarn; 82, Cantal; 83, Upper Loire; 84, Puy de Dôme; 85, Golo; 86, Liamone; 87, Mont Blanc; 88, Maritime Alps; 89, Leman; 90, Dyle; 91, Eſcaut (Scheldt); 92, Forêts; 93, Jemmappe; 94, Lys; 95, Lower Meuſe; 96, Two Nèthes; 97, Ourthe; 98, Sambre and Meuſe; 99, Roër; 100, Sarre; 101, Rhine and Moſelle; 102, Mont Tonnerre; 103, The Apennines; 104, Doire; 105, Genoa; 106, Marengo; 107, Montenotte; 108, Po; 109, Seſia; 110, Stura. To which muſt be added for Parma and Plaiſance, Tuſcany, the papal dominions, and a new department formed out of different cantons of the departments of Aveyron, Upper Garonne, Gers, Lot, and Lot and Garonne by the ſenatus conſultum of the 2d of November 1808, the departments of, 111, Tarn and Garonne; 112, Taro; 113, Arno; 114, Mediterranean; 115, Ombrone; 116, Rome; and, 117, Traſimene.

The military diviſions of France are twenty-nine, each of which is commanded by a general of diviſion, *viz.*; 1, Paris; 2, Mezières; 3, Metz; 4, Nancy; 5, Straſburg; 6, Beſançon; 7, Grenoble; 8, Marſeilles; 9, Montpellier; 10, Toulouſe; 11, Bourdeaux; 12, Nantes; 13, Rennes; 14, Caen; 15, Rouen; 16, Lille; 17, Dijon; 18, Lyons; 19, Périgueux; 20, Bourges; 21, Tours; 22, Baſtia; 23, Bruſſels; 24, Liège; 25, Mayence; 26, Turin; 27, Genoa; 28, Florence; 29, Rome.

Beſides the important natural advantages of a large extent of country, enjoying an extenſive ſea-coaſt on three different ſeas, of a highly centrical and commercial ſituation, of limits fixed by the boldeſt features of nature, three chains of high mountains, three ſeas, and a large river; of a moſt favourable climate, excellent ſoil, and advantageous topographical diviſions; France enjoys the advantage of being irrigated by ſeven great rivers, the Rhine, the Rhône, the Maes, the Scheldt, the Seine, the Loire, and the Garonne, and interſected by more than 7000 leſſer ones. Its principal lakes are, 1, the lake of Geneva, in the department of the Léman, now called lac Leman, about twenty-nine leagues long and four leagues broad in its greateſt breadth; 2, the lake of

Annecy, in the department of Mont Blanc, four leagues long; 3, the lake of Bouget, in the ſame department; and, 4, the lake of Allègre, at the top of a mountain in the department of the Puy de Dôme.

Of the mountains of France, the moſt remarkable are that chain of the Alps which croſſes the three departments of the Maritime Alps, Lower Alps, and Upper Alps, afterwards ſtretches to the north, and divides France from the kingdom of Italy and Switzerland. Some of the ſummits of the Alps are 2700 fathoms, (toiſes,) or 5260 metres above the level of the ſea. A leſs elevated branch of the Alps begins in the department of the Leman, ſtretches into the departments of the Jura, Upper Saône, Doubs, Upper Rhine, Voſges, Lower Rhine, Meurthe, Moſelle, Sarre, and Mont Tonnerre. A third branch riſes in the department of the Drôme, croſſes the departments of the Ardêche, Loire, Rhône, Saône and Loire, and Côte d'Or as far as Dijon. It has alſo ſome ramifications in the departments of the Cantal and Puy de Dôme, extends itſelf to the ſouth-weſt through the departments of the Upper Loire, Lozère, Gard, Aude, Hérault, Tarn, Upper Garonne, and Arriège as far as the Pyrenees, which form a natural boundary between France and Spain. This chain of the Pyrenees ſtretches to the ſouth of France, from the port of Vendres on the coaſt of the Mediterranean ſea to the Atlantic ocean on the coaſts of Spain. Its greateſt breadth is 40 leagues, and its higheſt ſummit 1442 fathoms, (toiſes,) or 2808 metres above the level of the ſea.

France abounds in woods and foreſts. A committee of the firſt national aſſembly ſtated the whole extent of territory covered with wood at 13,100,691 arpens, of 100 perches of 28 ſquare feet French each. Mr. Neckar and Mr. Arthur Young have both conſiderably over-rated it by ſtating it at 22,289,016 arpens. This eſtimate may however be tolerably correct now, with the addition of the conquered countries.

The roads of France are generally ſpacious, ſtraight, well paved, planted on both ſides with cheſnut-trees, poplars, walnut, mulberry, or other fruit-trees. There are twenty-eight principal roads from Paris to the boundaries of France. Turnpike-gates and tolls have been eſtabliſhed ſince the revolution, at the diſtance of five kiliometres from each other. The duty is 15 centimes, about 1½*d.* ſterling for every coach-horſe, and 10 centimes, about 1*d.* for a ſaddle-horſe. The wheels of heavy waggons are nine inches three lines broad. They are allowed to carry only a certain weight, which varies during the five winter and the ſeven ſummer months.

Of the numerous canals of France, the moſt conſiderable are, 1, the ſouthern canal, better known by the name of the Canal du Languedoc. It forms a communication between the Atlantic ocean and the Mediterranean ſea; 2, the canal of Briare and Orléans, thus called becauſe it forms a communication between the Seine and Loire, which begins at Orléans and ends at Briare; 3, the eaſtern canal, known by the name of Canal de la Côte d'Or, and forming a communication between the Yonne and Saône; 4, the canal of the center, formerly called Canal du Charolais, which forms a communication between the Saône and Loire.

France has no dependencies in Europe but the kingdom of Italy, which is, however, to loſe its connection with the French empire after the demiſe of the preſent emperor Napoleon I., who is at the ſame time king of *Italy* (which ſee). Still the ſtates of the Confederation of the Rhine, and the kingdoms of Naples and Holland, as well as the Helvetic union, of which the French emperor is the mediator, are little better than dependencies or vaſſal ſtates, forced to move in the direction to which they are impelled by France.

But, if France has been a gainer in its own immediate neighbourhood, it has experienced ſevere loſſes in its diſtant colonies. The fate of its moſt important Weſt India iſlands has already been detailed under the article *St. Domingo* (which ſee). All the other French Weſt India iſlands, which were acknowledged as belonging to France by the treaty of Amiens of the 25th of March 1802, have been conquered by the Engliſh in the courſe of the war which broke out in 1803, and which is ſtill (1810) raging. They were *La Martinique*, *Guadaloupe*, *St. Lucia*, *Tobago*, *Marie Galante*, *La Deſirade*, *Les Saintes*, (which ſee). Cayenne, on the South American continent, has ſhared the ſame fate. The poſſeſſion of the two iſlands in the Eaſt Indian ſeas, Mauritius and Bourbon, called by the French Iſles de France, and de la Réunion, is not leſs precarious, the latter having been recently invaded by the Engliſh, and the former being at this moment cloſely blockaded. The other commercial eſtabliſhments of the French in the Eaſt Indies and on the African coaſt were never of any great importance, and have dwindled into complete inſignificance, through the loſs of their foreign commerce in general, and of their ſugar colonies in particular, which were ſupplied with negroes from the Guinea coaſt. See INDIES, and NEGROE, or SLAVE *Trade*.

The fiſheries of France have alſo materially ſuffered from the war with England. The herring fiſhery was already on the decline before the revolution, and is now almoſt annihilated. In the ſhort interval of peace in 1802 it produced

49,550	barrels of	ſalt herrings
6,000	-	freſh
12,000	-	red
making in all 67,550		barrels.

The mackarel fiſhery, which was moſt flouriſhing in 1785, is in the ſame predicament. Oyſters are in abundance at Granville, Dieppe, and Cancale. During the ſhort interval of peace in 1802, 188 Engliſh veſſels loaded at Cancale 119,473,000 oyſters, worth 179,209 French livres. Paris conſumes about twelve millions of oyſters annually. There is a coral fiſhery in the Mediterranean. The coral is poliſhed and wrought at Marſeilles. It uſed to be employed moſtly in the African trade. The commerce of anchovies in the Mediterranean ſea is ſtill conſiderable. They are pickled at Fréjus, St. Tropez, and Cannes. The ſalt is coloured red with ochre. Eels are alſo ſalted for exportation. There is a great abundance of all ſorts of fiſh in all the rivers of France, and in ſome very extenſive fiſhponds, ſuch as the Etang de Villers in the department of the Cher, which is ſix leagues in circumference, and the Etang de l'Indre in the department of the Meurthe, which is four leagues in circumference.

Situated nearly in the centre of Europe, France owes to its ſoil, and to the excellence of its climate, the advantage of rearing alike the plants of the moſt ſouthern countries of Europe, and thoſe which ſucceed more particularly in the north. In the eaſtern Pyrenees the vine is cultivated with as much ſucceſs as in Spain. Silk-worms are reared in the ſouth of France with as much ſucceſs as in Italy, and the olive oil of Aix is preferred all over Europe to that of Genoa and Sicily. Though the agriculture of France cannot be praiſed as good, it yet is amply adequate to furniſh the country with all the objects of firſt neceſſity, food, cloathing, and ſhelter againſt the inclemencies of the weather.

Among the vegetable productions of France, the moſt conſiderable are,

1. Corn, under the general denomination of which are compriſed

comprised wheat, rye, barley, and oats. Its annual produce, before the revolution, was rated

by Vauban at	59,175,000	{ fétiers of 12 Paris buſhels, or 240lb. weight.
by Queſnay at	45,000,000	
by the Abbé d'Expilly at	78,473,380	
by Lavoiſier at	50,000,000	
by Mr. Arthur Young at	75,000,000	
	307,648,380	

the average of which ſum gives 61,519,672 fétiers.

The price of wheat generally varies from 25 to 35 French livres the fétier.

2. Wine. Before the revolution of 1789, France, according to Mr. Arthur Young, cultivated the vine on an extent which conſtituted nearly the twenty-ſixth part of its territory, and grapes formed the ſixth part of its produce. Of 130 millions of acres, five millions were covered with vines, which, at the average produce of 175 French livres per acre, yielded 875 millions. The ſame line of demarcation which that intelligent agriculturiſt traced at that time for the growth of the vine is ſtill correct. France has not changed in that reſpect ſince 1787, and is not likely to change. The annual average produce may be eſtimated at 15,000,000 muids of Paris, of 144 quarts each, or 540 millions of Engliſh gallons. The beſt French wines are thoſe of Burgundy, Champagne, Bourdeaux, Anjou, Orléans, and Poitou.

In the beginning of the laſt century France exported, upon an average of five years, from the year 1720 to 1725, annually, wine to the amount of 20,880,200 French livres.

In 1778 the exportation amounted to	24,570,170	——
In 1788 - - -	33,032,100	——

Of brandy, the exportation in the beginning of the laſt century amounted annually to 5,852,900 livres.

In 1778 - - -	4,660,221	—
In 1784 - - -	11,360,200	—
In 1787 - - -	14,689,600	—
In 1788 - - -	14,657,300	—

Of vinegar, the exportation in the beginning of the laſt century amounted annually to 34,400 livres.

In 1778 - - -	141,893	—
In 1784 - - -	124,400	—
In 1787 - - -	130,900	—
In 1788 - - -	201,700	—

3. Hemp and flax, but neither in ſufficient abundance for its own conſumption.

4. Rape and poppy ſeed, which furniſh excellent lamp-oil, chiefly in the northern departments.

5. Indian corn and buck-wheat.

6. Madder, tobacco, and hops.

7. All ſorts of pulſes, roots, pot-herbs, greens, graſſes, and an immenſe variety of medicinal plants.

8. All ſorts of the fineſt fruits, as lemons, oranges, cheſnuts, olives, &c.

Attempts have alſo recently been made at introducing the culture of indigo and cotton. A report of the municipality of Lille, in the department of Vaucluſe, confirmed the ſucceſs of a plantation of indigo upon a large ſcale, in an open field, on part of the eſtate of Mr. Icard de Bataglini, and on ſome of the heaths (landes) of France. Mr. Louis Dupoy, a coloniſt of St. Domingo, at preſent comptroller of the cuſtoms at Dax, has ſucceſsfully introduced the culture of cotton; he provided himſelf with ſeeds proper for the experiment in Louiſiana. Very fine cotton has been produced, and the pods have attained perfect maturity.

Among the principal animal productions of France are,

1. Horſes, which have, however, conſiderably degenerated ſince 1789; the public ſheds having long been neglected, a vaſt conſumption occaſioned by continual wars, and a wilful deterioration introduced by the farmers to ſave their cattle from the revolutionary requiſitions. In the year 1802 the total number was,

Of plough horſes - -	1,500,000
Horſes kept at Paris -	35,100
In all the other towns -	200,000
In the armies - -	100,000
	1,835,100

2. Oxen and cows, *viz.*

Oxen employed in huſbandry -	3,208,000
—— feeding - - -	404,500
Young oxen - - - -	1,456,000
Cows - - - - -	1,016,000
	6,084,500

3. Sheep, which are improved from the Spaniſh flocks of Rambouillet, Perpignan, Croiſſy ſur Seine, Dun ſur Auroux, and Montbar. Their number in 1802 was 30,307,728, one million of which were in the moſt improving condition. The common fleeces weigh 3lb. each; thoſe of the improved breed from 6 to 8lb. The total of the wool they yield may be rated at 106,770,048lb. This ſupply is, however, inſufficient for the manufactures when they are in full activity. There are alſo great numbers of goats, mules, aſſes, and hogs. Poultry is uncommonly abundant. The average price of a good fowl is 10*d.*; of a pigeon 3*d.*; of a duck 1*s.*; a gooſe 2*s.*; a turkey 2*s.* 9*d.* Bees are carefully reared. The beſt honey is that of Narbonne.

France is very rich in mineral productions. They have been conſiderably increaſed by the diſtreſs to which it was reduced in 1792, 1793, and 1794, by the coalition of all the great powers of Europe.

1. Of the pure metals iron is the moſt abundant. Two thouſand forges ſupply the wants of the country, which before the revolution was obliged to import iron to the annual value of from 11 to 12 millions of French livres.

The principal copper mines are in the departments of the Rhône, the Upper Pyrenees, and the Upper Alps.

Of the few lead mines that are worked moſt yield ſilver at the ſame time.

The principal mines of mercury and calamine are in the departments of the Ourte and Roër. Antimony and manganeſe are in great abundance.

2. Of metallic ſalts France has green, white, and blue copperas; verdigris chiefly at Montpellier; alum, Epſom-ſalt, in the neighbourhood of Liège; marine ſalt (ſoud muriatée) ſaltpetre, and ſal ammoniac.

3. Of the mineral acids France has the moſt important, *viz.* the ſulphuric acid, or oil of vitriol, the nitric acid, or aqua fortis, and the muriatic oxygenated acid.

4. Of the combuſtible minerals France has pit-coal in abundance, chiefly in the departments of Jemmappe, Sarre, Lower Meuſe, Roër, North, Calvados, Loire, Upper Loire, Hérault, and Tarn. Some anthracites in the Pyrenees and in the department of the Rhône. Jet in the departments of the Aude, Gard, and Ardêche. Solid bitumen,

called aſphaltum, chiefly in the departments of Ain and the Lower Rhine. Glutinous bitumen, called piſaſphaltus, in the department of Puy de Dôme. Liquid bitumen, called naphtha and petroleum, in the departments of the Hérault and the Lower Pyrenees. Turf chiefly in the departments of the Somme, North, and Pas de Calais.

All ſorts of earths and ſands uſed in manufactures, as kaolin, or porcelain earth, arenaceous quartz, puzzolane, &c. and all kinds of ſtony ſubſtances employed in the arts, abound in France, from the maſſy rock that forms the ſtately column, to the gem that ſparkles on the neck of beauty.

The principal manufactures of France are thoſe

1. Of linen cloth, in the departments formed out of the ancient provinces of Normandy, Picardy, Flanders, Hainaut, Cambréſis, Bretagne, Maine, Dauphiné, Auvergne, Beaujolais, Gaſcogne, and Anjou. Before the revolution France exported linen cloth to the amount of from 12 to 13 millions of livres.

2. Of lawn and cambric, the exportation of which amounted to about ſix millions of livres.

3. Of thread lace, chiefly at Bruſſels, Malines, Valenciennes, Dieppe, and Le Puy.

4. Of ſail cloth, chiefly at Rennes, Angers, Agen, Marſeilles, Mont de Marſan, &c.

5. Of cables and ropes at Breſt, Rochefort, Toulon, Abbeville, Dunkirk, and Havre de Grace.

6. Of printed calico, ſhawls, ſiamoiſes, &c. at Rouen, Troyes, Darnetal near Rouen, Beauvais, Langres, Crevelt.

7. Of muſlin at Rouen, Niſmes, Geneva, Béziers, Rheims.

8. Of dimity and fuſtian of a ſuperior quality at Alençon, Lyons, Troyes, Bruſſels, and Toulouſe.

9. Of writing and printing paper at Annonay, Montargis, Eſſonne, Courtalin, Rambervilliers, Dynoſée, Arches, Archettes, Docelles, St. Breſſon near Luxeuil, Beſançon, Ornant, Villafant, Arbois. Paper-hangings at Paris in the manufactures of Réveillon, Arthur, and others. They are exported to Italy, Holland, Germany, and as far as Ruſſia. Before the revolution the paper manufactured in France amounted to the annual value of 8 millions, 1,350,000 livres of which were exported to foreign countries, and 350,000 livres to the French colonies. Paris alone conſumes annually 305,000 reams.

10. Of ſoap of the firſt quality at Marſeilles, inferior ſoap at Toulon, Bourdeaux, Rouen, Nice, Lille, Abbeville, Amiens, St. Quentin. The amount of this manufacture is 60 millions, two of which only are exported.

11. Of ſtarch, the principal manufacture of which is at Paris.

12. Of tobacco and ſnuff, *viz.* 22,000 cwt. of ſnuff, and 2000 cwt. of tobacco. Every individual in France is ſuppoſed to uſe on the average 12 ounces of ſnuff annually.

13. Of fine woollen cloth, chiefly at Sédan, Abbeville, Louviers, Elbeuf, Rouen, Darnetal, les Andélys, Vienne, and Montauban. Common woollen cloth is made at Chateauroux, Iſſoudun, Aubigny, Romorautin, St. Aignan, Roybon, Creſt, Saillans, Romano, Grenoble, Valence, Valogne, Amboiſe, Niort, Aix, Apt, the Cévennes, &c. Woollen ſtuffs, as camelots, baracans, ſerges, calamancoes, and pluſh, are are alſo manufactured in great quantities. In 1784 France exported

Cloth amounting in value to -	15,530,900 livres.
Stuffs - - - - -	7,600,600
Pluſh, &c. - - - -	4,425,100.

The exportation of the two firſt articles in 1787 amounted to 14,242,400, and 5,615,800 livres. The produce of the whole woollen manufacture was rated in 1789 at 140 millions annually.

14. Of ſilks, chiefly at Lyons, Tours, Niſmes, Paris, and Marſeilles. This manufacture has, however, declined ſince the revolution. In 1789 its produce was rated at 125 millions, and it employed from 28 to 30,000 looms. The ſilk-worms reared in France yield 15,000,000lbs. of ſilk annually; but this quantity is not ſufficient for the manufacture.

15. Of hats chiefly at Lyons, Rouen, and Paris.

16. Of watches at Paris, Geneva, Cluſe, and Carouges. The number of watches conſumed annually in France before the revolution was ſuppoſed to amount to 200,000.

17. Of jewellery, which at Paris and Lyons only employed nearly 70,000 workmen before the revolution.

18. Of cannons and all ſorts of arms. This manufacture has been conſiderably improved, and attracts the particular attention of government.

19. Of china, (chiefly at Sèvres,) glaſs, and mirrors. This manufacture is alſo carried to a high degree of perfection, and the ſame may be aſſerted of the manufacture.

20. Of carpets and tapeſtry. The tapeſtry manufactures at La Savonnerie and Beauvais, though not equal to the celebrated manufacture of the Gobelins at Paris, are very little inferior to it.

The inland trade of France, like that of all extenſive, populous, and induſtrious countries, was at all times far ſuperior to its foreign commerce. It reſults from the conſumption of the produce of its own fiſheries, mines, agriculture, and manufactures, and its circulation from one province to the other. The foreign commerce of France, compriſing its exports of the produce of French induſtry and French colonies, and the importation of foreign commodities, is almoſt annihilated by the war with England. In 1787 the exportation amounted in all to 542,604,000 livres, of which 311,472,000 livres were the raw produce of the ſoil, mines, and fiſheries, and 231,132,000 the produce of French manufactures. In 1800 it amounted only to 271,564,000 livres in all, *viz.*

Raw produce and wines - - -	87,562,000
Metals, minerals - - - -	4,530,000
Manufactured goods - - -	140,854,000
Divers other articles - - -	38,618,000

The imports of France, upon an average of the years 1785, 1786, and 1787, were 611,008,200 livres. But Mr. Roland, in his report to the convention in 1792, ſtated the average imports of France to amount to no more than 319 millions. In 1800 they amounted to 325,116,000 livres.

According to Mr. Neckar the balance of commerce in 1784 was 70 millions of French livres in favour of France. He calculated the imports at 230 millions annually, and the exports at about 300 millions. But from the ſtate of the French commerce in 1787, which Mr. Arnould has analyſed with much care, it appears that

the importation, amounting to	611,008,200 livres, and
the exportation only to -	542,604,000
there was a balance of -	684,042,200 livres

againſt France. And in the year 1800, when

the importation amounted to	325,116,000 livres, and
the exportation only to -	271,564,000
there was ſtill an unfavourable balance of - -	53,552,000 livres.

A very

FRANCE.

A very inconſiderable part of the French trade is carried on in French ſhips. Colbert was the firſt miniſter of ſtate in France who directed his particular attention to the encouragement of the French merchant navy, which in the year 1669 did not count above 600 veſſels; and it is ſuppoſed that in the beginning of the 18th century this number had not been increaſed to much beyond 800 veſſels of from 100 to 250 tons. From that period, however, to the revolution of 1789, the French merchant navy had been conſiderably improved and greatly encouraged. Yet even at that time, though the French trade in the Baltic employed 705 veſſels, there were ſcarcely 100 French among them; and in 1788 all the ports of France had not above 1000 merchantmen of the average of 250 tons employed in long voyages to both the Indies, and in the cod and whale fiſheries. The exports to different countries in Europe took up about the ſame time 580,000 tons, of which a little better than a fourth, or 152,000 tons, were French.

From an official report made by Roland to the national convention in 1793, it appears that in the year 1792 there entered inwards into the ports of France 7607 veſſels, amounting in all to 639,235 tons; of which

1823	veſſels, or	147,821	tons, were	French,
1940	- -	145,012	- -	Engliſh,
3844	- -	346,402	- -	belonging to

other nations. And in the ſame year there cleared outwards 8618 veſſels, amounting in all to 544,935 tons, of which

1940	veſſels, or	147,410	tons, were	French,
3111	- -	90,662	- -	Engliſh, and
3567	- -	306,863	- -	belonging to ſeveral other nations.

The money in circulation in France in the year 1789 was ſtated by Mr. Bonvallet Deſbroſſes in his "Tableau des Richeſſes de la France," at 2,474,254,960 livres, 350 millions of which conſiſted in notes of the Caiſſe d'Eſcompte.

In the maritime departments the circulating medium amounted to 1,053,838,350 livres, and the buſineſs tranſacted by its means to 4,485,600,000 livres. In thoſe on the boundaries of France the money in circulation amounted only to 385,227,000 livres, and the buſineſs done with it to 453,600,000. In the central departments the circulating medium was 1,035,189,600 livres, and the trade carried on with it amounted to 11,874,600,000 livres; this more animated circulation ariſing entirely from the trade of the metropolis.

The ſtandard coin of France is a piece of ſilver of the weight of five grammes, or five times 18 $\frac{8\,4\,1}{1\,0\,0\,0}$ grains, containing a tenth of alloy and $\frac{9}{10}$ of pure ſilver, and very nearly the 24th part of the pound ſterling's metallic value. It is called a franc, and ſubdivided into décimes and centimes. Its value is to that of the ancient livre Tournois in the proportion of 81 to 80, or as it contains $\frac{9}{10}$ of fine ſilver, it is equal to 1 livre, 3 deniers. There are pieces of 5 francs, 2 francs, $\frac{3}{4}$, $\frac{1}{2}$, and $\frac{1}{4}$ franc. The decime is the tenth part of a franc. It is equal to 2 ſous, $\frac{3}{1}$ deniers. The centime is the hundredth part of a franc, equal to 2 $\frac{4\,3}{1\,0\,0}$ denier. The gold coins, like the ſilver coin, contain $\frac{1}{10}$ of alloy, and $\frac{9}{10}$ of pure metal. They are called Napoleons d'or, or octogrammes. An octogramme of gold is worth 25 francs. The kiliogramme of gold, which is the premium awarded by the national inſtitute for the beſt anſwer to its prize queſtions, is valued at 3375 francs. The towns which have mints where money is coined are diſtinguiſhed by a particular letter on the coin. Paris has the letter A; Perpignan, Q; Bayonne, L; Bourdeaux, K; Nantes, T; Lille, W; Straſburg, BB; Lyons, D; Geneva, G; Marſeilles, MM; Turin, C.

The preſent bank of France was eſtabliſhed in 1801, with a capital ſtock of thirty millions of francs in hard caſh, made up of thirty thouſand ſhares of a thouſand francs each, which makes each ſhare equal to 1012 livres Tournois. The law of the 22d of April, 1806, inſures to this bank an excluſive privilege of forty years, to be reckoned from the 22d of September, 1803, for iſſuing notes payable to the bearer and at ſight. Its operations conſiſt in diſcounting, (but only twice in the week, Mondays and Thurſdays,) keeping the caſh of public eſtabliſhments and private individuals, and receiving depoſits of ſums not below fifty francs, for which it gives recognizances bearing intereſt, and made payable either to the bearer or to order. Its general aſſembly is compoſed of 200 holders each of five ſhares or above, who elect fifteen directors and three cenſors. Both the directors and cenſors muſt be holders of at leaſt thirty ſhares. Three of the directors and one of the cenſors go out annually by rotation. The general aſſembly meets once in the year to audit the accounts. The dividend is paid every ſix months. The firſt dividend was of $9\frac{1}{2}$ *per cent.* or 95 francs *per* ſhare: but 5 *per cent.* only were paid, and $4\frac{1}{2}$ *per cent.* were reſerved for leſs favourable times, when the dividends might be under 5 *per cent.*

After many fruitleſs attempts by almoſt all the rulers of France from Charlemagne down to Louis XIV., France, during its ſhort-lived republican conſtitution, ſucceeded in eſtabliſhing uniform weights and meaſures upon the following ſimple plan. The French fundamental, elementary, or ſtandard meaſure, is connected with the dimenſions of the terreſtrial globe. This meaſure, which they call metre, or méſure par excellence, from the Greek μετρον, is the ten millionth part of a quarter of the terreſtrial meridian, that is to ſay, of the diſtance from the equator to the pole. It is equal to 3 feet 11 lines $\frac{4\,4}{1\,0\,0}$.

The are ſerves to meaſure the ſurface of the ſoil in the ſame manner as the ancient arpent. It is equal to 100 ſquare metres, or 948 $\frac{3\,1}{1\,0\,0}$ ſquare feet.

The ſtere is equal to a cubic metre, or $\frac{2\,0\,2\,7}{1\,0\,0\,0\,0}$ cubic feet.

The litre is the meaſure of capacity. It is equal to a cubic decimetre, or 50 $\frac{4\,6}{1\,0\,0}$ cubic inches, or one-twentieth of the former pint of Paris.

The gramme marks the weight. It is equal to the weight of a cubic centimetre of diſtilled water, and weighs 18 $\frac{3\,4\,1}{1\,0\,0\,0}$ grains.

Theſe five primitive meaſures are ſucceſſively multiplied or ſubdivided by ten, in order to form the greater or ſmaller meaſures by analogy to the decimal ſyſtem of arithmetic, which is almoſt univerſally adopted in Europe. The three diviſors are deci, centi, and milli, expreſſing the tenth, hundredth, or thouſandth part: thus, decimetre is the tenth part of the metre, deciare the tenth part of the are, deciſtere the tenth part of the ſtere, decilitre the tenth part of the litre, and decigramme the tenth part of the gramme. The four multiplicators are deca, hecto, kilio, and myria, denoting ten times, hundred times, thouſand times, and ten thouſand times, the primitive meaſure or weight; thus the decametre is ten metres, the hectare hundred ares, the kiliolitre a thouſand litres, the myriagramme ten thouſand grammes, or 20lb. 7 ounces, 58 grains.

That France has not yet recovered its former degree of proſperity may be inferred from the price of land, which is cheap, and the intereſt of money, which is very high. Mr. Pinkney, who travelled through the ſouth of France in

1807 and 1808, reports, that an eſtate of eleven hundred acres, ſeven hundred of which were in culture, the remainder wood and heath, was offered for ſale for leſs than eight thouſand pounds ſterling. The manſion-houſe was in ruin beyond the poſſibility of repair; but the land, under proper cultivation, would have paid 25 *per cent.* on the purchaſe money. There is no law prohibitory of uſury in the code Napoleon; the money market, like that of all other commodities, is left to find its own level.

But although the food, dreſs, and accommodations of the inhabitants of France, have not been improved ſince the revolution, their individual happineſs does not appear to have been materially impaired. Sunday is ſtill a day of feſtivity and a holiday. They ſing and dance, and frequent the theatres. The arts of painting, ſtatuary, architecture, muſic, and dancing, are held in high eſtimation, and foſtered with particular care. Seventeen of the principal towns of France have public galleries of pictures and ſtatues, called muſeums, and the central muſeum at Paris contains above one thouſand paintings, each of which would be deemed a maſterpiece in the collection of a private individual. The moſt eminent living painters of France are Vien, David, Regnault, Vincent, Greuze, Gérard, Girodet, Guerin, Hennequin, Ménageot, Taunay, &c. The moſt eminent ſtatuaries, Pajore, Moitte, Julien, Roland, Houdon, Dejoux, Foucou, Chaudet, Stouf, Boichot, &c. The beſt French architects are David Ledoy, Clériſſeau, Gondouin, who built the Ecole de Chirurgie at Paris, Chalgrin, Le Grand, Molinos, Raymond, Percier, the younger Moreau, Le Doux, Brongniard, &c. The moſt eminent muſical compoſers in France are Grétry, Monſigny, Martiny, Daleyrac, Méhul, Goſſec, Le Sueur, Langlé, Catel, Boyeldieu, Champein, Pleyel, Steibelt, Adam, Kalkbrenner, Kreutzer, Bruni, &c. The love of the arts is particularly encouraged by the fondneſs of the French for theatrical repreſentations, in which all the arts combine for the amuſement of the ſpectators. There is not a town of 30 or 40,000 inhabitants that has not a theatre, in which plays are performed almoſt every evening from one end of the year to the other.

The principal amuſement of which all the claſſes of Frenchmen are equally fond is dancing. Excurſions to watering-places for pleaſure only and change of ſcene are confined to very few perſons of the very firſt claſſes of ſociety. The moſt renowned mineral waters of France are thoſe of Bagnères and Barrège in the Upper Pyrenees, Uſſat and Ax in the department of the Arriège, St. Amand in the department of the North, Bourbonne in the Upper Marne, Plombieres in the Voſges, Chaudes Aigues in the Cantal, Aix in the Bouches du Rhône, Sultz in the Lower Rhine, Sultzbach in the Upper Rhine, Spa in the department of the Ourte, and Aix la Chapelle in that of the Roër.

The French language is derived from the Latin. Its principal merit is the ſteady regularity of its conſtruction. Even French poetry admits few inverſions, and appears on that account extremely tame to the Engliſh, Germans, and Italians, whoſe poets, by the boldneſs of their inverſions, ſpeak as it were a language of their own. It was only in the beginning of the 17th century that the French commenced to write with elegance. The merit of the literary works produced in French in the reign of Louis XIV. is generally acknowledged, and though the preſent be more particularly the age of ſcience, France has yet ſome eminent men in the department of the belles lettres, ſuch as Delille, Le Brun, Bernardin de St. Pierre, Parny, Fontanes, Chénier, Colin d'Harleolle, Andrieux, Desfaucherets, St. Lambert, Monvel, Picard, Anquétil, Ségur, Suard; and it is not very long ſince ſhe has loſt her Voltaire, Rouſſeau, Buffon, d'Alembert, La Harpe, Marmontel, Boufflers, Favre d'Eglantine, Roucher, Condorcet, &c. The average number of new books publiſhed annually in France is from 1000 to 1200. But there is ſcarcely a town of 15 or 20,000 inhabitants which has not a literary ſociety, and the former royal academies at Paris have been replaced by a national inſtitute. (See PARIS.) The public libraries of France are alſo numerous and important. The national library at Paris alone contained, in the beginning of 1807, 300,000 printed books, 70,000 manuſcripts, 200,000 engravings, 40,000 copper medals, 30,000 gold medals, 30,000 ſilver medals, and many other curioſities.

France has a great many valuable remains of antiquity, which are detailed under the head of each department. There is in particular a moſt intereſting collection of monuments at Paris, called le Muſée des Antiques. See PARIS.

The conſequences of the revolution were very fatal to religion and public education; but the former is regaining its ſalutary influence on the principles and actions of the French, and the latter has recently been provided for by the eſtabliſhment of an imperial univerſity at Paris, which is excluſively charged with the public inſtruction, and controls every ſchool and ſeminary of education in the empire. It is compoſed of as many academies as there are tribunals or courts of appeal in France. There are ſchools attached to each academy, in the following order: 1. Univerſities, called les facultés; 2. Lyceums; 3. Colleges, or grammar ſchools; 4. Inſtitutions, or ſeminaries; 5. Boarding-ſchools, called penſionats; and, 6. The leſſer, or primary ſchools. The univerſities are compoſed of five faculties, *viz.* theology, juriſprudence, phyſic, mathematical and phyſical ſciences, and literature. The poet Fontanes, now comte de Fontanes, is grand maſter of the imperial French univerſity. There are alſo ſeveral eſtabliſhments for educating young men for ſome particular public ſervice, ſuch as the Ecole Polytechnique, which admits three hundred boys, that are generally inſtructed in mathematical and phyſical ſciences, chemiſtry, and drawing; and who, after a reſidence of three years, are examined and paſſed over, according to their particular inclination and talents, to the Ecoles des Ponts et Chauſſées, d'Artillerie de Terre, d'Artillerie de la Marine, des Génie Militaire, des Mines, des Ingénieurs de Vaiſſeau, &c. beſides which there are two military colleges at Fontainbleau and Saint Cyr.

In the year 1754, the marquis de Mirabeau, father of the celebrated count of that name, rated the whole population of France at 18 millions.

In 1772 the abbé d'Expilly eſtimated it at 22,140,357 individuals, and nearly at the ſame epoch the celebrated Buffon ſtated it at 21,672,777. In 1785 Mr. Neckar made it amount to 24,676,000.

In the year 1789 Mr. Bonvallet Deſbroſſes rated the population of France at 27,957,267, and in 1791 the committee of the National Aſſembly, from a more accurate calculation, ſtated it to be 26,363,074.

In 1798 Mr. Prony made the population of France, including Corſica and the conquered countries, amount to 31,123,218, *viz.*

26,048,254	on the territories of ancient France.
3,511,055	in the Comtat Venaiſſin, Savoye, Nice, Porentruy, Geneve, the Auſtrian Netherlands, &c.
1,563,909	in the countries ſituated between the Rhine and the Moſelle.

In 1799, Mr. Depere, in his Report to the Council of Five Hundred, ſtated it at 33,501,694.

The

The ſenatus conſultum of the 4th of Auguſt 1802 made the whole population of France amount to	33,111,962
To which muſt be added for Piémont and the iſland of Elba, which were incorporated with France on the 26th of Auguſt and 11th of September 1802,	1,864,351
which makes the whole population in 1802	34,976,313

The chevalier de Tinſeau, in the ſecond edition of his ſtatiſtical view of France, publiſhed at London in 1805, deviates very little from this ſtatement. He rates the whole population of France at 33,104,343, and gives for the ſix Piemonteſe departments 1,946,800

Making in all 35,051,143. To theſe muſt be added,

For the three departments of the Apennines, Genoa, and Montenotte, formed out of the Ligurian republic -	928,563
For the department of the Taro, formed out of the duchies of Parma and Plaiſance -	368,084
For the departments of the Arno, Mediterranean, and Ombrone, formed out of Tuſcany or the kingdom of Etruria -	956,068
And for the departments of Rome and Traſimene, formed out of the papal dominions -	800,000, which makes the whole
population of the French empire	38,103,858

But taking the population of France as it was in the beginning of 1802, when its territorial extent was 30,505 ſquare leagues, it gives 1086 inhabitants for the ſquare league.

The moſt populous towns of the French empire are,

1. Paris,	in	1803	had 672,000	inhabitants.
2. Rome,	in	1807	— 134,973	——
3. Marſeilles,	in	1807	— 96,413	——
4. Bourdeaux,	in	1807	— 90,992	——
5. Lyons,	in	1807	— 88,919	——
7. Turin,	in	1807	— 79,000	——
9. Genoa,	in	1807	— 75,000	——
6. Rouen,	in	1807	— 87,000	——
8. Nantes,	in	1807	— 77,162	——
10. Bruſſels,	in	1807	— 66,297	——
11. Antwerp,	in	1807	— 56,318	——

The annual number of births in France is as 1 to 25; and of theſe, every forty-ſeventh child in 1780 was illegitimate, whilſt the proportion now is that every eleventh child is illegitimate. The number of marriages is as 1 to [illegible]; the number of deaths as 1 to 30. The prefect of the department of the Doubs, on comparing the accounts of the children that died under ten years of age in 1800, and of thoſe that died under ten years of age in 1802, found that 939 more children had died in that ſingle department in 1800 than in 1802, and aſcribed the difference to the great progreſs which the introduction of the vaccine had made in the latter period.

The conſtitution of the French empire may be defined a military deſpotiſm engrafted upon a republican form of government, Napoleon Bonaparte having exchanged the conſular for the imperial dignity. The privy council, or ſtate council, in which the emperor preſides, and of which all the princes of the imperial family, the princes, great dignitaries of the empire, and the miniſters of ſtate are members, is compoſed of thirty privy counſellors, or counſellors of ſtate, and thirty-five auditors. The ſenate, of which the French princes and the great dignitaries are alſo members, is compoſed of eighty ſenators named by the emperor. The legiſlative body is compoſed of two hundred and fifty deputies of the different departments of the French empire.

There are ten miniſters and one ſecretary of ſtate, *viz.*

1. A miniſter for the department of the adminiſtration of juſtice, called great judge, (grand judge). 2. A miniſter for the foreign department. 3. For the home department. 4. For the financial adminiſtration of the empire. 5. A chancellor of the exchequer. 6. A war miniſter. 7. For the adminiſtration of the war department. 8. For the adminiſtration of naval and colonial affairs. 9. For the general police of the empire; and, 10. For the religious inſtitutions of the country. But theſe miniſters are accountable to the emperor only, and not to the nation.

The Roman Catholic religion has been declared that of the majority of the French people; but the ſtate provides equally for the miniſters of the reformed church, either of the Lutheran or Calviniſtic confeſſion, and ſuperintends even the ſynagogues of the Jews. The difference of religion is no bar to the advancement of any French citizen to the higheſt offices in the ſtate.

There is an inferior court of juſtice in every diſtrict, and a juſtice of the peace in every canton. Every department has a criminal court of juſtice. There are thirty-five courts of appeal, and two ſupreme tribunals, called the Haute Cour Impériale, and the Cour de Caſſation. The Code Napoléon regulates both the civil and criminal proceſs. But all theſe inſtitutions are of ſo recent a creation, that there are no data yet to pronounce on their merits.

According to Mr. Neckar's report of the 1ſt of May 1789, the public revenue of France at that time amounted only to 475,294,027 livres Tournois annually, whilſt the annual expenditure was 531,444,000 livres Tournois. There was of courſe an annual deficit of 56,149,973 livres. The preſent regular revenue of France is derived from a land-tax, a perſonal tax, a tax on moveables and ſumptuaries, on houſes and windows, on patentees, on the privilege of exerciſing any profeſſion, additional centimes or hundredths; from the produce of the national demeſnes and foreſts, cuſtoms, poſt office, lottery, ſalt mines, &c. all theſe taxes, in 1803, produced a ſum total of 569,500,000 francs, which,

together with contributions levied in foreign countries, called recette extérieure, and amounting to - - -	20,000,000
covered the expenditure of the ſame year amounting to	589,500,000 francs,

The principal heads of this expenditure were

1. Intereſt

1.	Intereſt of the national debt -	64,023,482 francs.
2.	Adminiſtration of juſtice - -	23,318,730
3.	Foreign department - -	7,000,000
4.	Home department - -	47,110,000
5.	Collection of the revenue and penſions - - -	56,047,788
6.	Public exchequer - -	6,000,000
7.	War department - -	243,000,000
8.	Naval department - -	126,000,000
9.	Sundries, and ſurplus in reſerve	17,000,000
		589,500,000

The national debt of France, which in 1789 exceeded three milliards, or three thouſand millions of francs, is reduced to leſs than one third, and as there are ſeveral annuities dropping off every year, it ſcarcely requires 60 millions annually for both the intereſt and the annuities. In the budget for the year following the above ſtatement of expenditure, both the intereſt of the conſolidated debt and the annuities are ſtated together at 58,730,000 francs. There is alſo a ſinking fund.

Beſides paying the general taxes and impoſts of the country, every department is obliged to provide for its adminiſtrative, judiciary, and ſchool expences.

The police of France, which even before the revolution was conſidered as excellent, is more vigilant than ever. It employs an incredible number of ſpies, and is powerfully aſſiſted by the national gendarmerie, a corps of 17,445 horſemen, divided into 28 legions, ſtationed by ſmall brigades all over the country, and deſtined to watch more particularly over the ſafety of the high roads.

There is no legal proviſion for the poor in France, but they are maintained in richly endowed charitable foundations, or ſupported by the liberality of a generous public. The hoſpital of the blind at Paris admits 420 blind individuals. The inſtitution for the deaf and dumb, which is become ſo celebrated by the talents of the late abbé de l'Epée, and its preſent director the abbé Sicard, admits only 60 pupils. There is a board of health at Charenton, a general hoſpital for gratuitous vaccination, and ſcarcely any town of importance is without infirmaries and charitable foundations. Begging is ſtrictly prohibited. Every beggar is taken to a dépôt de mendicité.

The army of France, that powerful engine with which ſuch aſtoniſhing deeds have been performed, and ſuch important changes operated on the continent of Europe, conſiſts of

90	Infantry regiments of the line, each at 3230 men each - - - - -	290,700
27	Regiments of light infantry, at 3230 men each	87,210
2	Regiments of carabiniers, at 706 men -	1,412
12	Regiments of cuiraſſiers, at 706 men -	8,472
30	Regiments of dragoons, at 946 men -	28,380
24	Regiments of chaſſeurs, at 946 men -	22,704
10	Regiments of huſſards, at 946 men - -	9,460
8	Regiments of artillery on foot, at 2582 men each	20,656
6	Regiments of hotillerie à cheval, at 524 men each	3,144
22	Battalions of the artillery train, at 477 men each	10,494
16	Companies of artillery labourers, at 78 each -	1,248
2	Battalions of pontoneers, at 610 men -	1,220
9	Companies of miners, at 100 men -	900
5	Battalions of ſapeurs, at 909 men - -	4,545
1	Battalion of gardes du génie - -	550
	Men	491,095

commanded by fifteen marſhals of the empire, 150 generals of diviſions, 300 generals of brigades, and 135 adjutants commandants. This army is recruited by voluntary enliſtings and by a rigorous conſcription, which comprizes all Frenchmen from the age of 20 to that of 25, without any diſtinction of rank, fortune, or buſineſs; but every ſoldier is entitled to be gradually promoted to the higheſt military appointments, provided he be found fit for the ſame. No military commiſſions whatever can be ſold. The military ſpirit of the French ſoldier is ſupported and animated by the decoration of a military order, which may be obtained alſo in a few caſes for civil merits, called the legion of honour, compoſed of 16 cohorts, poſſeſſed each of national demeſnes to the amount of an annual income of 200,000 francs. Each cohort conſiſts of ſeven great or ſuperior officers or dignitaries, 20 commanders, 30 officers, and 350 légionnaries. The great officers have an annual income of 5000 francs, the commanders 2000, the officers 1000, and the légionnaries 250. The knights of the legion of honour amount in all to 6512.

In the reign of Louis XIV. the French navy was ſtrong enough to equip a fleet of 63 ſhips of the line, 7 frigates, 36 veſſels armed en flute, and 14 cutters, under the orders of admiral de Tourville in the year 1690, and in 1704 the French fleet that fought the combined Engliſh and Dutch fleets at Veles Malaga conſiſted of 50 ſhips of the line, 8 frigates, and 9 fire ſhips. On the 1ſt of March 1791, the French had 73 ſhips of the line, 67 frigates, 19 cutters, 29 armed brigs, 7 gun boats, beſides ſeveral hoſpital ſhips, galliots, and others. But at preſent the French navy is reduced to a very low ſtate, and it is not probable that the intention of the French government to have at leaſt 100 ſhips of the line and 100 frigates afloat, will ſoon be realized. In the mean time the French have ſtill 7 vice-admirals, 16 rear-admirals, and about 200 poſt captains, on their navy liſt.

France holds at this moment the firſt rank among all the powers of the continent of Europe, and keeps them either in vaſſalage, or is in relations of amity with them all, except a ſmall portion of Spain, Great Britain, Portugal, and the iſland of Sicily.

The national character of the French has not been materially altered by their late political revolution. They are ſtill lively, polite, witty, amiable and brave; but vain glorious, inconſtant, volatile, and eaſily diſcouraged. They have been taxed of inſincerity in their offers of ſervices; but their wiſh to oblige ſtrangers whom they conſider as viſitors is really unfeigned. Mr. Pinckney, one of the lateſt travellers in France, obſerves that the French are unwearied in their acts of kindneſs. They offer their minor ſervices with ſincerity. They can never be ſufficiently praiſed for their indiſcriminate, their natural, their totally unintereſted and ſpontaneous benevolence.

FRANCE, *Iſle of*, a part of France, ſo called before the revolution, being bounded by the rivers Seine, Marne, Oiſe, Aiſne, and Ourque. Paris, ſituated in the centre, was its capital.

FRANCE, *Iſle of*. See MAURITIUS.

FRANCE, *School of Engravers in*. See FRENCH *ſchool of Engravers*.

FRANCESCA, PIETRO DELLA, commonly called *Franceſco Dal Borgo a San Sepolcro*, in *Biography*, was a painter of conſiderable merit and renown, for the early period of the art in which he lived.

He was born at Borgo in Umbria in 1372. In his youth he ſtudied the mathematics, and it was not till he was 15 years of age that he determined on being a painter, when he was patronized, or (as Vaſari terms it) adopted by Gindobaldo

baldo Fettro, duke of Urbino. He did not, however, ſo completely devote his time to painting, as to neglect his former ſtudies, but wrote ſeveral eſſays on geometry and perſpective, which were long preſerved in the duke's library at Urbino. He afterwards painted in Peſara, Ancona, and Ferrara; but few of his works remain at either of theſe places.

Having obtained much reputation, he was ſent for to Rome by pope Nicholas V. to paint two hiſtorical ſubjects in the chambers of the Vatican, in concurrence with Bramante di Milano, called Bramantino; but ſuch was the greater eſteem in which the talents of Raphael were juſtly held when he ſome years after flouriſhed, that Julius II. deſtroyed theſe two pictures to make room for his favourite artiſt to paint in their ſtead the miracle of Bolſena, and St. Peter in priſon.

Notwithſtanding this degradation of his labours, before the ſuperior powers of Raphael, he was very deſerving of eſteem, if the account which Vaſari gives of him be true, and we conſider the imperfect ſtate of the art at the time in which he lived. He exhibited much knowledge of anatomy, feeling of expreſſion, and of diſtribution of light and ſhade. The principal work of Franceſca was a night ſcene, in which he repreſented an angel carrying a croſs, and appearing in viſion to the emperor Conſtantine ſleeping in his tent with his chamberlain near him, and ſome of his ſoldiers. The light which iſſued from the croſs and the angel illuminated the ſcene, and was ſpread over it with the utmoſt diſcretion. Every thing appeared to have been ſtudied from nature, and was executed with great propriety and truth. He alſo painted a battle which was highly commended for the ſpirit and fire with which it was conducted; the ſtrength of the expreſſion, and the imitation of nature; particularly a group of horſemen, which Vaſari ſays, "conſidering the period, cannot be too highly commended."

Having exerciſed the various talents nature had beſtowed upon him, till he was 86 years old, he ſhared the common fate of mankind, and died in the year 1458.

FRANCESCAS, in *Geography*, a town of France, in the department of the Lot and Garonne, and chief place of a canton in the diſtrict of Nérac; ſix miles S.E. of Nérac. N. lat. 44° 3′. E. long. 0° 30′. The place contains 1314, and the canton 7624 inhabitants, on a territory of 145 kiliometres, in 21 communes.

FRANCESCHELLO, in *Biography*, the moſt exquiſite performer on the violoncello of his time, flouriſhed early in the laſt century. The admirable Benda, firſt violin to the king of Pruſſia, (Frederic,) and ſo juſtly celebrated for expreſſion on his inſtrument, in his life, written by himſelf, ſpeaks of the great advantage he received from frequently hearing and playing with Franceſchello. Geminiani uſed to relate of him, that in accompanying Nicolini, at Rome, in a cantata compoſed by Aleſſandro Scarlatti, for the violoncello, the author, who was at the harpſichord, would not believe that a mortal could play ſo divinely; but ſaid, that it was an angel who had aſſumed the figure of Franceſchello; ſo far did his performance ſurpaſs all that Scarlatti had conceived in compoſing the cantata, or imagined poſſible for man to expreſs.

FRANCESCHINI, Marc Antonio, an hiſtorical painter, born at Bologna in 1648. He was at firſt a diſciple of G. Battiſta Galli, and from him entered the ſchool of Carlo Cignani.

That maſter, who ſoon diſcovered the talents of his pupil, not only formed his ſtyle, but made him his relation by marrying him to his niece, and he ſoon became his principal aſſiſtant.

He was employed in embelliſhing many churches and convents in his native city, and in other parts of Italy; and particularly at Modena; he painted the grand hall of the duke's palace ſo much to the ſatisfaction of that prince, that he wiſhed to retain him at his court by an offer of a large penſion, and ſuch honours as were due to his merit. But Franceſchini preferred his freedom and eaſe to the greateſt acquiſitions of wealth, and with polite reſpect refuſed the offer. At Genoa he painted, in the great council chamber, a deſign, that at once manifeſted the fertility of his invention, and the grandeur of his ideas; for moſt of the memorable actions of the republic were there repreſented with a multitude of figures nobly deſigned, judiciouſly grouped and diſpoſed, and correctly drawn. And in the Palazzo Monti at Bologna is a ſmall gallery painted by him, of which the colouring is exceedingly lovely, though the figures appear to want roundneſs.

Franceſchini, though of the ſchool of Cignani, is original in the ſuavity of his colour, and the facility of his execution. He is freſh without being cold, and full without being crowded. As he was a machiniſt, and in Upper Italy what Cortona was in the Lower, ſymptoms of the Manneriſt appear in his works. He had the habit of painting his cartoons in chiaro-ſcuro, and, by fixing them to the ſpot where the freſco was to be executed, a judge of their effect.

He preſerved the powers of his mind and pencil unaltered at a very advanced age, and when he was even 78 years old, he deſigned and coloured his pictures with all that fire and ſpirit for which he had been diſtinguiſhed in his beſt time. He died in 1729, at the age of 81. Fuſeli's Pilkington.

Franceschini, Baldassare, called *Volterrano*, a painter of hiſtory, landſcape, and portrait, born at Volterra in 1621. He ſtudied under Matteo Sorella and Roſelli, but principally formed himſelf by his ſtudy of Corregio. He painted a great variety of works with conſiderable ſucceſs, but excelled principally in portrait. He died in 1689, aged 68.

FRANCESES, in *Geography*, a ſmall iſland near the coaſt of Brazil. S. lat. 20° 12′.

FRANCESINA, Signora, in *Biography*, a very pleaſing female Italian ſinger, and a beautiful woman, arrived in England in 1736, in order to ſing in the opera eſtabliſhed by the nobility and gentry againſt Handel; and the Daily Poſt, Nov. 18, of that year, informs us that "Sig'. Mirighi, Sig'. Clementi, and the Franceſina, (three ſingers lately come from Italy for the Royal Academy of Muſic,) had the honour to ſing before her majeſty, the duke, and princeſſes, at Kenſington, on Monday night laſt, and met with a moſt gracious reception; and her majeſty was pleaſed to approve their ſeveral performances: after which the Franceſina performed ſeveral dances to the entire ſatisfaction of the court." We believe ſhe never danced on the ſtage in England, though ſhe remained here as a ſinger to the end of her life. She however ſung for Handel at the end of his opera regency in Lincoln's-inn-fields, 1740, in the little drama of "Imeneo," or Hymen, and in 1741 in "Deidamia," the laſt opera which he compoſed, and in which ſhe had an air at the end of the firſt act, "Naſcondi l'uſignol," compoſed in a light airy ſtyle, ſuited to the active throat of the Franceſina. It was for the natural warble of this ſinger that Handel compoſed his Engliſh airs of execution, ſuch as "Sweet Bird," in Milton's Penſoroſa, "Myſelf I ſhall adore," and "The morning lark to mine attunes his throat," in Congreve's Semele, &c. Though the Franceſina came hither as ſecond woman, and had not a voice ſufficiently powerful for a firſt woman's part in a large theatre, having quitted the opera ſtage, ſhe attached herſelf to Handel, and was the principal ſinger in his oratorios during many years.

FRANCESIO, Araia, maeſtro di cappella to the court of Ruſſia, was born at Naples. His firſt eſſay in compoſition, after quitting the conſervatorio, was the opera of "Berenice," performed at the court of the grand duke of Tuſcany at Florence in 1730. This was followed, in 1731, by "Amore per regnante" for Rome. In 1735 he was called to Peterſburgh by the empreſs Anne, with a complete band of vocal and inſtrumental performers; where he compoſed the firſt Italian opera that was ever heard in that capital. During this reign concerts were eſtabliſhed at the imperial palace twice a week. In 1737 he ſet the opera of "Abiazure," and in 1738 "Semiramide," for the imperial theatre.

The empreſs Elizabeth, who began her reign in 1741, and had a paſſion for muſic, continued Araia in the office of maeſtro di cappella to the court. At her coronation, "La Clemenza di Tito" of Metaſtaſio, ſet by Haſſe, was performed, but with a prologue ſet by Araia, entitled "La Ruſſia afflitta e conſolata." Soon after this event Peterſburgh firſt heard an opera, "Cephalis and Procris," in the Slavonian language, which was likewiſe ſet in the Italian ſtyle by Araia, whoſe taſte was refined and melody graceful. He was honoured with the title of Aulic-counſellor, and received magnificent preſents from the court before he quitted Ruſſia, and in 1759 he returned to Italy poſſeſſed of conſiderable wealth, and ſettled at Bologna, where he enjoyed the fruits of his labours and good fortune in ſplendid eaſe and tranquillity.

FRANCESTOWN, in *Geography*, an interior poſt-town of America, in Hillſborough county, New Hampſhire, on the E. ſide of Contacook river, about 21 miles to the S.W. of Concord. It was incorporated in 1772, and in 1800 contained 1355 inhabitants.

FRANCFORT *on the Mayne*, a large, wealthy, imperial city of Germany, in the circle of the Upper Rhine, ſituated in a healthy, fertile, and beautiful country on the river Mayne, which divides it into two parts, diſtinguiſhed by the names of Francfort and Saxenhauſen; 20 miles N.E. of Mentz, and 350 W. by N. of Vienna. The whole city is divided into 14 wards, of which two are ſituated in Saxenhauſen. Its circumference is about a league and a half; its fortifications, conſiſting of a wall lined with towers, and ditches filled with water, ramparts, baſtions, &c. are regular and ſolid; but they ſerve chiefly for appearance, as the place is on all ſides eaſily acceſſible. Its garriſon commonly conſiſts of 13 companies of ſoldiers. The ſtreets are ſpacious, regularly paved, and well lighted. The houſes exhibit a ſplendid appearance, the ſhops are well ſtocked, and the inhabitants live in a coſtly ſtyle. No city in Europe contains larger and more magnificent buildings, elegant private houſes and commodious inns, all built of large and ſquare ſtones. The town-houſe, called "Römer," is a large magnificent building; and among its archives is ſeen a caſket of gold, containing the golden bull of the emperor Charles IV. in which are inſcribed, in Latin capital letters, the fundamental ſtatutes of the empire. In one of the churches belonging to the Roman catholics is a curious clock, conſiſting of three parts. In the loweſt, which has the appearance of a calendar, are ſeveral circles, the firſt of which ſhews the days and months; the ſecond the golden number, with the age and change of the moon; and the third the dominical letter. The fourth and fifth circles repreſent the ancient Roman calendar. On the ſixth are the names of the apoſtles and martyrs, the length of the days and nights, and the entrance of the ſun into the 12 ſigns of the zodiac. The ſeventh and eighth circles exhibit the hours and minutes of the ſun's riſing and ſetting. In the ninth circle, the diviſions of the 12 ſigns of the zodiac, the four ſeaſons, the 12 months, &c. are marked. The circle in the centre ſhews the moveable feaſts. The figures which ſtrike the hours repreſent two ſmiths with hammers in their hands. This curious piece of workmanſhip was put up in 1605, and repaired for the firſt time in 1704. In 1780 its inhabitants, including Jews and Catholics, were reckoned to be about 40,000. The Roman catholics have three churches, and the Lutherans ſix: the Calviniſts were formerly obliged to celebrate their worſhip at Bornheim, a village about ſix Engliſh miles from the city, belonging to the landgrave of Heſſe Caſſel. In the year 1790 they obtained permiſſion to erect public places of worſhip, and were allowed the free exerciſe of their religion. Their number is very conſiderable, and they are conſidered as the moſt induſtrious and wealthy of the inhabitants. The greateſt part of the Calviniſt families conſiſts of the deſcendants of French proteſtants, who left their country at the revocation of the edict of Nantz; they have two churches, to one of which belongs a German, and to the other a French preacher. There are ſeveral convents of female nobility, belonging to proteſtant families, the ladies of which are allowed to marry and to aſſociate with the moſt noble families in the city. There are alſo ſeveral Roman catholic male and female convents, the members of which do not keep public aſſemblies, and are enjoined celibacy by vow, conformably to the Roman catholic church. Here is alſo a ſeminary, named the "Engliſh Proteſtant Convent," eſtabliſhed for families of Engliſh extraction, whoſe predeceſſors fled to Hamburgh and to Holland during the perſecutions in the reign of queen Mary; the latter of whom, having been driven from Holland by the cruelty of the duke of Alva, found an aſylum for themſelves and their poſterity in this city. The Jews of Francfort are reckoned to be about 8000; they are reſtricted by law to a narrow ſtreet, and prohibited from living in any other part of the city. They have a public ſynagogue of conſiderable ſize. Francfort has not any univerſity; but it has many eſtabliſhed colleges, belonging to the learned of all ſciences, to which foreigners have free acceſs. Doctors of law, and all belonging to juriſprudence, medicine, ſurgery, natural hiſtory, natural philoſophy, mechanics, &c. meet regularly twice a week. Public lectures on theſe ſciences are delivered, and mechanical inventions are exhibited. Since the year 1789 an agricultural ſociety has been eſtabliſhed in this city. Society at Francfort is divided into the ancient and modern nobility, and "burgeois." The firſt conſiſts of ſome ancient noble families from various parts of Germany, who reſide here for ſeveral months in the year. Modern nobility comprehends thoſe who have obtained the rank of nobles, and are generally called "patricians," they reſide here continually; and ſo do the "burgeois," ſuch as bankers and great merchants who have made their fortunes by commerce, and who are very numerous.

Francfort is advantageouſly ſituated for trade; the articles which it exports conſiſt of wine, corn, hemp, timber, flax, iron, madder, ſeed of all ſorts, linen, lace, hides, leather, mineral waters, inland tobacco, hams, ſour krout, and many other raw materials, and minerals. Its trade is much aided by its two annual fairs, to which there is a great reſort of perſons from all parts of Europe. One fair begins on Eaſter Tueſday, the other in the middle of the month of September; and each continues three weeks. Six months before each fair begins, Francfort is ſupplied from all parts of the world with foreign ſtores, manufactures, &c. either by water or by land; and it may then be called a depôt of foreign productions. At the time of the fair, the wealthieſt merchants in the German empire reſort to this city, and by their purchaſe and ſales ſupply almoſt all other places on the continent of Europe. The third week of the fair is called the pay-week; and thoſe who then neglect their payments

are declared bankrupts, and obliged to fly the country till their affairs are ſettled, or if taken, are put under arreſt. The magiſtrates of Francfort are divided into three benches; the firſt is compoſed of 14 echevins, the ſecond of 14 counſellors, and the third chiefly of tradeſmen or artificers. All affairs of importance are decided by the two former, out of whom two burgomaſters are annually choſen; the third bench executes offices relating to the police. Francfort was aſſeſſed 500 florins for the Roman month, and is taxed to the imperial chamber 676 rix-dollars, 26 kreutzers. The government of this city is generally allowed to be one of the beſt and moſt moderate in Germany. During the reign of the emperor Joſeph II. many ſalutary laws were eſtabliſhed in this and other imperial cities. The old cuſtom of indulging extravagantly in the expence of funeral pomp and coſtly mourning, by which many families were ruined, has been altogether aboliſhed in Francfort. Another law was enacted, which prohibits the burying of dead bodies in any church or chapel whatever. All ſorts of beggars are alſo prohibited by law, and the wanderings of gypſies are alſo forbidden.

The origin of this ancient city has not been ſatisfactorily aſcertained. Some have aſcribed it to Marcomire, duke of Franconia, father to Pharamond: others to one of his predeceſſors, named Francus, who lived 100 years before him, and they ſay it was anciently called "Trajectum Francorum." It was alſo denominated "Helenopolis," from Helen, mother of Conſtantine the Great. In 1792 this city was taken by the French, but ſoon after reſigned to the Pruſſians. In 1796 it was ſurrendered to the French, and taxed to pay ſix millions of livres in ſpecie, and two millions in proviſions. On the defeat of Jourdan at Wurzburg, the French were obliged to evacuate it in the ſame year.

A council was held here in 794, againſt the hereſy of Felix, biſhop of Urgel, who taught that Chriſt was the ſon of God only by adoption; and another in 1006 to erect the city of Bamberg into a biſhopric. N. lat. 50° 7′ 40″. E. long. 8° 35′ 45″.

FRANCFORT *on the Oder*, a town of Germany, in the Middle Mark of Brandenburgh, containing about 16,000 inhabitants, with an univerſity, founded, as ſome ſay, in the year 1516, by the elector Joachim, or according to others by John Cicero, the father of this elector. The profeſſors are of the Calviniſtic perſuaſion. Beſides the univerſity it has a noble academy, a ſociety for promoting the arts and ſciences, two colleges, two fauxbourgs, and ſeveral churches. In the year 1806 this town fell into the hands of the French: 12 miles S.S.W. of Cuſtrin, and 48 E. of Berlin. N. lat. 52° 22′ 8″. E. long. 14° 45′.

FRANCHE-COMTE, anciently called Upper Burgundy, was, before the revolution, a province of France, bounded on the north by Lorraine, on the E. by Switzerland and Savoy, on the S. and W. by Burgundy and Champagne; lying between 46° 15′ and 47° 55′ N. lat., and between 5° 20′ and 6° 55′ E. long., being 39 leagues from N. to S. and 20 to 26 in breadth, and containing upwards of 700,000 inhabitants. Its form is oval, half of it is level, and the other half uneven and hilly. The ſoil conſiſts of red ferruginous loam, ſchiſtus, gravel, and lime-ſtone, and yields grain, wine, fruits, and excellent paſtures. It has mines of iron, copper, and lead. The moſt conſiderable rivers are the Saone, the Doubs, and the Oiguon. When this province was ſeparated from Burgundy it received its modern appellation; and by the treaty of Nimeguen, A.D. 1678, was annexed to France. It was divided into four large diſtricts, *viz.* Beſançon, Dole, Amont, and Aval, which now compoſe three departments, *viz.* Saone, Doubs, and Jura.

FRANCHIMONT, a town of France, in the department of the Ourthe, with a ſmall country to which the title of marquis was annexed; 13 miles S.E. of Liege.

FRANCHINUS, GAFFURIUS, in *Biography*, the firſt and the beſt writer on counterpoint in Italy, before the time of Zarlino. In the preface to an early edition of one of his works, the editor, Pantaleone Melegulo of Lodi, has given an account of his life and writings, whence we have extracted the following particulars. Franchinus Gaforius, or Gaforio, of Lodi, (Walther miſtakenly makes him a native of Lyons, in France, Lundenſis,) born 1451, was the ſon of Betino, a ſoldier in the ſervice of Gonzago, duke of Mantua, and Catherine Fixaraga, of the ſame place. He was firſt intended for prieſt's orders, but after ſtudying muſic for two years under friar John Goodenach, a carmelite, he manifeſted ſo much genius for that ſcience, that it was thought expedient to make it his profeſſion. After learning the rudiments of muſic at Lodi he went to Mantua, where he was patronized by the marquis Lodovico Gonzago; and where during two years he purſued his ſtudies with unwearied aſſiduity night and day, and acquired great reputation both in the ſpeculative and practical part of his profeſſion. From this city he went to Verona, where he read public lectures on muſic for two years more, and publiſhed ſeveral works; after which he removed to Genoa, whither he was invited by the doge Proſpero: there he entered into prieſt's orders. From Genoa he was invited to Milan by the duke and ducheſs Galeazzo, but they being ſoon after expelled that city, he returned to Naples, where Philip of Bologna, profeſſor royal, received him as his colleague; and he became ſo eminent in the theory of muſic, that he was thought ſuperior to John Tinctor, William Guarnieri, Bernard Yeart, and many celebrated and learned muſicians, with whom he now converſed and diſputed. He there compoſed and publiſhed his profound "Treatiſe on the Theory of Harmony," 1480; which was afterwards corrected, enlarged, and republiſhed at Milan, 1492; but the plague raging in Naples, and that kingdom being likewiſe much incommoded by a war with the Turks, he retreated to Otranto, in Apulia; whence, after a ſhort reſidence, he returned to Lodi, where he was protected and favoured by Pallavicino the biſhop, and opened a public ſchool, in which, during three years, he formed many excellent ſcholars. He was offered great encouragement at Bergamo if he would ſettle there; but the war being over, and the duke of Milan, his old patron, reſtored, he preferred the reſidence of that city to any other. It was here that he compoſed and poliſhed moſt of his works; that he was careſſed by the firſt perſons of his time for rank and learning; and that he read lectures by public authority to crowded audiences, for which he had a faculty granted him by the archbiſhop and chief magiſtrates of the city in 1483, which exalted him far above all his cotemporary brethren: and how much he improved the ſcience by his inſtructions, his lectures, and his writings, was teſtified by the approbation of the whole city; to which may be added the many diſciples he formed, and the almoſt infinite number of volumes he wrote, among which ſeveral will live as long as muſic and the Latin tongue are underſtood. He likewiſe firſt collected, reviſed, commented, and tranſlated into Latin the ancient Greek writers on muſic, Bacchius ſenior, Ariſtides, Quintilianus, Ptolemy's Harmonics, and Manuel Briennius. The order of the works which he publiſhed is as follows: "Theoricum Opus Harmonicæ Diſciplinæ," mentioned above, Neapolis, 1480, Milan, 1492. This was the firſt book on the ſubject of muſic that iſſued from the preſs after the invention of printing, if we except the "Definitiones Term. Muſicæ," of John Tinctor. "Practica

Muſicæ utriuſque Cantus," Milan, 1496, Breſcia, 1497, 1502; and Venice, 1512. "Angelicum ac Divinum Opus Muſicæ Materna Lingua Scrip." Milan, 1508. "De Harmonica Muſicor. Inſtrumentorum," Milan, 1518. This work, we are told by Pantaleone Melegulo, his countryman and biographer, was written when Gafforio was forty years of age, that is to ſay, in the year 1501; and though the ſubject is dark and difficult, it was abſolutely neceſſary for underſtanding the ancient authors. If, ſays Pantaleone, a life ſpent in labour for the advancement of ſcience, and in a ſeries of laudable actions, can entitle a human being to fame in this world, and felicity in the next, the claim of Gafforio to both ſeems indiſputable.

The doctrines of this venerable and excellent theoriſt, who died in 1520, are ſo frequently cited in the courſe of this work, that after the ample liſt juſt given, a table of contents, or extracts from them here, ſeem alike unneceſſary. We were diſappointed at not finding the name of Franchinus or Gaffurius, for he is called by both theſe titles in muſical books, either in Ducange or Fabricius. An authority ſo good and ſo ancient of the uſe of muſical terms in the Latin language would have been more ſatisfactory to the readers of Ducange, than that of many obſcure monks which he is obliged to cite: and Fabricius, who ſo frequently ſpeaks of muſical tracts and of their authors, might have furniſhed his work and his readers with a uſeful and intereſting article, in giving an account of Gaffurius and his writings, which, being chiefly compoſed in Latin, had a claim to his notice.

FRANCHISE, a ſpecies of incorporeal hereditament, having the privilege or exemption from ordinary juriſdiction. And the term is alſo uſed for an immunity from the ordinary tributes and taxes.

This is either real or perſonal; that is, either belonging immediately to the perſon, or accruing on account of this or that place, or office of *immunity*, which ſee.

Theſe franchiſes, being royal privileges, or branches of the king's prerogative, ſubſiſting in the hands of a ſubject, are derived from the crown by grant or charter, and in ſome caſes are held by preſcription and uſage. They may be veſted either in natural perſons, or bodies politic; in one man or in many; but the ſame identical franchiſe that has before been granted to one, cannot be beſtowed on another, for that would prejudice the former grant. The principal kinds of franchiſes are the following: to be a county palatine is a franchiſe veſted in a number of perſons. It is likewiſe a franchiſe for a number of perſons to be incorporated, and ſubſiſt as a body politic, with a power to maintain perpetual ſucceſſion, and do other corporate acts; and each individual member of ſuch corporation is alſo ſaid to have a franchiſe or freedom. Other franchiſes are to hold a court leet; to have a manor or lordſhip; or at leaſt, to have a lordſhip paramount; to have waifs, wrecks, eſtrays, treaſure-trove, royal fiſh, forfeitures, and deodands; to have a court of one's own, or liberty of holding pleas and trying cauſes; to have the cognizance of pleas, which is a ſtill greater liberty, being an excluſive right, ſo that no other court ſhall try cauſes ariſing within that juriſdiction; to have a bailiwick, or liberty exempt from the ſheriff of the county, wherein the grantee only and his officers are to execute all proceſs; to have a fair or market, with the right of taking toll, either there or at any other public places, as bridges, wharfs, and the like; which tolls muſt have a reaſonable cauſe of commencement, elſe the franchiſe is illegal and void; or, laſtly, to have a foreſt, chaſe, park, warren, or fiſhery, endowed with the privileges of royalty. See the ſeveral articles above recited.

FRANCHISE, *Allowance of.* See QUO *Warranto.*

FRANCHISE, *Diſturbance of.* See DISTURBANCE.

FRANCHISE is alſo uſed for an aſylum, or ſanctuary, where people are ſecure of their perſons, &c.

Churches and monaſteries in Spain are franchiſes for criminals; ſo were they anciently in England, till they were abuſed to ſuch a degree that there was a neceſſity for aboliſhing the cuſtom.

One of the moſt remarkable capitulars made by Charlemagne in his palace of Heriſtal, in 779, was that relating to the franchiſes of churches. The right of franchiſe was held ſo ſacred, that even the leſs religious kings obſerved it to a degree of ſcrupulouſneſs; but to ſuch exceſs in time was it carried, that Charlemagne reſolved to reduce it. Accordingly he forbade any proviſion being carried to criminals retired into churches for refuge.

FRANCHISE *of Quarters*, is a certain ſpace, or diſtrict, at Rome, wherein are the houſes of the ambaſſadors of the princes of Europe; and where ſuch as retire cannot be arreſted or ſeized by the ſkirri, or ſergeants, nor proſecuted at law.

The people of Rome look on this as an old uſurpation, and a ſcandalous privilege, which ambaſſadors, out of a jealouſy of their power, carried to a great length in the fifteenth century, by enlarging inſenſibly the dependencies of their palaces and houſes, within which the right of franchiſe was anciently confined. Several of the popes, Julius III. Pius XIV. Gregory XIII. and Sixtus V. publiſhed bulls and ordinances againſt this abuſe; which had reſcued ſo conſiderable a part of the city from their authority, and rendered it a retreat for the moſt abandoned perſons.

At length Innocent XI. expreſsly refuſed to receive any more ambaſſadors, but ſuch as would make a formal renunciation of the franchiſe of quarters.

FRANCHISE, *Royal*, is a place where the king's writ runs not; as at Cheſter and Durham; and anciently at Tyndal, and Hexamſhire in Northumberland. But Bracton ſays, that a franchiſe royal is where the king grants to one and his heirs an exemption of toll, &c.

FRANCHISING. See ENFRANCHISEMENT, and MANUMISSION.

FRANCIA, FRANCESCO, in *Biography*, an hiſtorical painter, who is known by that name, but whoſe real one was Raibolini. He was born at Bologna in 1450, and was bred to the profeſſion of a goldſmith, which he exerciſed for ſome time with very conſiderable celebrity, having the coinage of the city of Bologna under his care.

His deſire of reputation, and his acquaintance with Andrea Mantegna and other painters, led him to the ſtudy of painting, and in 1490 he produced a picture of the virgin ſeated, and ſurrounded by ſeveral figures; among whom is the portrait of M. Bart. Feliſini, for whom the picture was painted. This, and another picture of a ſimilar ſubject, painted for the chapel Bentivoglio a St. Jacopo, gained him great repute. He painted many pictures for churches, &c. in Bologna, Modena, Parma, and other cities; but they were in the early, Gothic, dry manner, which he greatly improved upon in his latter productions. On Pietro Perugino he formed his characters of heads, and his choice of tone and colour; on Gian. Bellino fullneſs of outline and breadth of drapery; and if the beſt evidence of his merit, the authority of Raphael, be of weight, in proceſs of time he excelled them both. In a letter dated 1508, edited by Malvaſia, Raphael declares, that the Madonnas of Francia were inferior in his opinion to none for beauty, devoutneſs, and form. His idea of Francia's talents exhibited itſelf ſtill ſtronger in his entruſting his picture of St. Cecilia, deſtined for the church of St. Gio da

Monte at Bologna, to his care, by letter ſoliciting him as a friend to ſee it put in its place, and if he found any defect in it that he would kindly correct it.

Vaſari ſays that Francia died with grief upon ſeeing by this picture that he was as nothing in the art compared with the ſuperior genius of Raphael. Malvaſia confutes Vaſari, and proves that he lived ſome years afterwards, and in an improved ſtyle produced his celebrated St. Sebaſtian, which Caracci deſcribes as the general model of proportion and form for the ſtudents at Bologna.

FRANCIA, in *Geography*, a town of Naples, in Calabria Ultra; 8 miles N.E. of Nicotera.

FRANCIABIGIO, MARCO ANTONIO, or *Francia Bigio*, in *Biography*, as Vaſari calls him, was an hiſtorical painter, born in 1483. He ſtudied for a ſhort time under Albertinelli, but is chiefly known as the competitor, and in ſome works the partner of Andrea del Sarto. Similar in principle, but inferior to him in power, he ſtrove to ſupply by diligence the defects of nature; with what ſucceſs, will appear on compariſon of his work in the cloiſter of the Nunziata at Florence, with thoſe of Andrea at the ſame place. On its being uncovered by the monks, the painter in a fit of ſhame or rage gave it ſome blows with a hammer, nor ever after could be induced to finiſh it. He appears to have ſucceeded better in two hiſtories which he inſerted among the freſcos of Andrea at the Scalzo, nor is he there much inferior. He likewiſe emulated him at Poggio a Cajano, where he repreſented the return of M. Tullius from exile, a work, which though it remained unfiniſhed, ſhews him to great advantage. Fuſeli's Pilkington.

FRANCIGENA, or FRENCHMAN, in our *Ancient Cuſtoms*, was a general appellation of all foreigners; *i. e.* all perſons who could not prove themſelves Engliſhmen.

FRANCIS I., in *Biography*, emperor of Germany, ſon of Leopold, duke of Lorrain, was born in the year 1708. In early life he ſerved with high reputation in the wars of Hungary and Bohemia. He married Maria Thereſa, daughter and heireſs of the emperor Charles VI., and having by the death of his father become duke of Lorrain, he ceded it to France, and obtained in its ſtead the duchy of Tuſcany as an indemnification. After the deceaſe of his father-in-law, Maria Thereſa aſſociated her huſband in the adminiſtration of her eſtates, and in 1745 he was elected to the empire. He obtained and merited the character of a humane prince, but was not great as an emperor. He was anxious to promote the good of his ſubjects, and was a patron of the arts and ſciences. He died at Inſpruck in 1765, leaving behind him a numerous family. Univer. Hiſt.

FRANCIS I., king of France, ſon of Charles Orleans, and Louiſa of Savoy, was preſumptive heir to the crown in the reign of Lewis XII. who married him to his eldeſt daughter. At the death of Lewis he ſucceeded to the throne, being then in his twentieth year. Formed with the mien of a hero, he excelled in the exerciſes of a martial age; eloquent in debate, and undaunted in action, courteous in his manners, and bounteous in his diſpoſition, his virtues and accompliſhments dazzled the unthinking crowd, who were blind to the miſeries which awaited his impetuous valour and inconſiderate ambition. He was impatient to diſtinguiſh himſelf, and reſolved to aſſert the claims of his houſe upon the duchy of Milan, and, paſſing the Alps with a powerful army, entered that country. To ſupply the funds for this expedition, Francis, by the advice of his chancellor, not only reſtored the taxes which his predeceſſor had aboliſhed, but expoſed the offices of the crown to ſale, and endeavoured to repleniſh his coffers by meaſures the moſt arbitrary and impolitic. A confederacy was formed againſt him by the emperor Maximilian, Ferdinand of Arragon, Leo X., Sforza, and the Swiſs: the number and reſources of his enemies ſeemed only to ſtimulate his ardour; the paſſes of the Alps which had been occupied by the Swiſs were eluded; new roads were cut by the active perſeverance of the French; the army, after having ſurmounted every obſtacle of nature and art, entered Italy, and ſurpriſed the general of the papal forces, who, ignorant of their approach, was negligently encamped with a thouſand cavalry on the banks of the Po. Francis, on receiving the intelligence of this ſucceſs, prepared to join his commander, and during his abſence devolved the regency of France on his mother Louiſa of Savoy, a princeſs, whoſe character in a great meaſure influenced the various events which diverſified the reign of her ſon. The king of France, on aſſuming the command of the army, entered the Milaneſe, and preſſed on towards the capital. He was oppoſed by the Switzers alone, who had encamped at Marignano, about a league from Milan. Hiſtory ſcarcely affords any example of a battle diſputed with greater obſtinacy than that of Marignano. It commenced about four in the afternoon, in the month of September, and laſted more than three hours after the night had cloſed in. Wearineſs and darkneſs ſeparated the combatants without abating their animoſity: the Swiſs renewed the charge in the morning with freſh vigour; but they were at length repulſed with cruel ſlaughter; ten thouſand periſhed on the field, and the reſt of their forces retired unbroken and undaunted, and ſtill truly formidable, though defeated. The loſs of the conquerors was computed at ſix thouſand men, and the intrepidity of the king expoſed him to the moſt imminent danger. When night ſuſpended the conflict he found himſelf intermingled with his enemies, and accompanied only by a few attendants. On the carriage of a cannon, completely armed, and anxious for the dawn, he ſnatched a few moments reſt; in every charge he was foremoſt; his horſe was wounded, and his body was covered with contuſions; but though his perſonal proweſs ſtood unrivalled, the victory of the day was chiefly to be aſcribed to the conſtable Charles of Bourbon, whoſe ſkill and martial genius were eminently diſplayed, and whoſe younger brother the duke de Chatelleraud fell gallantly fighting by his ſide. Francis diſplayed his chivalrous turn by receiving knighthood on the field of battle from the celebrated chevalier Bayard. The Milaneſe afterwards fell under his power, and pope Leo X. thought it adviſable to come to an agreement with him. The concordat made on the occaſion was ſo favourable to the pretenſions of the Roman ſee, that it excited conſiderable oppoſition in France, but the king's authority overcame all reſiſtance. The ambition of Francis led him to be a competitor for the imperial crown, left vacant by the death of Maximilian in 1519; but the ſuperior intereſt of Charles V. carried it againſt him, and the rivalſhip between theſe young monarchs began from that time to produce thoſe hoſtilities which ſo long diſturbed the peace of Europe. To gain Henry VIII. of England to his party, Francis procured that interview between them and their two courts, to which in another article we have lately referred, known by the name of "the field of the cloth of gold" (ſee FRANCE); in which, after a diſplay of unparalleled magnificence at a ruinous expence, no political purpoſe was effected; for ſerious buſineſs was not allowed to obtrude upon hours devoted to entertainment, and when the monarchs ſeparated, it might be, and probably was, a ſource of regret and great uneaſineſs to the French monarch, that a greater ſum had been laviſhed away in this fruitleſs pageantry than what Charles had diſtributed to acquire the imperial crown, and who by his bribes and promiſes to Wolſey eaſily deſtroyed all the impreſſion which the frankneſs of Francis had made upon the mind of Henry VIII. The king next over-ran the kingdom of Navarre, but ſoon loſt it again; in the mean time the

Milaneſe

Milaneſe revolted from the French, and expelled them from their country. At this period the conſtable Bourbon withdrew his ſupport from the French, and even turned his arms againſt them. This prince, having defeated Bonnivet, who was ſent upon an expedition into Italy, marched at the head of the imperialiſts into France, and laid ſiege to Marſeilles; but the place held out till it was relieved by the approach of Francis. Relying upon his own proweſs and the ſtrength of his armies, the king again croſſed the Alps, and inveſted the city of Pavia. Here he was attacked, February 24, 1527; but after the greateſt exertions of perſonal valour, Francis was obliged to ſurrender himſelf priſoner. By this defeat France was left without a ſovereign, without treaſures, and without an army. Ten thouſand of her braveſt ſoldiers had periſhed on the bloody field, and the moſt illuſtrious of her nobility had ſacrificed their lives to preſerve their honour. Among theſe the leaſt regretted was Bonnivet. His fatal counſels had precipitated the national calamity, and his haughty mind ſcorned to ſurvive the public diſaſter, but ruſhing into the thickeſt ranks of the enemy, he fell covered with wounds. The firſt intelligence of the rout at Pavia was tranſmitted by the king himſelf to his mother in a letter containing theſe memorable words: "Madam, all is loſt, except our honour." The royal captive was treated with every mark of reſpect, but when he was conveyed to the caſtle of Madrid, ſuch conditions were impoſed, or intended to be impoſed, on his releaſe, that he reſolved to die in captivity rather than accede to them. At length the emperor, finding his health evidently on the decline, paid him a viſit, and concluded a treaty for his liberation, which took place after he had been confined almoſt thirteen months. He was exchanged for his two ſons in a boat in the midſt of a ſtream which ſeparates France and Spain, and inſtantly upon touching his own ſhore, he mounted his horſe, and waving his hand over his head, cried out "I am yet a king." His firſt meaſure, on reſuming the reins of government, was to form a league with the pope, the Venetians, and the duke of Milan, againſt the emperor, and then, without any difficulty, he obtained from the holy pontiff Clement VII. an abſolution from his oath to obſerve the treaty of Madrid. And when Charles ſent embaſſadors to ſummon him to the performance of the conditions, Francis, for anſwer, introduced them to an aſſembly of the ſtates of Burgundy, who, as was preconcerted, explicitly declared that he had no right to alienate their country from his crown, and refuſed to have them transferred to the emperor's dominion. A war enſued, in the progreſs of which one of the principal actions on the part of the French was the ſiege of Naples, which was rendered unſucceſsful by the death of the general and a great part of his army by the plague. The defection of Doria completed the ruin of the French affairs in Italy. At length the peace of Cambray, in 1529, gave a temporary reſpite to the hoſtilities of the two rivals. By this the children of Francis were reſtored to him in conſideration of a ranſom of two millions of crowns, and the emperor for the preſent deſiſted from his claims on Burgundy, but without renouncing his right.

Some years of peace enſued, in which Francis diſplayed the character of a ſplendid and enlightened prince. The encouragement he gave to literature is a very ſtriking feature of his reign. Francis had a real love of learning, and invited many foreign ſcholars, among whom was Eraſmus, to take up their abode at Paris. He always kept men of ſcience and enlightened minds about his perſon, to whom he gave the heads of ſubjects on which he deſired information, and it was their buſineſs at leiſure times, and eſpecially at his meals, to read to him what they had drawn up. At the inſtigation, and with the aſſiſtance of his learned friends, he collected manuſcripts, augmented the royal library, founded a printing-office, and inſtituted the college for the learned languages. But he cauſed all public acts and law proceedings to be compoſed in the French language, inſtead of the barbarous Latin before in uſe. Francis was equally a friend to the fine arts; the palace of Fontainbleau, and ſeveral other edifices are monuments of this reign. To this prince the French court principally owes that free intermixture of the fair ſex which has ſince conſtituted its diſtinguiſhing luſtre and amenity. At the ſame time it muſt be acknowledged that the king himſelf, by a boundleſs propenſity to gallantry, ſet an example, as well of debauchery as of weakneſs; and his favourite miſtreſs, the counteſs d'Eſtampes, enjoyed her power in the ſtate as publicly as it was ever afterwards done during the French monarchy. In this reign Britanny was annexed to the crown of France; and the reformation excited in the mind of Francis as much attention as it did in the other princes of Europe. His ſiſter, the queen of Navarre, was addicted to the new opinions, which were likewiſe received by many of his ſubjects. The king, however, affected a great zeal for orthodoxy, and cauſed ſeveral heretics to be burned, with circumſtances of extraordinary cruelty, and probably with as little remorſe as the actors in this ſavage work would have experienced in any other buſineſs of their lives. A new war broke out between Francis and his rival Charles; this was in the year 1535, and it was continued with great animoſity for three years. Francis, to ſtrengthen his party, made an alliance with the Turks, a meaſure which excited the bitteреſt reproaches againſt him throughout Europe; nor was he himſelf inſenſible to the infamy which accompanied his confederacy with infidels againſt a Chriſtian king. Innumerable obſtacles ſeemed to oppoſe a definitive treaty; nevertheleſs each prince affected to liſten to the exhortations of the Roman pontiff, and Paul at laſt prevailed on them to ſuſpend their hoſtile efforts by a truce of ten years. In a very ſhort time after this pacification had been agreed upon, the rival monarchs held a conference with the greateſt demonſtrations of mutual friendſhip and confidence. In the year 1539, Charles, wiſhing to viſit the Low Countries, on account of a revolt of the people of Ghent, deſired permiſſion to paſs through France, and put ſo much truſt in the king's honour that he refuſed any other ſecurity for his ſafety than his mere word. He farther promiſed to confer the duchy of Milan upon the king's ſecond ſon, the duke of Orleans; Francis, pleaſed with this mark of confidence, received Charles at Paris with the greateſt magnificence, and gave him every facility in the proſecution of his deſigns. Charles was not equally liberal, and when he got to his own dominions, he meanly cavilled about his promiſe, and refuſed at laſt to perform it. This was the occaſion of a new war, in which Henry VIII. joined; peace was however concluded with the emperor in 1544, and with the king of England in 1546.

A diſeaſe, the fruit of his licentious amours, had long been preying upon the conſtitution of Francis, and his life was now embittered by domeſtic contention. The enmity and intrigues of his own miſtreſs, the ducheſs d'Eſtampes, and of Diana de Poitiers, miſtreſs to the Dauphin, divided the court into open and violent factions. The death of Henry VIII. inflicted a deep wound on the French monarch, who had long known and perſonally loved him: his own diſorder continually preyed upon him, he wandered from palace to palace languid and depreſſed, and, at length, at Rambouillet he cloſed, with much compoſure, in the fifty-third year of his age, a reign of thirty-two years, diſtinguiſhed, as well by its ſplendour, and its viciſſitudes of fortune, as by its length. He died in March 1547, at a time when he had

had begun to attend more ſeriouſly to his affairs, and by economy had brought his finances into a good condition. He left two ſons and four daughters. Francis was the founder of the houſe of Valois, that being his title when he aſſumed the crown: on his deceaſe the title of *great* was attached to his name, but by poſterity he has not been conſidered as meriting this high honour. He oppreſſed his ſubjects by exceſſive impoſts, and endangered his kingdom by ambitious projects. Nevertheleſs few ſovereigns of his country have been more diſtinguiſhed. The magnificence which accompanied him through life deſerted him not in his death: his funeral obſequies were performed with unuſual pomp; and the proclamation which announced his death, diſplayed his character as "a prince mild in peace, and victorious in war, the father and reſtorer of learning and the liberal arts." Moreri. Univer. Hiſt. Robertſon's Charles V.

FRANCIS II., king of France, eldeſt ſon of Henry II. by Catherine de Medicis, and grandſon to Francis I. was born in 1544. This prince married, at the age of fifteen, Mary Stuart, the beautiful and unfortunate queen of Scotland. He ſucceeded to the crown on the death of his father in 1559, and his reign was marked by violence and diſorder, which laid the foundation for thoſe civil contentions with which France was ſo long afflicted. As his youth rendered him incapable of holding the reins of government, and as he was alſo of a very delicate conſtitution, the duke of Guiſe, and his brother the cardinal of Lorraine, took upon them to govern in his name. Their party was joined by Catherine of Medicis, who had been declared regent. It was, however, her determination to break with the Guiſes, whenever ſhe ſhould find a fit opportunity, and to take the whole adminiſtration of government into her own hands. Meaſures were ſoon adopted againſt the Proteſtants, which excited them to ſelf-defence. An aſſociation was formed, and a plot was entered into to get poſſeſſion of the king's perſon, to baniſh or deſtroy the Guiſes, and to procure liberty of conſcience, but it was diſcovered and defeated with the death of its acting leader, La Renaudie, though the prince of Condé was ſuppoſed to be ſecretly at the head of the plot. A dreadful revenge was taken by the government, and all were executed who either took, or were ſuſpected of having taken, any part in it. By this unſucceſsful attempt the power of the Guiſes was eſtabliſhed, and the Proteſtant cauſe was ſtill more obnoxious than it had ever been. In order to appeaſe the diſorders which were becoming general, an aſſembly of notables was firſt called, which was followed by an aſſembly of the ſtates convoked at Orleans. The king of Navarre, and the prince of Condé, who attended, were put under an arreſt, and the latter was tried and condemned to loſe his head. The execution of the ſentence was delayed, and to this the prince of Condé was indebted for his life: for the king was ſuddenly attacked with a diſorder in his head which ſoon proved fatal; he expired in the eighteenth year of his age and the ſecond of his reign. His character, ſays the hiſtorian, preſents a blameleſs void: he was a king without vice, and almoſt without energy enough to produce one virtue. He had acted ſo entirely under the controul of others, that ſcarcely any thing had appeared of his natural diſpoſition: and amidſt the cabals of the various court intereſts, his corpſe was indecently neglected: Catherine, and the Guiſes were engaged in extending or in confirming their influence, and the funeral obſequies of the deceaſed monarch were only attended by thoſe who had been the governors of his education, and the biſhop of Senlis, who had long been blind. Moreri. Univer. Hiſt. Hiſt de France.

FRANCIS of Paulo, a Romiſh ſaint, born at Paulo, a town of Calabria, in the year 1416. He was devoted by his parents to a religious life from his birth, and entered accordingly into the Franciſcan convent at St. Marks. Having remained there about a year he engaged in various pilgrimages, and then adopted the hermit's life, in a ſolitary and ſecluded ſpot not far from his native town; after this he retired to a deſert part of the ſea-coaſt, where he found means to conſtruct for himſelf a cell among the rocks. The fame of his abſtinence and great ſanctity ſoon drew together a number of diſciples, who in the firſt inſtance built a chapel and a ſmall hermitage adjoining his cell; but their numbers rapidly increaſing, a monaſtery was built on the ſpot, which was the firſt belonging to the new order, of which the original denomination was that of the "Hermits of St. Francis." The ſubject of this article was the founder, and ſuperior general of the order, after his inſtitute had received the approbation of pope Sixtus IV. in the year 1473. The name of the order was afterwards changed to that of Minims, becauſe the humility of Francis was ſuch that he wiſhed himſelf and followers to be diſtinguiſhed by the appellation of "Fratres Minimi." The rules of the order were extremely rigorous, enjoining on the members a perpetual Lent, and great ſeverity of perſonal diſcipline. No one was ſo ſtrict in conforming to the precepts of the order as the inſtitutor himſelf: he allowed himſelf nothing but bread and water: he ſlept on the bare floor without pillow or covering, and he wore as his uſual dreſs a rough hair-cloth next his ſkin. Hence he acquired, in thoſe days of ignorance and barbariſm, the higheſt character for piety and virtue; and ſo great was the opinion entertained of his ſanctity, and of the prevalence of his interceſſions with heaven, that when Lewis XI. of France was attacked by a dangerous diſtemper, he ſent for Francis out of Calabria, hoping to obtain a cure by virtue of his prayers. The ſaint at firſt refuſed to comply with the royal demand, and was at laſt induced to ſet out on the journey by an expreſs order from the pope. He was received by Lewis with the greateſt honour, and had apartments aſſigned to him in the palace, and after the death of the king, his ſucceſſor Charles VIII. built a convent for Francis and his monks in a park belonging to that palace. Here he died, in 1507, at the advanced age of ninety-one years. He was highly applauded for his ſanctity, but was a total ſtranger to literature: the auſterities which he practiſed upon himſelf ſtood in ſtead of every other accompliſhment. In 1519 he was canonized by pope Leo X. Moreri.

FRANCIS XAVIER, a Romiſh ſaint, ſtyled "the Apoſtle of the Indians," was ſon of John Jaſſe, a gentleman of Navarre, and born at the chateau of Xavier, at the foot of the Pyrenees, in the year 1506. Having attained a competent ſtock of claſſical learning, he was ſent to Paris, where he went through a courſe of philoſophy, and took his degrees. Some time after this he undertook to teach philoſophy in the college of Beauvais, until he became acquainted with the famous Ignatius Loyola, with whom he ſolemnly embarked in a new undertaking, for promoting the intereſts of the catholic faith, particularly by the converſion of infidels. From this time he renounced all proſpect of any eſtabliſhment in the world, and applied himſelf diligently to the ſtudy of theology. In the year 1537, he quitted Paris, and went to Venice, where Loyola, who had taken a journey into Spain to ſettle ſome affairs, met him and the reſt of his companions. He next went to Rome, where he obtained leave of the pope for himſelf and others to embark on a miſſion to the holy land, and alſo to be admitted to prieſt's orders. They were, however, prevented from undertaking the voyage by the reſtrictions which the grand ſeignior had laid on the admiſſion of pilgrims and miſſionaries into Paleſtine. They, therefore,

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turned their thoughts to increaſing their numbers from among the members of the different Italian univerſities, in preaching and inſtructing young perſons, and in laying the foundation of the famous ſociety of Jeſus. Almoſt as ſoon as the pope had given his ſanction to the eſtabliſhment of this new order, John III. king of Portugal applied to the holy ſee of Rome for miſſionaries to be ſent to propagate the catholic faith in the Eaſt Indies. Francis Xavier was one of the perſons ſelected for this arduous enterprize; he embarked at Liſbon for the Indies in 1541, and in the following year arrived at the Portugueſe ſettlement at Goa, where he laboured inceſſantly in ſpreading the knowledge of the catholic faith in that city, the ſouthern continent of India, Malacca, the Molucca iſlands, and Japan. Many became converts to chriſtianity, and at Japan, Francis Xavier, with wonderful rapidity, laid the foundation of the catholic church, which flouriſhed for many years in that vaſt empire. From Japan he went to China, but was taken ſick on his voyage, and died in ſight of the empire in 1552, in the forty-ſixth year of his age. As an author he is known by five books of "Epiſtles," publiſhed at Paris in 1631; "a catechiſm," and ſome other ſmall pieces. He was beatified by pope Paul V. in 1613, and canonized by his ſucceſſor pope Gregory XV. in 1662.

Francis de Borgia, a Romiſh ſaint, born about the year 1511, was grandſon of pope Alexander VI. and hereditary duke of Candia. He was by birth a Spaniard, obtained the viceroyſhip of Catalonia, and from his connections he might have obtained the higheſt honours of the ſtate; but he grew diſguſted with the world, and determined to embrace the eccleſiaſtical life. He became a member of the ſociety of Jeſus in 1548, and, in 1565, he was raiſed to the poſt of general of that order. He frequently declined valuable eccleſiaſtical dignities, as well as the high honour of the cardinalate, and dedicated his whole time and labour to the advancement of the intereſts of the ſociety. By the expreſs wiſh of pope Pius VI. he accompanied his nephew cardinal Alexandrinus, whom he ſent legate into Spain, Portugal, and France. He died at Rome in 1572, in the 62d year of his age, having been canonized the year before. He was author of ſeveral theological and devotional pieces written in the Spaniſh language, which were afterwards tranſlated into Latin, and publiſhed in folio at Bruſſels in 1675. Moreri.

Francis de Sales, a ſaint and founder of the religious order of the "Viſitation," was born at Sales, near Geneva, in the year 1567, and was educated partly at Annecy and partly at the univerſity of Paris. He was intended for the profeſſion of the law, but this not being congenial to his mind he embraced the eccleſiaſtical life. He ſoon became diſtinguiſhed as a popular preacher, and poſſeſſed a moſt ardent zeal in the converſion of heretics, and on that account was ſent by his biſhop on miſſions into the valleys of his dioceſe, to endeavour to bring back the diſciples of Zuingle and Calvin into the true church. He was afterwards appointed coadjutor to the biſhop of Geneva, and was conſecrated under the title of biſhop of Nicopolis. Having occaſion to take a journey to Paris, the moſt handſome offers were made him by Henry IV. but he declined the appointment, as he did alſo the honour of a cardinalate. On the death of the biſhop of Geneva, he was called to the full exerciſe of the epiſcopal functions in that dioceſe, when he applied himſelf with great diligence to the reformation of abuſes among the clergy, and united in his own perſon, to the character of a vigilant eccleſiaſtical ſuperintendant, that of a good paſtor, and benevolent friend of the people committed to his care. In every caſe of diſtreſs he was ready to afford his aſſiſtance, and in his own life he exhibited a large ſhare of piety, purity, candour, and unaffected ſimplicity and urbanity. Still the moſt prominent traits in his character were the zeal and activity which he exhibited in winning over the proteſtants to the catholic faith. He is ſaid to have been the means of reconciling above 70,000 heretics to the church of Rome, during the ten years before his ſucceſſion to the epiſcopate of Geneva; and after that event he perſevered in the ſame courſe with equal diligence and proportionate ſucceſs. In the year 1610, he eſtabliſhed, in conjunction with madame de Chantal, the order of the "Viſitation," for female devotees, of which the firſt inſtitution was fixed at Annecy. In 1622, the biſhop received an order from the duke of Savoy to proceed to Avignon, to be preſent at an interview between that prince and Lewis XIII. of France. From hence he went to Lyons, where he died in the fifty-fifth year of his age. He was canonized by pope Alexander VII. in the year 1665. As an author he is known by many devotional pieces highly eſteemed by the catholics. Theſe have been collected and publiſhed in two volumes folio. Moreri.

Francis, or Franciscus de Victoria, a celebrated Spaniſh divine in the 16th century, purſued his ſtudies at Paris, where he took his degrees. He entered into the order of the Dominican preaching friars, was appointed profeſſor of theology, and delivered lectures at Salamanca and other celebrated Spaniſh univerſities. His works as an author have been highly prized in the catholic world; but the moſt important of them is a collection of theological and moral lectures, entitled Theologicæ Prælectiones XIII. in two volumes, which have obtained the critical notice of Dupin. He died at Salamanca in the year 1549. Moreri.

Francis de Jesus-Maria, a learned Spaniſh carmelite monk of the reformed order of St. Thereſa, who flouriſhed in the 17th century, was a native of Burgos in Old Caſtile. He obtained the high office of definitor-general; was author of "Curſus Theologiæ moralis Salmanticenſis;" and of "Commentaries on the Apocalypſe" publiſhed at Lyons in 1648, in two volumes folio. He died in 1677.

Francis, *St.* in *Geography*, a lake, or extenſion of the river St. Lawrence, between Kingſton and Montreal, through which paſſes the line dividing Upper from Lower Canada.—Alſo, a river in the province of Lower Canada, which riſes from various ſources near the northern boundary of the United States, and runs northward into the river St. Lawrence, at the W. end of lake St. Peter. If it were all the way navigable, it would afford an important communication from the northern parts of Vermont, to the markets of Montreal and Quebec. Its banks are fertile, and accommodate ſettlers, who reſort thither from New England.—Alſo, a ſmall river in Louiſiana, which purſues a S. E. courſe into the Miſſiſſippi, 108 miles above Arkanſas river, and 70 miles above Margot river on the E. ſide of the Miſſiſſippi. It is the general rendezvous for the hunters from New Orleans, who winter there, and collect ſalt meat, ſuet, and bear's oil, for the ſupply of that city.—Alſo, the name of a ſmall river in the W. territory, which runs a S. W. by W. courſe into the Miſſiſſippi, between Cold and Rum rivers, 60 miles above S. Anthony's Falls. The country above it is hilly, and the ſoil tolerably good. To the N. E. are the ſmall lakes called the Thouſand Lakes. Here the Miſſiſſippi is not above 90 yards wide.

FRANCISCANS, in *Eccleſiaſtical Hiſtory*, are religious of the order of St. Francis, founded by him in the year 1209. Francis was the ſon of a merchant of Aſſiſi, in the province of Umbria, who, having led a diſſolute life, was reclaimed by a fit of ſickneſs, and afterwards fell into an extravagant

extravagant kind of devotion, that looked leſs like religion than alienation of mind. Soon after this, *viz.* in the year 1208, hearing the paſſage repeated, Matt. x. 9, 10. in which Chriſt addreſſes his apoſtles, "Provide neither gold nor ſilver, &c." he was led to conſider a voluntary and abſolute poverty as the eſſence of the goſpel, and to preſcribe this poverty as a ſacred rule both to himſelf and to the few that followed him. This new ſociety, which appeared to Innocent III. extremely adapted to the preſent ſtate of the church, and proper to reſtore its declining credit, was ſolemnly approved and confirmed by Honorius III. in 1223, and had made a conſiderable progreſs before the death of its founder in 1226. Francis, through an exceſſive humility, would not ſuffer the monks of his order to be called *fratres*, *i. e.* brethren, or friars, but *fraterculi*, *i. e.* little brethren, or friars-minor, by which denomination they ſtill continue to be diſtinguiſhed. They are alſo called *grey friars*, on account of the colour of their cloathing, and cordeliers, &c. The Franciſcans and Dominicans were zealous and active friends to the papal hierarchy, and, in return, were diſtinguiſhed by peculiar privileges and honourable employments. The Franciſcans, in particular, were inveſted with the treaſure of ample and extenſive indulgences, the diſtribution of which was committed to them by the popes, as a means of ſubſiſtence, and a rich indemnification for their voluntary poverty. In conſequence of this grant, the rule of the founder, which abſolutely prohibited both perſonal and collective property, ſo that neither the individual nor the community were permitted to poſſeſs either fund, revenue, or any worldly goods, was conſidered as too ſtrict and ſevere, and diſpenſed with ſoon after his death. In 1231, Gregory IX. publiſhed an interpretation of this rule, mitigating its rigour; which was farther confirmed by Innocent IV. in 1245, and by Alexander IV. in 1247. Theſe milder alterations were zealouſly oppoſed by a branch of the Franciſcans, called the *ſpiritual*; and their complaints were regarded by Nicholas III. who, in 1279, publiſhed a famous conſtitution, confirming the rule of St. Francis, and containing an elaborate explication of the maxims it recommended, and the duties it preſcribed. In 1287, Matthew of Aqua Sparta, being elected general of the order, diſcouraged the ancient diſcipline of the Franciſcans, and indulged his monks in abandoning even the appearance of poverty; and this conduct inflamed the indignation of the ſpiritual or auſterer Franciſcans; ſo that from the year 1290, ſeditions and ſchiſms aroſe in an order that had been ſo famous for its pretended diſintereſtedneſs and humility. Such was the enthuſiaſtic frenzy of the Franciſcans, that they impiouſly maintained, that the founder of their order was a ſecond Chriſt, in all reſpects ſimilar to the firſt; and that their inſtitution and diſcipline were the true goſpel of Jeſus. Accordingly, Albizi, a Franciſcan of Piſa, publiſhed a book in 1383, with the applauſe of his order, entitled, "The Book of the Conformities of St. Francis with Jeſus Chriſt." In the beginning of this century the whole Franciſcan order was divided into two parties; the one embracing the ſevere diſcipline and abſolute poverty of St. Francis, were called *ſpirituals*; and the other, who inſiſted on mitigating the auſtere injunctions of their founder, were denominated "brethren of the community." Theſe wore long, looſe, and good habits, with large hoods; the former were clad in a ſtraight, coarſe, and ſhort dreſs, pretending, that this dreſs was enjoined by St. Francis, and that no power on earth had a right to alter it. Neither the moderation of Clement V. nor the violence of John XXII. could appeaſe the tumult occaſioned by theſe two parties; however, their rage ſubſided from the year 1329. In 1368 theſe two parties were formed into two large bodies, comprehending the whole Franciſcan order, which ſubſiſt to this day; *viz.* the "conventual brethren," and the "brethren of the obſervance, or obſervation," from whom ſprung the Capuchins and Recollects. Moſh. Eccl. Hiſt. vol. iii. See alſo *Nuns of St.* CLARE, and FRIARS. The general opinion is, that the Franciſcans came into England in the year 1224, and had their firſt houſe at Canterbury, and their ſecond at London; but there is no certain account of their being here till king Henry VII. built two or three houſes for them. At the diſſolution of the monaſteries, the conventual Franciſcans had about fifty-five houſes, which were under ſeven cuſtodies, or wardenſhips; *viz.* thoſe of London, York, Cambridge, Briſtol, Oxford, Newcaſtle, and Worceſter.

FRANCISCO DE TRADO, in *Geography*, a town of Brazil; 80 miles S. E. of Pauxis.

FRANCISCO, *St.* a river of Brazil, which diſembogues itſelf into the bay of Vaſabarris, ſouthward of Fernambuco, occaſioning ſuch eddies to the diſtance of three or four leagues from the land, that few veſſels which approach near the ſhore in this bay eſcape ſtranding. About 30 leagues inland this river loſes itſelf, running under ground for ſeveral miles, and again makes its appearance. On the banks of this river there are ſeveral villages, and large plantations, from which the inhabitants ſend annually great quantities of ſugar, tobacco, and mandioc to Fernambuco, exchanging theſe commodities for cloathing and implements of huſbandry. The bar of the river has not above eight feet of water upon it, ſo that they are obliged to uſe ſmall ſchooners for the convenience of exporting their goods.

FRANCIUS, PETER, in *Biography*, a celebrated Greek and Latin poet, was born at Amſterdam in 1645. Here and at Leyden he purſued his ſtudies under Hadrian Junius, and Gronovius, with whom he entered into a moſt intimate friendſhip. In 1669, he made a tour to England, from whence he proceeded to France, where he obtained the degree of doctor of laws. He formed an acquaintance with many of the moſt learned men of the age in which he lived; was treated with high reſpect by the grand duke at Florence, and at Rome he was viſited by the principal people of the city. In 1674, the magiſtrates of Amſterdam appointed him profeſſor of hiſtory and rhetoric, and, in 1692, he was invited to be profeſſor of Greek, which he declined, and continued to diſcharge the duties of his office at Amſterdam till his death in 1704. He was deeply ſkilled in Latin poetry and oratory, though ſome excellent judges have thought more highly of his Greek verſes than of thoſe which he compoſed in Latin. His oration, "De Præſtantia Linguæ Græcæ," poſſeſſes great merit. Many of his poems were written on William III. king of England; Frederic-William, elector of Brandenburg, and his ſon, the firſt king of Pruſſia; and after his death a number of gold coins and other valuable preſents, which he had received from theſe and other princes and great men were found among his property. His works are numerous, and conſiſt chiefly of poems, orations, and diſſertations. Gen. Biog.

FRANCK DE FRANCKENAU, GEORGE, was born at Naumburg, in Upper Saxony, on the third of May 1643. His father, although living as a ſimple peaſant, was of a noble family. After going through his ſchool-education, George went to Jena at the age of 18, and was crowned a poet by count palatine Richter, in conſequence of his extraordinary talent for writing verſes in the German, Latin, Greek, and Hebrew languages. But he exhibited ſtill greater talents during his courſe of medical ſtudies; and the canons of Naumburg, who recognized his merits, afforded

him liberal means of ſubſiſtence while he applied himſelf to this ſcience. He made ſuch good uſe of their money and his time, that he was deemed eligible to give lectures in botany, chemiſtry, and anatomy, before he obtained the degree of doctor, which, after having fulfilled theſe duties, he received at Straſburg in 1666. He continued his progreſs in the cultivation of his profeſſion with great ſucceſs; and the progreſſive increaſe of his reputation was at once the reſult and the recompence. In 1672, the elector palatine appointed him to the vacant profeſſorſhip of medicine at Heidelberg, and a few years afterwards nominated him his own phyſician. But the troubles occaſioned by the war compelled Franck to leave Heidelberg in 1688, and he retired to Francfort on the Main. John George III., elector of Saxony, then received him into his ſervice, and appointed him profeſſor of medicine at Wittemberg; an office which he filled with ſo much eclat, that the principal profeſſorſhip, and the title of dean of the faculty at Leipſic, were ſoon offered to him. This, however, he refuſed, by the inſtigation of his friends, who ſought to retain him at Wittemberg. The two ſucceeding electors likewiſe loaded this phyſician with ſo many favours, that it was ſuppoſed he could never dream of quitting Heidelberg. Nevertheleſs he was induced, by the offers of Chriſtian V. king of Denmark, to remove to Copenhagen, where he was received moſt graciouſly by the royal family, and was honoured with the title of Aulic counſellor, which was continued to him by Frederick IV. the ſucceſſor of Chriſtian. Death, however, terminated his brilliant career on the 16th of June 1704, in the 60th year of his age.

Franck was a member of ſeveral learned ſocieties, and was ennobled by the emperor Leopold in 1692, and in 1693 was created count palatine, by the title of "De Franckenau." He wrote many works, but it will be ſufficient to enumerate the titles of thoſe which have obtained the moſt extenſive circulation. 1. "Inſtitutionum Medicarum Synopſis," Heidelberg, 1672. 2. "Lexicon Vegetabilium uſualium," Argentorati, 1672. This was republiſhed ſeveral times. In the edition of Leipſic 1698, the title of "Flora Francica" was given to it. 3. "Bona nova Anatomica," Heidelberg, 1680. 4. "Parva Bibliotheca Zootomica," ibid. 1680. 5. "De calumniis in Medicos et Medicinam," ibid. 1686. 6. "De Medicis Philologis," Wittebergæ, 1691. 7. "De palingeneſia, ſive reſuſcitatione artificiali plantarum, hominum, et animalium, è ſuis cineribus, liber ſingularis," Halæ, 1717, edited by Nehring. 8. "Satyræ Medicæ XX." Leipſic, 1722. Theſe pieces, which had begun to appear in 1673, were publiſhed by his ſon, George Frederick Franck, who was alſo a teacher of medicine at Wittemberg, and wrote ſeveral works on botany and phyſic. Eloy. Dict. Hiſt.

FRANCKE, Augustus Herman, a learned German Lutheran divine, was born at Lubeck in 1663, where he received the early parts of his education, and, in 1679, he was ſent to the univerſity of Erfurt, and from thence to Kiel, in both which places he diſtinguiſhed himſelf by his diligence and improvement. In 1682, he ſpent ſome time at Hamburgh, to perfect himſelf in the Hebrew language under a learned Jew in that city, and then went to Gotha, whence, in 1684, he proceeded to Leipſic, where, in the following year, he was admitted to the degree of M. A. Here, after he had been at Wittemberg and Lunenburg for improvement, he delivered lectures on the ſcriptures, in which he combined critical diſcuſſion with practical and uſeful reflections. His popularity was ſo great as a lecturer, that he is ſaid to have had frequently 300 ſtudents, but from ſome cauſes not diſtinctly aſcertained, he was obliged to relinquiſh his lectures, and to withdraw from the univerſity. No imputation was ever made to affect his moral character, and, in 1690, he was called upon to undertake the office of miniſter of one of the churches of Erfurt, but through jealouſy of his ſuperior talents he was in a few months deprived of that ſituation, and ordered to quit the place. Upon this event, which was marked with injuſtice, the court of Gotha, ſatisfied of his innocence and of his merit, immediately offered him a choice of preferments, but having received, at the ſame time, an invitation from the elector of Brandenburg, to become profeſſor of the oriental and Greek languages in the univerſity at Halle, he gave the preference to this; which, however, he ſoon reſigned for the profeſſorſhip of divinity. He now employed his talents in inſtructing the poor, and engaged, at his own expence, a ſtudent in the univerſity to aſſiſt in the ſame plan. Soon after, he extended his project, and formed an eſtabliſhment, to be ſupported by voluntary contributions, in which orphans, and other neceſſitous children, ſhould be inſtructed and ſupported, until they were qualified to be ſent out into the world. This was the commencement of the hoſpital, or houſe of orphans at Halle; an inſtitution that has been of eſſential ſervice to the intereſts of humanity and good morals in Germany, and has rendered the memory of Francke highly reſpected. He lived to ſee this inſtitution flouriſh in ſuch a manner as abundantly to repay all his labours: proviſion was made in it, and in others connected with it, for more than two thouſand children. Having provided for their neceſſaries, he began to contrive plans for the enlargement of their ſtudies: he eſtabliſhed a printing office, and furniſhed it with the means of printing books in all languages, even thoſe that are leaſt generally known; a muſeum of natural curioſities, and a numerous library. The zeal and activity manifeſted by Mr. Francke in his benevolent ſchemes injured his health ſo much, that he was obliged to ſeek relief from foreign travel: this ſeemed, for a time, to ſtop the progreſs of diſeaſe; nevertheleſs his infirmities were evidently increaſing, and though they did not, for the preſent, incapacitate him entirely for public duty, yet they prevented him from any conſiderable exertions, and, in 1727, he died in the 65th year of his age, regretted by all ranks in Germany, for the noble ſervices which he had rendered his country and the world. He was author of many theological works, ſeveral of which were intended to explain and illuſtrate the books of the Old and New Teſtament. Moreri.

FRANCKEN, or Francks Franciscus, commonly called *Old Franck*, a native of Flanders, who practiſed hiſtorical painting with very conſiderable ſucceſs in a ſmall ſtyle of proportion. His birth is fixed in 1544, but when he died is uncertain, but ſuppoſed to be in 1616, at the age of 72.

He poſſeſſed the power of invention, and compoſed with great eaſe the ſubjects he choſe for repreſentation, which were generally from the Old or New Teſtament. He ſeems to have imagined it to be the quinteſſence of art, to introduce as many figures as poſſible into his pictures; and beſides this he had the fault of the time he lived in, *viz.* introducing ſeveral points of time, or parts of the hiſtory of his heroes, into one picture. Excepting theſe defects, his works are worthy of admiration for the ingenuity of the execution. At Wilton is a work of his repreſenting Belſhazzar's feaſt, which is beautifully wrought; but the compoſition is exceedingly confuſed from the number of the figures and the management of the lights. It could not well be more ſo if the painter's head had been filled with the vapours of Belſhazzar's wine.

Francken, or Franckes Franciscus, commonly called

Young

Young Franck, ſon of the preceding, was born in 1580, and followed his father's profeſſion as hiſtorical painter, in the ſame ſtyle and manner, but with conſiderable improvement in colour and expreſſion; and his deſigns were conducted with more elegance and greater clearneſs, though ſtill with the fault of having often too many hiſtorical incidents in one picture, repreſenting by that means a ſeries of incidents, inſtead of one principal action or event.

After ſtudying ſome time with his father, he travelled to Venice to improve his taſte in colouring. There he copied, and attentively ſtudied, the works of the great artiſts that had been, and were then employed in adorning that city. At his return to Flanders he was greatly admired and encouraged, though he does not appear to have carried back with him much of the taſte of the Venetian, or any of the Italian ſchools; but continued the practice of his father, painting ſmall hiſtories with a great number of figures, touched with great neatneſs, freedom, and ſpirit.

He had a peculiar mode of giving brilliancy to the eyes of his figures by a ſmart touch of pure white upon them, which diſtinguiſhes his pictures, and ſerves as a guide to the connoiſſeurs. The works of the father and the ſon are often confounded and miſtaken for each other, ſo ſimilar are they in conception and execution. Young Franck died in 1642, aged 62.

FRANCKEN, CHRISTIAN, a learned German unitarian divine, was born, about the middle of the ſixteenth century, at Gardleben, a town of Brandenburg. His parents were of the Lutheran perſuaſion, but he himſelf, at an early period of life, became a convert to popery, and entered the order of the Jeſuits in the year 1568. He was ſent to Rome to go through his noviciate, and, after ſpending ſome years in Italy, was recalled to Germany, where he manifeſted much zeal in oppoſing the heterodox doctrines that were then ſpreading in all directions. At Vienna he was appointed profeſſor of philoſophy, and in this ſituation he became convinced that the doctrines of popery were unſcriptural and highly erroneous, reſigned his office, and withdrew to his native town. He is ſaid after this to have been wavering as to the courſe he ſhould adopt, and deſirous of returning into the boſom of the church which he had juſt openly abandoned. At length, however, he joined himſelf to the unitarians in Poland, and became a ſtrenuous advocate for the opinions maintained by Francis David, and entered into a controverſy with Socinus on the ſubject. See DAVID. In 1584 he publiſhed an account of this diſpute, which was afterwards republiſhed by Socinus with notes, remarks, and many corrections. From this period to 1590, Francken was at the head of an unitarian ſeminary firſt at Chelmnitz, and afterwards at Tranſylvania. From this place he went to Prague, where he is reported to have returned again into the communion of the Catholic church. He next went to Ratiſbon, where he was patronized by Ladiſlaus Popelius, one of the emperor's officers, who was zealouſly attached to philoſophical purſuits. In this place, and under this protection, he publiſhed his "Analyſis Rixæ Chriſtianæ, quæ Imperium turbat, et diminuit Romanum." From this period we learn nothing more of him; he was author of many theological pieces, and of a ſevere ſatire on the Jeſuits, entitled, "Breve Colloquium Jeſuiticum, toti orbi Chriſtiano, ad recte cognoſcendam hactenus non ſatis perſpectam Jeſuitarum Religionem, utiliſſimum, habitum à Sacræ Theologiæ Doctore et Profeſſore Paulo Florenio cum Chriſtiano Francken, &c." Moreri. Toulmin's Life of Socinus.

FRANCKLIN, THOMAS, was born in London about 1720. He was educated at Weſtminſter, and at Trinity college Cambridge, where he diſtinguiſhed himſelf in his ſtudies. His father, as printer and publiſher of the Craftſman, was ſupported by Bolingbroke, Pulteney, and others, and from theſe he hoped for ſome proviſion for his ſon, but was diſappointed. The young man became fellow of his college, and was firſt known as an author in 1749, by a tranſlation of "The epiſtles of Phalaris," and of one of "Cicero on the nature of the Gods." In 1750, he was elected to the Greek profeſſorſhip in the univerſity of Cambridge; and, in 1758, he was preſented with the livings of Ware and Thunbridge in Hertfordſhire. In the following year he publiſhed one of his moſt conſiderable works, *viz.* "A Tranſlation of all the Plays of Sophocles," in two volumes 4to. which have ſince been printed in the octavo ſize. In 1767, he was nominated one of the king's chaplains, and took the degree of D. D. in 1770; he ſtill continued his literary occupations, and even wrote a farce for the ſtage; but the concluſion of his labours was a tranſlation of "The works of Lucian," in two vols. 4to. 1780, which is thought to give the Engliſh reader a good idea of the humour and vivacity of that celebrated writer. To this tranſlation was prefixed "A dialogue between Lucian and lord Lyttelton in the Elyſian Fields," intended as an account of the life and character of Lucian. In his latter years Dr. Francklin held the living of Bruſted in Kent. As a clergyman he was author of ſeveral ſingle ſermons; of a volume of "Diſcourſes on the Relative Duties;" and of "A letter to a biſhop concerning Lectureſhips," pointing out, in ſtrong terms, the diſgraceful ſteps that are often taken in procuring thoſe offices. Gen. Biog.

FRANCKS, or VRANX, JOHN BABTIST, a painter of hiſtory and converſations. He was born at Antwerp in 1600. At firſt he made the works of Vandyke and Rubens his ſtudy, but never ſucceeded to any high degree of excellence. He was moſt ſucceſsful in repreſenting interiors of galleries or grand apartments ornamented with ſtatues and pictures, with perſons engaged in different ways, either in converſation, play, or concerts of muſic. Theſe ſubjects he deſigned and executed extremely well, finiſhing them with a neat and agreeable pencil; but he was not ſufficiently ſkilful in the arrangement and due ſubordination of lights, ſo that his effects are frequently confuſed.

Houbraken deſcribes one of his works of this kind as being truly excellent. It repreſents the interior of a grand apartment or cabinet of a curious perſon, decorated with buſts and other ornamental furniture elegantly diſpoſed, with pictures arranged upon the wall; which are ſo admirably finiſhed, that the taſte of the maſters, whoſe works they are ſuppoſed to be, is diſtinguiſhable. There are only two figures in the apartment, which are portraits of Rubens and Vandyke engaged in playing at tables. The likeneſſes of theſe artiſts are greatly commended, and the delicacy of touch with which they are executed.

FRANCO, MAGISTER, ſcholaſtic of the cathedral of Cologne; a very important perſonage in the hiſtory of muſic, whoſe merit had lain dormant many ages buried in MSS. which had never entered the preſs, nor would it have been known to modern muſicians that he ever exiſted, but for the general reſearch in the principal libraries of Europe after materials for a general hiſtory of muſic.

Magiſter Franco is by ſome called a native, or at leaſt an inhabitant of Paris; by others a ſcholaſtic of Liege; but if we may believe Franco himſelf, he was of Cologne; for, ſeeming to foreſee the diſputes which would ariſe concerning his locality, he begins his "Compendium de Diſcantu," one of his muſical tracts which has been preſerved, in the following manner: "Ego Franco de Colonia, &c." which, if the

authors of the "Hiſtoire Litteraire de la France" had ſeen, they doubtleſs would not have fixed him at Liege, nor would thoſe who have implicitly followed them, have been led into this miſtake.

Sigebert tells us that Franco ſupported the functions of his office of ſcholaſtic, or preceptor, by a great fund of religion and knowledge: and acquired as much celebrity by his virtue as ſcience: "Scientia literarum et morum probitate clarus." He ventured, ſay the Benedictines, to ſtudy profane ſcience as well as eccleſiaſtic, and had the courage to attempt ſquaring the circle. Chriſtian philoſophers generally regard a man for loſt who addicts himſelf to ſuch purſuits as the ſquaring of the circle, the multiplication of the cube, perpetual motion, the philoſopher's ſtone, judicial aſtrology, or magic. But Franco is ſaid to have exerciſed his faculties in theſe ſtudies with ſuch diſcretion, that he never neglected his more important concerns.

By the teſtimony of Sigebert, his cotemporary, he had acquired great reputation for his learning in 1047. At leaſt it is certain that he had written concerning the ſquare of the circle before the month of February 1055, at which time Heriman, archbiſhop of Cologne, to whom he dedicated his work, died.

Franco lived at leaſt till Auguſt 1083, for he at that time filled the charge of ſcholaſtic of the cathedral of Liege.

Among many works which Franco is ſaid to have produced upon religious and mathematical ſubjects, we are told by the authors of the "Hiſtoire Litteraire de la France," that he wrote upon muſic and plain-chant; and that in the abbey of Lire in Normandy, there is a manuſcript in folio, which contains "Ars Magiſtri Franconis de Muſica Menſurabili." Theſe writers add, that there can be no doubt of this Magiſter Franco being the ſame as the ſcholaſtic of that name; or that another tract on muſic, in ſix chapters, entitled "Magiſtri Franconis Muſica," and preſerved in the Bodleian library at Oxford, is by the ſame author, as well as the "Compendium de Diſcantu, tribus capitibus," in the ſame library.

Theſe authors, who indeed pretend not to have ſeen the muſical tracts of Franco, have imagined, contrary to their uſual accuracy, that the treatiſe "De Muſica Menſurabili," in the library at Lire, and "Muſica Magiſtri Franconis," in the Bodleian library, were different works, but there remains not the leaſt doubt of their being duplicates of the ſame tract, in every reſpect, but their titles.

Trithemius, who calls him Franco Scholaſticus Leodienſis Eccleſiæ, of the church of Liege, natione Theutonicus, and a German, tells us, that "he was very learned in the holy ſcriptures; a great philoſopher, aſtronomer, arithmetician, (computiſta;)" and that he dedicated ſeveral of his works to the archbiſhop of Cologne: ſuch as his tract "De Quadratura Circuli;" "De Computo Eccleſiaſtico; et alia plura;" but he ſpecifies none of the muſical writings of Franco, who, according to this biographer, flouriſhed under the emperor Henry III. 1060.

The firſt mention however which we can find of Franco as a writer on muſic in any treatiſe on the ſubject is in the "Lucidarium in Arte Muſicæ planeæ," by Marchetto da Padova, written in the year 1274, who ſays that the agreement of different melodies, according to Magiſter Franco, conſtitutes diſcant ("diſcantus ſecundum Magiſtrum Franconem, eſt diverſorum cantum conſonantia. Ex. cod. Vatic. Num. 5322.") He likewiſe cites him in his "Pomœrium de muſica menſurata," as an *inventor* of the four firſt muſical characters. (Muratori Antiq. Med. Ævi Diſſert. 24. tom. ii. Padre Martini, tom. i. p. 189. Gerb. tom. ii. p. 124.) And this would have been ſufficiently early to have ſtript John de Muris of the honour of their invention, had he choſen to inveſt himſelf with it. He is next in point of time mentioned by John de Muris himſelf, and in a MS. of the Bodleian library (Digby 90) aſcribed to Thomas, or John of Tewkſbury, which, it is ſaid at the end, was finiſhed at the univerſity of Oxford, 1351. There is a chapter expreſsly on the muſical characters for time, invented by Franco: "De figuris inventis a Francone."

Franchinus Gaforius, Pract. Muſicæ, lib. ii. c. 5. quotes him twice as author of the time-table; and aſcribes to him, ib. lib. iii. c. 1. the completion of counterpoint, by his contrivance of moving in different melodies at the ſame time: meaning his invention of muſical characters for meaſure.

Our countryman Morley, Annotations to his Introduction, p. 7. ſays that "Franco was the moſt ancient of all thoſe whoſe works on practical muſic had come to his hands." But he ſeems only to have ſeen a commentary on his treatiſe by Robert de Handlo, and to know nothing of his age and country. Robert de Handlo wrote a commentary on the "Muſica Menſurabilis of Franco," 1326. (See Tanner, p. 376.) And this is even an earlier period than was aſſigned to the invention by thoſe who had given it to John de Muris. And Ravenſcroft, "Briefe diſcourſe of the true uſe of charactering the degrees in Meaſurable Muſicke, 1614," p. 1. who appears indeed to have been no better acquainted with the original than Morley, quoting him only through John Dunſtable, an Engliſhman, Id. p. 3. tells us boldly, that he was the inventor of the four firſt ſimple notes of menſurable muſic; but, unluckily, calls him Franchinus de Coloniâ, confounding him with Franchinus Gafurius.

Critical exactneſs, with reſpect to dates, names, or facts, was not yet much practiſed in writing upon the arts; and Morley, the beſt author who had written expreſsly on muſic, in our language, ſince the invention of printing, took many things upon truſt; and though he gave a long liſt of practical muſicians, whoſe works he had conſulted, he never had ſeen the writings of Guido, nor does he quote a ſingle manuſcript treatiſe throughout his introduction, which indeed is profeſſedly more didactic than hiſtorical.

We have been the more ſolicitous to eſtabliſh the exiſtence of Franco, and the time when he flouriſhed, as muſical writers have been ſo long in the habit of aſſigning to John de Muris the invention of the time table, or muſical notation, by copying each other without further enquiry, that they ſeem unwilling to ſtrip him of an honour which they themſelves have ſo gratuitouſly conferred upon him.

Having collected the evidence of reſpectable and unſuſpected writers in favour of the muſical tracts of Magiſter Franco, it will be neceſſary to give the reader an account of the particular treatiſes which chiefly concern the "Ars Cantus Menſurabilis:" and this we ſhall do from the work itſelf, of which we obtained a tranſcript from the Bodleian library at Oxford (842—49.)

This ſhort, but celebrated tract, contains ſix chapters: 1. Prologue, and definitions of the terms uſed in the treatiſe. 2. Of the figures, or repreſentations of ſingle ſounds. 3. Of ligatures, or compound notes. 4. Of reſts or pauſes. 5. Of the different concords uſed in diſcant. 6. Of the organum, and of other combinations of ſounds.

In ſpeaking of former muſical writers, he ſays, "that both the theory and practice of plain muſic, or chanting, had been ſufficiently explained by ſeveral philoſophers; particularly the theory by Boethius, and the practice by Guido," whom he exalts into a philoſopher. "The eccleſiaſtical tropes or modes," he adds, "had been ſettled by St. Gregory." Franco, therefore, only intends to

treat of meaſured muſic, of which, he pioufly obſerves, plain-chant has the precedence, as the principal of the ſubaltern. "Nor let any one ſay," continues he, "that I have undertaken this work through arrogance, or for my own convenience, but merely for the ſake of its evident truth, the eaſe with which it may be comprehended by the ſtudent, and its containing the moſt perfect method of teaching all the modes of meaſured muſic, and their notation. For as there are ſeveral authors, as well modern as ancient, who in their treatiſes give many good rules concerning meaſured muſic, and on the contrary are deficient and erroneous in other particulars, eſpecially in the appendages of the ſcience, we think their doctrines require ſome correction and improvement, leſt the ſcience itſelf ſhould ſuffer from their errors and defects. We therefore propoſe giving a compendious explanation of meaſured muſic, in which we ſhall not ſcruple to inſert *what others have ſaid well on the ſubject*, to correct their errors, and to ſupport by good reaſons *whatever we ourſelves may have newly invented.*"

It ſeems evident from this paſſage, particularly thoſe parts of it which are printed in italics, that the invention of muſical notes for time, is more ancient than Franco, and that he had only the merit of improvement. It likewiſe informs us, that there were, in his time, treatiſes "de Menſurabili Muſicâ," or, at leaſt, that doctrines had been propoſed and laid down concerning muſical notes, and the different duration of ſounds, by writers who were *antiqui*, with reſpect to him; and proves very ſtrongly that this manuſcript contains only a mixture of his own rules, with thoſe of his predeceſſors. And indeed, upon a careful analyſis of this whole tract, it does not appear that Franco was the inventor of muſical notes, or characters for time, though they have lately been given to him in ſuch very poſitive terms, by thoſe who, without ſeeing his manuſcript, have taken it for granted that it was wholly his property, becauſe no other writer of equal antiquity was found to have treated of cantus menſurabilis. Indeed, beſides the paſſages already cited, we find him ſpeaking of former writers, and former opinions concerning the notes and modes; particularly, chapter ſecond, the words *quemadmodum quidam poſuerunt*, acknowledge other writers upon the ſubject of meaſured muſic beſides himſelf; and, chapter the fourth, he ſpeaks of the great error which *ſome* have committed by tying together three *longs* in tenor parts; and of the ſtill greater blunder which *others* have made in tying a *long* between two breves. And the author of a Latin treatiſe, which was among the Cotton muſical manuſcripts, ſeems to determine with great preciſion the degree of merit that is due to Franco, with reſpect to the time-table; for ſpeaking of the canto fermo of an earlier period, he ſays: "Though muſic was at that time not meaſured, it was approaching *towards* meaſure, when Franco appeared, who was the firſt approved author, or writer, on meaſured muſic." After this introduction, definitions are given in which we ſhall mention whatever ſeems ſingular or curious. Meaſured muſic, he ſays, is regulated by long and ſhort times, or portions of meaſure; and meaſure he defines, the regulated motion of any ſeries of ſounds, whether quick or ſlow, different from plain-ſong, in which no ſuch regularity of movement is obſerved. A time is the ſtated proportion of a lengthened tone, or of a reſt of equal duration. "I ſpeak of a reſt," ſays he, "as meaſured by time, becauſe otherwiſe the performers of two different parts, one of which ſhould have a reſt, and the other not, would be unable to proceed together in exact time. This ſeems to be the purport of the original, which however we ſhall conſtantly throw into the notes for the conſideration of the curious and learned reader who may perhaps diſcover meanings which may have eſcaped our penetration. Indeed, this paſſage gives an idea of more than ſimple counterpoint, of note for note, and ſyllable for ſyllable, being practiſed in Franco's time, who is believed to have written his tract within fifty years of Guido.

"Meaſured muſic," continues he, "is of two kinds: wholly, and partly meaſured. Muſic wholly meaſured is diſcant, which is meaſured throughout; and that which is partly meaſured is the ſimple chant or plain-ſong, which, though meaſured by time in ſome degree, is neither organum nor diſcant, as it is commonly called by thoſe who ſing the eccleſiaſtical chants." "Dividitur autem menſurabilis muſica in menſurabilem ſimpliciter et partim. Menſurabilis ſimpliciter eſt diſcantus, eo quod in omni parte ſua menſuratur. Menſurabilis partim eſt cantus ſimplex et tempore menſuratus, ſed organum non eſt, neque diſcantus, (organum) communiter vero dicitur quibus cantus eccleſiaſticus tempore menſuratur."

It ſeems, by this paſſage, as if organizing, or ſinging in harmony, had firſt brought the *plain-chant* to *ſtrict time*; and that, then, when only a *ſingle* part or melody was ſung *in time*, it was cuſtomary to call it *organum*, becauſe *meaſured like* the *organum*. And perhaps, in ſinging upon a plain-ſong, the principal melody, while it continued to be chanted nearly in the ſame manner as it uſed to be before parts were added to it, was ſaid to be *partly meaſured*; and the organum or diſcant, moving in proportionate notes of different lengths, was regarded as *wholly meaſured*. In our cathedrals, where the pſalms are chanted in four parts, time is neither abſolutely kept, nor wholly diſregarded: it is kept with reſpect to the harmony, as all the parts move together; yet the melody of each part, being governed by the length of the verſes, cannot be ſaid to be regularly meaſured. In accompanied recitation the inſtruments move ſometimes *à tempo*, while the voice part ſeems *ad libitum*. He next defines *diſcant*, and, as the reader, curious in muſical hiſtory, may wiſh to know the acceptation of this term ſo near the time of its invention, we refer to the article DISCANT. He likewiſe defines *mood*, which ſee in its proper place. In his ſecond chapter, Franco treats of ſimple notes or characters, of which he enumerates only three kinds, the long, the breve, and ſemi-breve; (making no mention of the *large*, or the *minim*.) Theſe, he tells us, are either perfect or imperfect. The perfect long he calls the firſt and principal of all the notes, for in that all others are included. "The perfect note, he tells us, is that which is meaſured by three times, or portions; the ternary diviſion being the moſt perfect of all, as it had its name from the Holy Trinity, which is true and pure perfection."

The perfect long is repreſented by a ſquare, not with a tail on the right hand, deſcending, as thus:

This is equal to three breves. The imperfect long, repreſented by the ſame figure, is equal only to two. It is imperfect for the reaſon already aſſigned, ſays Franco, and can only acquire its full length by the addition of a breve before or after it. "Whence it follows," continues he, "that thoſe err who call it perfect; as that only is entire and complete which can ſtand by itſelf."

It ſeems by this paſſage as if there had been a controverſy even in Franco's time about the greater degree of perfection of triple, or common time; in after ages, however, the binary

binary number acquired the pre-eminence, and was called perfect, while the triple proportion was degraded into imperfect. The length of the notes, that is, the perfection or imperfection, triple or double powers, depended on their *poſition*. But to conclude this ſubject we plunge the reader into a ſea of trouble concerning diſtinctions about which our forefathers themſelves were not well agreed: and the rules of Franco on this ſubject are too numerous, complex, and uſeleſs to merit the reader's attention, or an attempt at explaining them. Indeed if they would help to decipher other muſic compoſed after the time of Franco, the curious enquirer's trouble and our own might be repaid, but there was at firſt ſo much confuſion in the moods, and ſo many and ſo dark were the exceptions to their rules, ſo numerous and jarring the opinions and deciſions concerning them, and ſo little agreed were muſicians about the different prolations, points of perfection and imperfection, of increaſe and diminution, diviſion and tranſlation, even in Morley's time, as gave occaſion to his ſaying, that "no two of them told the ſame tale."

FRANCO, NICHOLAS, born at Benevento in 1510, was ſon of a ſchoolmaſter, under whom he acquired a knowledge of the learned languages. In his youth he became acquainted with Peter Aretino, from whom he caught that ſpirit of ſatire which made him ſo many enemies, and which drove him from his own country to Venice, where Aretino then was. Their union was neither ſincere nor long lived. The ſucceſs of Aretino's letters excited the envy of Franco, who publiſhed, by way of rivalry, his "Piſtole Vulgari" in 1539. A fierce war was commenced between them, and ſuſtained on each ſide with the greateſt rancour and malignity. Franco left Venice and took up his abode at Montferrat, where he publiſhed a dialogue, entitled "Delle Belleze:" alſo a collection of ſonnets againſt Aretino with a "Priapeia Italiana," which contained the groſſeſt obſcenity, the moſt unqualified abuſe, and the boldeſt ſatire againſt princes, popes, the fathers of the council of Trent, and other eminent perſons. The licentiouſneſs of Franco did not injure his literary reputation; he was a principal member of the academy of Argonauti at Montferrat, and in this capacity wrote his "Rime Maritime," printed at Mantua in 1549. At Mantua he followed the profeſſion of a ſchoolmaſter, thence he removed to Rome, where he publiſhed commentaries on the "Priapeia," attributed to Virgil, the copies of which were ſuppreſſed and burned by order of pope Paul IV. Under Pius IV. he continued to indulge his virulence, but was preſerved from perſonal chaſtiſement by the protection of cardinal Morone. His imprudence however, in writing a Latin epigram againſt Pius V., with other deſamatory libels, brought upon him that puniſhment, which it ſeems extraordinary he ſhould ſo long have eſcaped. He was taken from his ſtudy in his furred robe, and hanged on the common gallows without trial or ceremony, which may and ought to prove a warning againſt the faults, the indiſcretions, and the vices to which talents, without principle and morality, are liable. He was author of ſeveral other works beſides thoſe already enumerated, and he left behind him in MS. a tranſlation of Homer's Iliad. An attempt has been made, in the "Annee Litteraire," to raiſe Franco to the dignity of a reformer of the corruptions of the age, on account of which he was ſingled out as a martyr to his heroiſm: but his writings will not juſtify the ſuppoſition. Moreri.

FRANCOA, in *Botany*, named by the late abbé Cavanilles, in honour of Francis Franco, a phyſician and botaniſt of Valentia, who lived about the middle of the 16th century, and taught phyſic at Alcala, Seville, and Coimbra. Cavan. Ic. v. 6. 76. Claſs and order, *Octandria Tetragynia*. Nat. Ord. uncertain.

Gen. Ch. *Cal.* Perianth inferior, permanent, in four deep, equal, lanceolate diviſions. *Cor.* Petals four, ovate-oblong, equal, narrow at the baſe. *Stam.* Filaments eight, awl-ſhaped, equal, ſhorter than the corolla, inſerted into the receptacle cloſe to the germen, accompanied by eight intermediate alternate glands between their baſes; anthers ovate, erect, of two cells. *Piſt.* Germen ſuperior, ſeſſile, ovate, with four deep furrows; ſtyles none; ſtigmas four, ſhort, ovate, flat, ſpreading. *Peric.* Capſule with four angles, and four deep intermediate furrows, of four cells and eight valves; or rather conſiſting of four bivalve capſules, compreſſed, and cohering by their inner margins. *Seeds* minute, numerous, oblong, rugged, ranged along the inner edge of the valves.

Eſſ. Ch. Calyx of four leaves. Petals four. Eight glands alternate with the ſtamens. Capſules four, bivalve, cohering by their inner edge. Seeds numerous.

1. F. *appendiculata*. Cav. Ic. v. 6. 77. t. 596.—Leaves lyrate, with diſtant lobes. Calyx and flower-ſtalks hairy. —Diſcovered by Louis Née in the fertile iſland of San Carlos de Chiloe, and other parts of Chili, flowering in February. *Root* ſpindle-ſhaped, perennial? *Stem* none. *Leaves* radical, deeply lyrate, wavy, crenate, downy, a ſpan long. *Flower-ſtalk* ſolitary, taller than the leaves, round, hairy, naked, ſimple or divided, racemoſe. *Flowers* leaning to one ſide, the ſize of Borage, of a pale roſe-colour, their calyx, ſtalks, and bracteas at the baſe of each partial ſtalk, villoſe. Sometimes the flowers are over luxuriant, or monſtrous. Each petal is marked with a deep-coloured ſpot.

2. F. *ſonchifolia*. Cav. Ic. v. 6. 77. (Llaupankè; Feuillée Plant. Med. 742. t. 31.)—Leaves lyrate, with imbricated lobes. Calyx and flower-ſtalks ſmooth.—Gathered by Feuillée on the mountains of Chili, latitude 36° 57 ſouth. This much reſembles the former, but the lobes of the *leaves* are repreſented as crowded and imbricated, and the *flowers* more numerous, crimſon, with a violet ſpot on each petal. The juice of the plant appears by Feuillée's account to be of an aſtringent quality, being uſed as an application to ſtop blood, and by the dyers to dye black.

Concerning the natural order of this genus, known to us only by the works of Cavanilles and Feuillée, we have no certain ideas. It ſeems allied to *Droſera*, whoſe affinity is itſelf obſcure.

FRANCOCCI, in *Geography*, a town of the duchy of Spoleto; ſeven miles W.N.W. of Spoleto.

FRANCŒUR, FRANCIS, in *Biography*, ſuperintendant of the king of France's band of muſic, born in 1698, was a profeſſor much reſpected by his countrymen. He connected himſelf in his earlieſt youth with M. Rebel, another reſpectable profeſſor, in ſo cloſe a friendſhip, that, like our Beaumont and Fletcher, they conſtantly ran the ſame courſe. Their intimacy was ſo perfect, that it was never known which was the author of the ſeveral pieces of their compoſition. In their early youth they played ſo agreeably on the violin, that they were only known by the title of the "little fiddlers." M. Francœur was admitted into the opera band in 1710, and ſoon after was appointed one of the king's chamber muſicians.

In 1724 he purchaſed the place of one of the twenty-four muſicians of the king's band on the eſtabliſhment, as well as the ſurvivorſhip of compoſer to his majeſty, to which he arrived in 1733. In 1736 Meſſrs. Rebel and Francœur were nominated inſpectors of the opera. In 1742 the latter purchaſed of M. Blamont the reverſion of the place of ſuperintendant or

maſter

maſter of the king's band, to which he ſucceeded in 1760. At length he became director and manager of the opera jointly with his friend Rebel, in 1757 to 1767, and was honoured with the order of St. Michael in 1764; and at the termination of this enterprize, the chevalier Francœur quitted all profeſſional concerns, and lived only for himſelf and his friends. At nearly 80 years of age he had the courage to be cut for the ſtone, and to ſuſtain that terrible operation, one of the longeſt and moſt difficult that ever was undertaken, it having been commenced three ſucceſſive days. His fortitude, and the cheerfulneſs of his character, ſupported him under ſuch dreadful circumſtances, and in a few days he was perfectly recovered. Poor Dr. Worgan, in our own country, ſunk under ſimilar ſufferings. M. Francœur publiſhed in his youth two ſets of ſonatas compoſed by himſelf alone; and in partnerſhip afterwards with M. Rebel, eight operas, which abound with melody and excellent recitative, and had no other defect than the being ſung too ſlow. Laborde.

Francœur, nephew of the preceding muſician, loſing his father during infancy, was adopted and educated by his uncle, and treated by him with all the care and tenderneſs of a father, and by his intereſt, and his own diligence and muſical talents, he ſucceeded to moſt of the appointments of his uncle. He was likewiſe a compoſer of operas, and leader of the opera band. By his probity, and the ſimplicity of his character, he had the honour of being diſtinguiſhed by the title of "honeſt Francœur" (Francœur l'honete homme.) He was author of a very uſeful tract to young muſical compoſers, under the title of "Diapaſon de tous les inſtrumens à vent," ſcale and compaſs of all wind inſtruments, 1772.

FRAN. OIS, in *Geography*, a town of Canada, on the eaſt coaſt of lake St. Pierre. N. lat. 46° 5'. W. long. 72° 36.

François, *Cape*. See Guarico.—Alſo, the northernmoſt point of Kerguelen's land.

François, *Old Cape*, a town and cape on the north coaſt of the iſland of Hiſpaniola. N. lat. 19° 40'. W. long. 70° 44'.

François, *Port des*. See Français.

François *River*, a river of Upper Canada, which runs S.W. from lake Nipiſſing into lake Huron; it has ſeveral portages: that neareſt to lake Nipiſſing is called Portage de Trois Chaudiers, about half a mile in length.

FRANCOISE, a ſmall iſland in the Atlantic, near the coaſt of Africa. N. lat. 20° 15'.

Françoise, *La*. See Française.

FRANCOLI, a river of Spain, which runs into the ſea near Tarragon, in Catalonia.

FRANCOLIN, in *Ornithology*, a ſpecies of *Tetrao*, which ſee.

FRANCOLINO, in *Geography*, a town of Italy, in the department of the Lower Po; eight miles N.E. of Ferrara.

FRANCONIA, a circle of Germany, bounded on the N. by Meiſſen and Thuringia, on the E. by Bohemia and the Upper Palatinate, on the S. by Bavaria and Swabia, and on the W. by the Lower Palatinate and the electorate of Mentz. The form of Franconia is ſomewhat circular, its diameter being about 150 miles; the land towards the centre is fertile in corn, wine, fruit, &c. but the frontiers are full of foreſts and mountains, and little cultivated. The chief river is the Mayne. The inhabitants of many towns are Roman Catholics, but the principal part conſiſts of Lutherans. The Calviniſts have ſome churches, and the Jews ſome ſynagogues. The ſtates compoſing this circle are partly eccleſiaſtical and partly civil. See Germany.

Franconia, a townſhip of America, in Grafton county, New Hampſhire, 14 miles N.E. of Haverhill on Connecticut river. It was incorporated in 1764, and firſt called Morriſtown. It contains 129 inhabitants.

FRANCOSO, a town of Portugal, in the province of Beira; 22 miles E. of Viſeu.

FRANCUCCI, Innocenzio, in *Biography*, an hiſtorical painter, born at Imola, and therefore known by the name of Innocenzio da Imola. He was one of the eſtabliſhers of the Bologneſe ſchool. He became a diſciple of Franceſco Francia in 1506; then paſſed ſome time with Albertinelli at Florence; and from the evidence of his works, and the teſtimony of Vaſari, ſtudied much after Fra. Bartolomeo and Andrea del Sarto: for though the main diſpoſition of his altar pieces be ſtill Gothic, he no longer uſed the ancient gilding; he placed the Virgin on high in the centre, and ſurrounded her with ſaints and angels, architecture, and back grounds ſkilfully grouped and arranged with novelty and taſte. Such is his ſtyle in the ſurprizing picture of the Duomo at Faenza, and in another at Peſaro. The aerial perſpective and back ground remind us of Leonardo da Vinci. He ſometimes placed ſmaller pictures under his altar pieces, like that at St. Giacomo of Bologna, which breathes the very ſpirit of Raffaello; that ſpirit he ſeems indeed to have aimed at in the greater part of his works, and to have approached it nearer than moſt of Raffaello's own ſcholars. He excelled Francia and his fellow ſcholar Bagnacavallo in erudition, majeſty, and correctneſs. Subjects of novel combination and fiery fancy he has not produced; nor ſeem they to have been congenial with that mildneſs and tranquillity of character which hiſtory aſcribes to him. Fuſeli's Pilkington.

FRANEKER, in *Geography*, a town of Holland, in Frieſland; watered by two canals, navigable for barges, and having a caſtle, built in the 15th century, and a celebrated univerſity, eſtabliſhed by the ſtates and William Louis comte of Naſſau, in the year 1585. This is one of the neateſt towns in Frieſland, and has commonly been the reſidence of the nobleſſe of the country. The mean temperature of this town, during five years, was 52° 6'. The greateſt uſual cold is 12°, and the greateſt heat 82°. The ſtandard temperature of its latitude is 50° 2', the difference being 2° 4': the reaſon of which, according to Kirwan, is, that all continents, if flat, are in ſummer much warmer than the ſtandard, and particularly thoſe which border on the German ſea, as that ſea is, upon an average of the whole year, two degrees warmer than the Atlantic; but in winter the German ſea is colder than the ſtandard, and Holland, in general, is much expoſed to N.E. Siberian winds. N. lat. 53. E. long. 5° 42.

FRANGIPANE, an exquiſite kind of perfume, frequently given to the leather whereof gloves, purſes, bags, &c. are made.

It takes its name from a Roman nobleman, of the ancient family of Fragipani, who was the inventor of it.

There is alſo a kind of perfumed liquor of the ſame denomination, ſaid to have been invented by a grandſon of Mutio Frangipani; and alſo a perfumed kind of *ros ſolis*, called by the ſame name.

FRANGULA, in *Botany*, ſo called from *frango*, to break, on account of the brittleneſs of its branches; the berry-bearing alder, *Rhamnus Frangula*; Engl. Bot. t. 250. (See Rhamnus.) The berries are often ſold mixed with thoſe of buckthorn, R. *catharticus*, with which they nearly agree in quality. If it be any object to diſtinguiſh them,

thoſe of the *Frangula* may be known, as remarked in Lewis's Diſpenſatory, by having two ſeeds only, inſtead of four.

FRANGY, in *Geography*, a town of France, in the department of Geneva, and chief place of a canton in the diſtrict of Leman. The place contains 814, and the canton 7,535 inhabitants, on a territory of 175 kiliometres, in 24 communes.

FRANI, a town of Italy, in the department of the Adda and Oglio; two miles S.W. of Breno.

FRANK, or FRANC, a term literally ſignifying free and open, or exempt from public impoſitions and charges; as frank confeſſion, frank fair, frank letter, &c.

The term frank is much uſed in our ancient cuſtoms and tenures, where it receives various particular modifications and meanings, according to the words it is combined with, as

FRANK *Allen*, or *allodium*, is a land, tenement, or demeſne, that is not held of any ſuperior lord.

FRANK *Almoign*, or *free alms*, is a tenure of lands or tenements beſtowed on God; that is, given to ſuch people as devote themſelves to the ſervice of God, in pure and perpetual alms; or, it is a tenure, whereby a religious corporation, aggregate or ſole, holdeth lands of the donor, to them and their ſucceſſors for ever.

Whence the feoffors or givers cannot demand any terreſtrial ſervice, ſo long as the land remains in the hands of the feoffees.

The ſervice which the feoffees were bound to render for theſe lands is not certainly defined; but only in general, to pray for the ſouls of the donor and his heirs, dead or alive; and, therefore, they do no fealty, which is incident to all other ſervices but this, becauſe this divine ſervice was of a more exalted nature. (Litt. § 131. 133. 135.) This is the tenure by which all the ancient monaſteries and religious houſes held their lands; and by which the parochial clergy, and many eccleſiaſtical and eleemoſynary foundations hold them at this day. (Bracton, l. 4. tr. 1. c. 28. § 1.) This was an old Saxon tenure, and continued under the Norman revolution, on account of the reſpect ſhewn to religion and religious men in ancient times; and for this reaſon, tenants in frank-almoign were diſcharged of all other ſervices, except the *trinoda neceſſitas*, of repairing the highways, building caſtles, and repelling invaſions. (Seld. 1. 42.) And this tenure is ſtill diſtinct from all others, being not in the leaſt feodal, but merely ſpiritual; for, if the ſervice be neglected, the law gives no remedy by diſtreſs or otherwiſe to the lord of whom the lands are holden; but merely a complaint to the ordinary or viſitor to correct it. (Litt. § 136.)

Britton mentions another kind of land given in alms, but not free alms; the tenants being tied in certain ſervices to the feoffor; as to ſing ſo many maſſes, diſtribute ſuch a ſum in alms, and the like; and this tenure by divine ſervice differs from the former, becauſe for this, unperformed, the lord might diſtrain, without any complaint to the viſitor. (Litt. § 137.) All ſuch donations are now out of uſe; for ſince the ſtatute of *quia emptores*, 18 Edw. I. none but the king can give lands to be holden by this tenure. (Litt. § 140.) Theſe donations are expreſsly excepted, by name, in the ſtat. 12 Car. II. c. 24. aboliſhing tenures, and therefore ſubſiſt in many inſtances at the preſent day. See MORTMAIN.

FRANK *Bank*. See FREE *bench*.

FRANK *Chaſe* denotes liberty of free chaſe, in a circuit adjoining to a foreſt, on account of which men, though they have land of their own within that compaſs, are forbidden to cut down wood, without the view of the foreſter; though it be their own demeſne. See CHASE.

FRANK *Fee*, *feudum francum*, as defined by Brook, is that which is in the hands of the king or lord of the manor; being ancient demeſne of the crown.

FRANK *Fee*, *feudum liberum*, according to ſome, denotes that for which no ſervice is performed to any lord.

According to Fachin, lib. vii. cap. 39. lands held in frank fee were exempted from all ſervices, except homage; in contradiſtinction to that in the tenant's hands, which is only ancient demeſne.

In the reg. of writs, frank fee is ſaid to be that which a man holds at common law to him and his heirs; and not by ſuch ſervice as is required in ancient demeſne, according to the cuſtom of the manor.

It is added, that the lands in the hands of king Edward the Confeſſor, at the making of Domeſday-book, were ancient demeſne; and all the reſt frank fee. On which footing, all the lands in the realm are either ancient demeſne, or frank fee.

Others define frank fee to be a tenure in fee ſimple, or lands pleadable in common law; and not in ancient demeſne. See DECEIT and FEE.

FRANK-*ferme*, *firma libera*, denotes lands or tenements, wherein the nature of the fee is changed by feoffment, from knight's ſervice to a certain yearly ſervice; and whence neither homage, wardſhip, marriage, nor relief, may be demanded, nor any other ſervice not contained in the feoffment. See FEE-*farm* and SOCAGE.

FRANK-*fold* is where the lord hath the benefit of folding his tenant's ſheep, within his manor, for the manuring of his land.

FRANK *Language*, or *lingua Franca*, is a kind of jargon, ſpoken on the Mediterranean, and particularly throughout the coaſts and ports of the Levant, compoſed of Italian, Spaniſh, French, vulgar Greek, and other languages.

The lingua Franca is the trading language; and is thus called from the Franks, a common appellation given in the Levant to all the European merchants and traders who come thither to traffick.

In this language, if it may be ſo called, nothing but the infinitive mood of each verb is uſed; this ſerving for all the tenſes and moods of the conjugation; and yet this lame, mutilated diction, this barbarous medley, is learnt and underſtood by the merchants and mariners of all nations who repair thither.

FRANK *Law*, *lex libera*, is the benefit of the free and common law of the land.

He that for any offence, as conſpiracy, &c. loſeth his frank law, incurs theſe inconveniences: 1. That he may not be impanelled on any jury or aſſize; or otherwiſe uſed as an evidence or witneſs to the truth. 2. That if he have any thing to do in the king's courts, he muſt not approach them in perſon, but appoint his attorney. 3. That his lands, goods, and chattels, be ſeized into the king's hands; and the lands be eſtreated, his trees rooted up, and his body committed to cuſtody.

FRANK *Letters*, or *letters free of poſtage*. The privilege of ſuch letters was claimed by the houſe of commons in 1660, when the firſt legal ſettlement of the preſent poſt office was made; but afterwards dropped on a private aſſurance from the crown, that this privilege ſhould be allowed the members. Accordingly, a warrant was conſtantly iſſued to the poſtmaſter general, directing the allowance thereof to the extent of two ounces in weight; till at length it was expreſsly confirmed by ſtat. 4 Geo. III. cap. 24. which adds many new regulations, rendered neceſſary by the abuſes crept into the

practice

practice of franking; whereby the annual amount of franked letters had gradually increaſed from 23,600*l.* in 1715, to 170,700*l.* in 1763.

By other ſubſequent regulations it is required that franks ſhould be dated, with the month, &c. written at length, and put into the office the ſame day. The following reſtrictions and orders are enjoined by 35 Geo. III. now in force; no letter, directed to or by any member of parliament, ſhall be exempted from poſtage, if it exceeds one ounce in weight. No letter directed by any member ſhall be exempted, unleſs he ſhall actually be in the poſt-town, or within the limits of its delivery of letters, or within twenty miles of ſuch poſt-town, on the day, or on the day before the day, on which the letters ſhall be put into the office. No member ſhall be entitled to ſend free from poſtage more than ten letters in one day, nor to receive more than fifteen. Whenever the number of letters ſent or received by ſuch members in one day ſhall exceed the number exempted, the letters chargeable with a higher poſtage ſhall be included in the number exempted, in preference to any chargeable with a lower poſtage, and the remainder ſhall be chargeable with the poſtage to which common letters are ſubject. Perſons who may now in right of their offices ſend and receive letters free, may continue ſo to do. Printed votes, or proceedings in parliament, and printed newspapers, may alſo be ſent as uſual.

No ſingle letter ſent by the poſt from any non-commiſſioned officer, ſeaman, or private, in the navy, army, militia, fencible regiments, artillery or marines, ſhall be charged with more poſtage than one penny; but the ſame muſt be paid at the time of putting the ſame into the poſt-office; and ſuch letter muſt have written thereon, in the hand writing of, and ſigned by the commanding officer, the name of ſuch commanding officer, and of the ſhip, veſſel, corps, regiment, or detachment. Alſo no ſingle letter directed to any ſuch non-commiſſioned officer, ſeaman or private, ſhall be charged with more poſtage than one penny, to be paid on the delivery thereof; but ſuch letter muſt be directed to ſuch perſons, ſpecifying the ſhip, veſſel, regiment, troop, corps, company or detachment to which they belong; and the poſt-maſter muſt deliver ſuch letter either to the party to whom it ſhall be directed, or to ſome perſon appointed to receive the ſame by the commanding officer, and to no other.

Every cover containing patterns or ſamples of goods, not exceeding one ounce, ſhall be charged only as a ſingle letter, if ſent open at the ſides, and without any letter or writing therewith, other than the name of the perſon ſending the ſame, the place of his abode, and the prices of the articles. See POST-OFFICE and REVENUE.

FRANK *Marriage*, *liberum maritagium*, is a tenure in tail ſpecial; whereby lands and tenements are held to a perſon and his wife, and the heirs of their bodies, on condition of doing fealty to the donor, till the fourth degree of conſanguinity between the iſſues of the donor and donee.

Fleta gives this reaſon, why the heirs do no ſervice till the fourth degree: "ne donatores, vel eorum hæredes, per homagii receptionem a reverſione repellantur;" and why, in the fourth deſcent, they ſhall do ſervice to the donor, "quia in quarto gradu vehementer preſumitur quod terra eſt pro defectu hæredum donatorum reverſura."

Frank marriage is expreſſed by Bracton, to be that where the donor intends that the land thus beſtowed ſhall remain quiet, and free from all ſecular ſervice that might be annexed to the fee; ſo that he who gave it ſhall claim no manner of ſervice from it, until the third heir, and the fourth deſcent, or degree; reckoning the donee in the firſt degree, his heir in the ſecond, the heir of him in the third, and his again in the fourth; but afterwards the ſame land to become ſubject to all the former ſervices; as being then ſuppoſed to revert to the lord, for want of heirs.

The lands otherwiſe given in marriage, viz. *ſervitio obligatæ*, were with a reſervation of the ſervices due to the lord, which the donee and his heirs were bound to perform for ever: only homage was not to commence till the fourth degree, when both ſervice and homage were to be enjoined for ever.

A gift of lands by one man to another with a wife in frank-marriage amounts by implication of law to a gift in tail; which in this caſe may be created without the words "heirs" or "body." (Litt. 17. Wood's Inſt. 120.) A gift in free-marriage might be made as well after as before marriage; and ſuch a gift was a fee-ſimple before the ſtatute of Weſtm. 2.; but ſince, it is uſually a fee-tail. Although this tenure is now grown out of uſe, it is ſtill capable of ſubſiſting in law. It is liable to no ſervice but fealty.

FRANK-*pledge* ſignifies a pledge or ſurety for the behaviour of a freeman; called alſo *friburgh*.

The ancient cuſtom of England, for the preſervation of the public peace, was, that every free-born man, at fourteen years of age (religious perſons, clerks, knights, and their eldeſt ſons, excepted) ſhould find ſurety for his truth towards the king and his ſubjects, or elſe to be kept in priſon.

Accordingly, a number of neighbours became interchangeably bound for each other, to ſee each man of their pledge forthcoming at all times; or to anſwer for the offence committed by any one gone away; ſo that whenever one offended, it was preſently inquired in what pledge he was, and then thoſe of that pledge either brought him forth within one and thirty days to his anſwer; or they ſatisfied for his offence.

This cuſtom was called frank-pledge; and the circuit it extended to *decenna*, becauſe it uſually conſiſted of ten houſholds; and every perſon thus bound for himſelf and neighbours was called a *decennier*. See DECENNARY, DECINERS, and TITHING.

In obſervance of this cuſtom, the ſheriffs at every county-court did from time to time take the oaths of young perſons, as they arrived at the age of fourteen; and ſee they were ſettled in one *decenna* or *dozein*, or another; whereupon this branch of the ſheriff's office and authority was called *viſus franci plegii*, i. e. *view of frank-pledge*. See COURT-LEET.

"Omnis homo, ſive liber ſive ſervus, aut eſt, vel debet eſſe, in franco plegio, aut de alicujus manupaſtu, niſi ſit aliquis itinerans de loco in locum, qui non plus ſe teneat ad unum quam ad alium, vel qui habet quod ſufficiat pro franco plegio, ſicut dignitatem, vel ordinem, vel liberum tenementum, vel in civitate rem immobilem, &c." Bracton, lib. iii. Tract. de Corona, cap. 20.

At this day no man ordinarily gives any other ſecurity for the keeping of the peace, beſides his own oath; ſo that no one anſwers for the tranſgreſſion of another, but every perſon for himſelf. 4 Inſt. 76.

FRANK *Service*. See SERVICE.

FRANK *Tenement*. See TENEMENT, and FREEHOLD.

FRANK, or *Franc*, alſo denotes an ancient coin, ſtruck, and current in France; thus called from its impreſſion, which repreſented a Frenchman, ſometimes on horſeback, and ſometimes on foot.

The frank was either of gold or ſilver: the firſt was worth ſomewhat more than the ecu d'or, or gold crown. See CROWN.

The ſecond was a third of the firſt; but theſe coins have been long diſuſed.

The term frank, however, is ſtill retained as the name of a money of account. In this ſenſe it is equivalent to a livre, or twenty ſols, or a third of a French crown. See EXCHANGE.

FRANKENAU, in *Geography*, a town of Germany, in the principality of Hohenlohe; 12 miles N. of Dinkelſbahl.—Alſo, a town of Germany, in the principality of Heſſe; 24 miles S.W. of Caſſel.

FRANKENBERG, an ancient town of Germany, in the circle of Erzgeburg, on the Tſchopa; fortified againſt the Saxons by Charlemagne; 7 miles N.N.E. of Chemnitz. N. lat. 50° 50′. E. long. 12° 59′.

FRANKENDAL, or FRANKENTHAL, a town of France, in the department of Mont Tonnerre, and chief place of a canton, in the diſtrict of Spire, ſituated on a fertile plain, on a navigable canal which communicates with the Rhine. It originated with two convents, one for men and the other for women; and by the acceſſion of ſome Flemings, who, flying from perſecution, ſettled here, it became a flouriſhing town: but it felt the miſeries of war in common with the reſt of the Palatinate in the 17th century, but was afterwards rebuilt in a regular and handſome manner. The inhabitants are engaged in manufactures of porcelain, cloth, ſerges, ſilk, ſtuffs, ſtockings, ſoap, &c. In 1793 it was taken by the French. It contains three churches and an hoſpital. In the town are reckoned 3,235, and in the canton 11,381 inhabitants, in 17 communes; 8 miles S. of Worms.

FRANKENFELS, a town of Auſtria, ſeated on the river Noderſpach; 36 miles W. of Vienna.

FRANKENHAUSEN, a town of Germany, in the principality of Schwartzburg-Rudolſtadt, divided into the old and new town, ſituated on a branch of the Wipper. It contains three churches, and a ſchool, which was formerly a Ciſtercian convent; with profitable ſalt-works, belonging to the citizens; 26 miles N. of Erfurt. N. lat. 51° 16′. E. long. 11° 10′.—Alſo, a town of Germany, in the circle of Erzgeburg; 8 miles N.N.W of Zwichau.

FRANKENHEIM, a town of Germany, in the county of Henneberg; 14 miles W. of Meinungen.

FRANKENIA, in *Botany*, ſo named by Linnæus in memory of his predeceſſor John Franck, or Franckenius, profeſſor of botany and anatomy at Upſal, who died in 1661, at the age of 71. He publiſhed a catalogue of plants with Latin and Swediſh names, under the title of "Speculum Botanicum," which went through two editions, and is now equally rare and uſeleſs. We have alſo an inaugural diſſertation under his preſidency in 1633, by Hernodius, on the virtues of Tobacco, which are therein highly extolled, and a ſmall German work on the Materia Medica, printed at Roſtock in 1619, in quarto. This ſame genus was originally called *Franca* by Micheli, after Dr. John Sebaſtian Franchi, of Lucca, who practiſed phyſic with great reputation at Florence, and was one of the founders of the Botanical Society of that place. If what Micheli ſays of him be true, which no one can doubt, he deſerved commemoration as much as Frankenius, whoſe laurels have thus been grafted on his ſtock.—Linn. Gen. 176. Schreb. 234. Willd. Sp. Pl. v. 2. 241. Sm. Fl. Brit. 387. Mart. Mill. Dict. v. 2. Juſſ. 303. (Franca; Mich. Gen. 23. t. 22. Nothria; Berg. Cap. 171.)—Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Caryophylleæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, funnel-ſhaped, ſomewhat cylindrical, ten-ſided, permanent, with five, rarely four, ſharp ſpreading teeth at the orifice. *Cor.* Petals five, rarely four, their claws the length of the calyx; limb flat, roundiſh, ſpreading. Nectary? a linear, channelled, pointed, parallel ſcale, inſerted into the claw of each petal. *Stam.* Filaments ſix, the length of the calyx; anthers roundiſh, two-lobed. *Piſt.* Germen oblong, ſuperior; ſtyle ſimple, the length of the ſtamens; ſtigmas three, oblong, erect, obtuſe. *Peric.* Capſule oval, of one cell and three valves. *Seeds* numerous, ovate, minute.

Eſſ. Ch. Calyx five-cleft, funnel-ſhaped. Petals four or five, with a ſcale upon each claw. Stigmas three. Capſule ſuperior, of one cell and three valves.

1. F. *lævis*. Smooth Sea-Heath. Linn. Sp. Pl. 473. Engl. Bot. t. 205. (Franca maritima ſupina ſaxatilis glauca ericoides ſempervirens, flore purpureo; Mich. Gen. 23. t. 22. f. 1.)—Leaves linear, cluſtered, ciliated at the baſe. Stem nearly ſmooth.—Found on the ſea coaſts of the ſouthern parts of Europe in a muddy ſoil, flowering in July. The *root* is perennial and woody. *Stems* procumbent, branched, forked, leafy, round, perennial, ſmooth or nearly ſo, except the young branches, which are downy. *Leaves* cluſtered, on ſhort ſtalks, oblong, revolute, pointed, glaucous, ſmooth; fringed at the baſe. *Flowers* ſolitary, ſeſſile, either in the forks of the ſtem or at the ends of the branches. They reſemble thoſe of a *Lychnis* in miniature, and are uſually pink; Micheli ſays they are ſometimes white.

F. *Nothria*. Thunb. Prod. 58. Willd. Sp. Pl. v. 2. 242. (Nothria repens; Berg. Cap. 171. t. 1. f. 2.); is certainly the ſame plant, and not even a variety, though a native of the Cape of Good Hope. The character of the ſharp petals, given by Willdenow, is merely taken from Bergius's figure, which is faulty. He himſelf deſcribes them rounded and obtuſe, as we find them in a Cape ſpecimen. Neither Bergius nor Thunberg ſeems to have known any thing of *Frankenia lævis*, or the latter would ſcarcely have made of it a new ſpecies, nor the former a new genus.

2. F. *hirſuta*. Hairy Sea-Heath. Linn. Sp. Pl. 473. Sm. Prodr. Fl. Græc. Sibth. v. 1. 243. (Franca maritima ſupina multiflora candida, caulibus hirſutis, foliis quaſi vermiculatis; Mich. Gen. 23. t. 22. f. 2.)—Leaves linear, cluſtered, ciliated at the baſe. Stem hairy.—Native of the ſea-coaſts of Italy, Barbary, Greece and the Archipelago, in moiſt places, flowering in July. We can ſcarcely think this more than a hairy and rather luxuriant variety of the former. The character of the flowers growing in terminal cluſters, taken by Linnæus from Micheli's plate, does by no means hold good, though the abundance of bloom on luxuriant ſpecimens gives them that appearance. They are produced from the forks of the *ſtem*, as well as from the ends of the branches, and it is only when thoſe branches are ſhort, and frequently forked, that the *flowers* acquire a cluſtered aſpect. The *leaves* ſeem to become more glaucous in proportion as the plant is more luxuriant.

Theſe are pretty plants, but extremely difficult of culture. The *Arenaria rubra*, ſo common on our ſandy heaths and ſea ſhores, is no mean imitation of them.

3. F. *microphylla*. Small-leaved Sea-Heath. Cav. Ic. v. 6. 77. t. 597. f. 1.—Leaves elliptical, revolute, ſmooth, imbricated in four rows. Stem ſmooth. Petals crenate.—Gathered by Louis Née at Port Deſire in South America, flowering in December. The *ſtems* are ſhrubby, much branched, decumbent, ſcarcely ſix inches long, ſmooth like every other part of the plant. *Leaves* oppoſite, united at the baſe, imbricated in four rows, ſmall, elliptical, entire, revolute, naked, concave underneath. *Flowers* terminal, ſolitary, ſeſſile, erect, whitiſh; the petals dilated and crenate at the extremity.

We know this only by Cavanilles' deſcription and figure,

which leave no doubt of its being diſtinct from both the preceding, of which its ſmooth naked imbricated leaves afford a deciſive mark.

4. F. *tetrapetala*. Four-petalled Sea-Heath. Billard. Nov. Holl. v. 1. 88. t. 114.—Leaves awl-ſhaped, fleſhy, dotted, ſmooth, oppoſite, ſpurred at the baſe. Petals four, obtuſe.—Gathered by Billardiere in Van Diemen's land. The *ſtems* are ſhrubby, proſtrate, apparently ſmooth, longer than the laſt, throwing up numerous ſhort, erect, ſimple or divided, leafy branches. *Leaves* oppoſite, ſomewhat imbricated, dotted with glandular pores, awl-ſhaped, with a longitudinal furrow on the upper ſide. *Flowers* terminal, ſolitary, ſeſſile. Segments of the *calyx* deep, downy at the edge, four only in number as well as the *petals*. The *ſtamens* and *piſtils* however are each of the number proper to the genus. Nothing is ſaid of the colour of the flowers, for though M. La Billardiere gathered them freſh, it appears from this and other inſtances, that his deſcriptions and figures were generally made from the dried ſpecimens after his return to Europe. Their accuracy therefore confers the more honour on their author.

5. F. *pulverulenta*. Powdery Sea-Heath. Linn. Sp. Pl. 474. Sm. Fl. Brit. 388. Hudſ. 138. Sm. Prodr. Fl. Græc. Sibth. v. 1. 243. (Franca maritima quadrifolia annua ſupina, chamæſyces folio et facie, flore ex albo purpuraſcente; Mich. Gen. 23. Alſine maritima ſupina, foliis chamæſyces; Dill. in Raii Syn. 352. Quadrifoglio annuo, piante di Perſia; Zannon. Iſt. 164. t. 66.)—Leaves obovate, abrupt, downy and powdery beneath.—Native of ſea-ſhores throughout the ſouth and eaſt of Europe, flowering in July. Dillenius and Hudſon report that it grows in Suſſex, but we have never ſeen an Engliſh ſpecimen. The *root* is annual. *Stems* numerous, proſtrate, repeatedly forked and divaricated, nearly ſmooth, except the oppoſite ſides of the young branches. *Leaves* oppoſite, two pair at every joint, nearly ſeſſile, obovate, entire, very obtuſe, ſomewhat revolute, ſmooth and green above, downy and rather powdery beneath. *Flowers* axillary and terminal, pale purple, with rounded crenate petals.—Micheli erroneouſly makes two ſpecies of this, ſuppoſing Zannoni's plant different from his own.

It is obſervable in this genus that the number of the ſtamens, ſix, bears an analogy to the three ſtigmas and three valves of the capſule, and not to the petals, nectaries, or ſegments of the calyx, which are each uſually five. This is a rare inſtance in nature, but not unique in the natural order to which it belongs, ſeveral of the genera of which have three ſtamens in a five-cleft flower.

FRANKENSTEIN, in *Geography*, a town of Sileſia, in the principality of Munſterburg, on the river Bautze; 12 miles S.S.W. of Glatz. N. lat. 51° 25'. E. long. 16° 42'.—Alſo, a town of Germany, in the circle of the Upper Rhine; 5 miles S.E. of Darmſtadt.—Alſo, a town of France, in the department of Mont-Tonnerre; 20 miles S.E. of Deux Ponts.

FRANKENWINHEIM, a town of Germany, in the principality of Wurzburg; 4 miles S.W. of Geroltzhoſen.

FRANKERAU, a town of Pruſſia, in the province of Ermeland; 10 miles S. of Heilſberg.

FRANKFORT. See FRANCFORT.

FRANKFORT, a poſt-town of America, in Hancock county, and ſtate of Maine, on the W. ſide of Penobſcot bay, 8 miles W. of Penobſcot; containing 867 inhabitants.

FRANKFORT, or *Frankford*, a pleaſant thriving village of America, in the county of Philadelphia and ſtate of Pennſylvania, on the N.E. ſide of a creek of the ſame name, 1½ mile from Delaware river, containing 100 houſes, an epiſcopal, and a German church; about 5 miles N.E. of Philadelphia.—Alſo, a new townſhip in Herkemer county, New York, E. of Whiteſtown; containing 946 inhabitants.—Alſo, a thriving village in Hampſhire county, Virginia, ſeated on a creek which empties itſelf into Potowmack river; 13 miles N.W. of Rumney.—Alſo, the capital of Pendleton county, Virginia, ſituated on the W. ſide of Potowmack river, containing a court-houſe, gaol, and about thirty houſes; 180 miles N.W. of Richmond.—Alſo, a poſt-town, and the metropolis of Kentucky, ſituated in Franklin county, on the N.E. bank of Kentucky river, about 50 miles from its confluence with the Ohio. It is a flouriſhing town, regularly laid out, and has a number of good houſes. The ſtate-houſe is a handſome building. It contains 628 inhabitants. N. lat. 38° 14'. W. long. 95° 28'.

FRANKINCENSE, or ſimply *Incenſe*, an odoriferous aromatic gum, or reſin, anciently burnt in temples, as a perfume, and now uſed in pharmacy, as an agglutinant and ſtrengthener.

The word is formed from the Latin *incenſum*, *burnt*; as alluding to its ancient uſe in temples.

Frankincenſe diſtils from inciſions made in a tree called *arbor thuriſera*, during the heats of ſummer. But notwithſtanding the great uſe of this gum, both in the ancient religion, and the modern medicine, the tree that produces it, or even the place where the tree grows, has been but little known.

The moſt common opinion has always been, that it was brought from Arabia Felix, and was found near the city of Saba; whence its epithet *Sabæum*; and yet the name *olibanum*, which it ſometimes alſo bears, ſeems to intimate, that there are of theſe thuriferous or incenſe-bearing trees in the Holy-land, near mount Lebanon. And travellers are poſitive that there are others in the Eaſt Indies.

Nor are we leſs at a loſs as to the form or kind of the tree from which it flows. Pliny contents himſelf to ſay, that it at firſt reſembles the pear-tree; then the maſtich-tree; then the laurel; but that in reality it is a kind of turpentine-tree. This gummy reſinous ſubſtance is ſaid to ooze ſpontaneouſly from the bark of the *Juniperus lycia*, appearing in drops or tears, of a pale yellowiſh, and ſometimes of a reddiſh colour.

Frankincenſe is uſually divided into male and female.

The beſt *male incenſe*, *thus maſculum*, called alſo *olibanum*, (which ſee,) is in fair white bits or tears, a little yellowiſh, of a bitter diſagreeable taſte; and when chewed it promotes the flux of ſaliva, which becomes white. When laid on coals, or a red-hot iron, it flames and burns with a ſtrong and not unpleaſant ſmell. On trituration with water, the greateſt part diſſolves into a milky liquor, which depoſits a reſinous matter, and, being gently inſpiſſated, leaves a yellow extract, retaining the greateſt part of the ſmell as well as taſte of the olibanum. Rectified ſpirit diſſolves leſs than water; nevertheleſs it extracts nearly all its active matter.

This drug has received different appellations according to its different appearances: the ſingle tears are called ſimply *olibanum*, or *thus*; when two are joined together, *thus maſculum*; and when two are very large, *thus femininum*; if ſeveral adhere to the bark, *thus corticoſum*: the fine powder which rubs off from the tears is denominated *mica thuris*; and the coarſer *manna thuris*.

That brought from the Indies is not near ſo good as that from Arabia or mount Lebanon; it is ſometimes called incenſe of Mocha; though it be not brought from that city.

It is often in a maſs, but ſometimes in looſe drops or tears; ſomewhat reddiſh, and bitter to the taſte. Some ſell this for the true bdellium.

Male incenſe, or *olibanum*, was formerly an ingredient in divers Galenical and chemical preparations: and was uſed, not only in divers diſeaſes of the head and breaſt, but in vomitings, diarrhœas, and dyſenteries. The doſe was from a ſcruple to a dram or more. Externally, it was applied to ſtrengthen the brain, and heal wounds. Some uſed it to aſſuage the tooth-ach; but it is apt to ſpoil the good teeth. Riverius found it of great efficacy in pleuriſies, which were ſaid to be epidemic; and Geoffroy likewiſe experienced its ſucceſs in theſe diſeaſes, eſpecially after veneſection. At preſent, however, recourſe is ſeldom had to this medicine, which is now ſuperſeded by myrrh, and other articles of a leſs ſtimulating kind.

As for female incenſe, or frankincenſe, authors deſcribe it to be ſofter, and more reſinous, but of leſſer virtue than the former. This common frankincenſe is brought to us in little globes or maſſes, of a browniſh or yellowiſh colour on the outſide, internally whitiſh, and variegated with whitiſh ſpecks. This reſin has a bitteriſh, acid, unpleaſant taſte, and no conſiderable ſmell; it diſſolves totally in rectified ſpirit, but is ſcarcely acted upon by watery menſtrua. It may be looked upon as a mild corroborant; though at preſent it is little otherwiſe made uſe of than as an ingredient in theriaca, and externally in plaſters. Lewis, Mat. Med.

Bark of incenſe, *cortex thuris*, is the bark of the tree whence the incenſe flows, which has the ſame qualities with the incenſe itſelf.

There is another bark brought from the Indies, called alſo bark of incenſe, and ſometimes Jews' incenſe, becauſe the Jews make frequent uſe thereof in their perfume: this is the *cortex eleutheriæ*.

Manna of incenſe is the flour, or farina of incenſe, occaſioned by the friction of the grains againſt each other in the ſacks wherein they carry it.

There is alſo a ſort of incenſe, which is a preparation of it, burnt like reſin to make lamp-black.

Frankincenſe was formerly burnt in the temples of all religions, to do honour to the divinities that were there adored. Many of the primitive Chriſtians were put to death, becauſe they would not offer incenſe to idols.

In the Romiſh church they ſtill retain the uſe of incenſe in ſome of their ceremonies; always at high-maſs, and at the elevation of the hoſt at veſpers; and at ſolemn funerals, beſtowing it on ſuch perſons as they would honour, as on prelates, &c. and ſometimes alſo on the people.

FRANKLAND'S ISLANDS, in *Geography*, a cluſter of ſmall iſlands on the N.E. coaſt of New Holland, in the South Pacific ocean, about two leagues diſtant from the main land. S. lat. 17° 12'. E. long. 146°.

FRANKLANDIA, in *Botany*, ſo named by Mr. Robert Brown, in his valuable paper on the natural order of *Proteaceæ*, in honour of the preſent ſir Thomas Frankland, bart. F.R.S. and F.L.S., an excellent Engliſh botaniſt, whoſe obſervations, illuſtrated by microſcopic drawings of his own, relating to ſubmarine plants, it is hoped may one day be communicated by himſelf to the public. This genus is happily choſen for the purpoſe, on account of the fucus-like appearance of the leaves.—Brown Tranſ. of Linn. Soc. v. 10. 157. Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Proteaceæ*.

Gen. Ch. *Cal.* none, except the corolla be taken for ſuch. *Cor.* of one petal, ſalver-ſhaped, inferior; tube permanent, at length indurated; limb in four deep ſegments, ſpreading, flat, equal, deciduous. Nectary four glands at the baſe of the germen, united into a tube. *Stam.* Filaments four, adhering through their whole length to the tube of the corolla; anthers oblong, included in the tube; pollen ſpherical. *Piſt.* Germen ſuperior, ſtalked; ſtyle ſimple, the length of the tube; ſtigma . . . *Peric.* Nut ſpindle-ſhaped, ſtalked, dilated at the top, and crowned with longiſh down. Cotyledons very ſhort.

Eſſ. Ch. Corolla ſalver-ſhaped; limb in four deep, flat, deciduous ſegments; tube permanent. Anthers included, adhering to the tube. Nectariferous glands united into a cylinder. Nut ſpindle-ſhaped, ſtalked, crowned with long down.

1. F. *fucifolia*. Native of Lewins' land, on the ſouth coaſt of New Holland, in moiſt heaths. *Mr. Brown*. A ſmooth *ſhrub*. Leaves alternate, thread-ſhaped, dichotomous. *Spikes* axillary, ſimple. *Flowers* alternate, of a dull yellow, each accompanied by one *bractea*.

FRANKLIN, BENJAMIN, in *Biography*, was born at Boſton, in New England, in 1706; but he ſprung from a Northamptonſhire family, who had, for many generations, poſſeſſed ſome freehold property at Eaton in that county. It was on account of the perſecutions carried on in the reign of Charles II. againſt the Nonconformiſts, that the father of Benjamin left England for America, where he carried on the trade of a tallow chandler. In that occupation the ſubject of this article was employed in early life; but it was ill adapted to his diſpoſition, and he felt unwilling to continue pulling cottons, filling moulds, and other employment to which his youth was equal, and was anxious to embark in a ſea-faring life. This was oppoſed by his father, who took every care to inſpire in his ſon the principles of morality; and in his ſcanty library Benjamin found books which he read with avidity; but Defoe's "Eſſay on Projects" was the work which gave him moſt delight, and which left on his mind impreſſions that influenced the principal events of his life. His inclination for books determined his father to place him as apprentice to an elder brother, a printer at Boſton. He was accordingly bound to him in the year 1717, when he was ſcarcely twelve years of age. He ſoon became a proficient in the mechanical part of the buſineſs, and ſeized every opportunity for reading books that he could borrow from his acquaintance; in which amuſement he ſpent the greater part of his nights. He ſoon began to indulge himſelf in writing ballads and other poetical pieces; but it is ſaid his father ſpeedily ſatisfied him that this was not the ſpecies of compoſition in which he could excel, and his next efforts were directed to proſe compoſition, in which his ſucceſs is well known and duly appreciated. With a paſſion for reading and writing he imbibed a kindred one for diſputation, and adopting the Socratic method, he became dextrous in confuting and confounding an antagoniſt by a ſeries of queſtions. This courſe gave him a ſceptical turn with regard to religion, and while he was young he took every opportunity of propagating his tenets, and with as much zeal as is ſhewn by a new convert to any other doctrine. He was, however, ſoon convinced, by the effect produced on ſome of his companions, that it was extremely dangerous to looſen the ties of religion without the probability of ſubſtituting other principles equally efficacious. The doubts which ſubſiſted in his own mind he was never able to remove; but he was not deficient in fortifying himſelf with ſuch moral principles, as directed him to the moſt valuable ends by honourable means. He, by habits of ſelf-denial, early formed in his mind, obtained a complete dominion over his appetites, ſo that at the age of ſixteen he readily diſcarded animal food from the conviction produced

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in his mind by perusing a work on the subject. He now offered his brother to maintain himself for half the sum paid for his board, and even with this he was able to make savings to purchase what books he wanted. In his brother he found a harsh master, and Benjamin felt indignant at the treatment which he experienced from him in the way of business. The brother had set up a newspaper, in which the apprentice contrived to insert some papers and essays anonymously, that were read and highly commended by people of the best judgment and taste in the town. The young man began now to feel his importance, which was still more impressed on him by having the paper published in his own name, that of his brother, for some political offence, having been interdicted by the state. In consequence of this his indentures were cancelled, and he went to New York, and from thence to Philadelphia. Here he contracted an acquaintance with some young men of a literary turn, in whose society he spent his evenings and improved his taste. At Philadelphia he obtained the notice of sir William Keith, the governor, who urged him to set up for himself, at the same time promising him support and protection. Franklin attempted to gain pecuniary aid from his parents, but was disappointed; the governor then persuaded him to make a voyage to England to furnish himself with all necessaries for a new printing-office. He embraced the proposal, and accompanied by his friend Ralph he sailed for England in 1725. Before his departure, he exchanged promises of fidelity with Miss Read of Philadelphia, with whose father he had lodged. Upon his arrival in London, Mr. Franklin found that governor Keith, upon whose letters of credit and recommendation he had relied, had entirely deceived him. He was now obliged to work as a journeyman printer, and obtained employment in an office in Bartholomew-close. His friend did not so readily find the means of subsistence, and was a constant drain upon the earnings of Franklin. In this great city the morals of the young travellers were not much improved; Ralph forgot, or acted as if he had forgotten, that he had a wife and child across the Atlantic; and Franklin was as little attentive to the promises and engagements he was under to Miss Read. About this period he published "A Dissertation on Liberty and Necessity, Pleasure and Pain," dedicated to Ralph, and intended as an answer to Woolaston's "Religion of Nature." This piece gained for him some degree of reputation, and introduced him to the acquaintance of Dr. Mandeville, author of the "Fable of the Bees," and some other literary characters. Franklin was always temperate and industrious, and his habits in these respects were eventually the means of securing his morals, as well as of raising his fortune. In the interesting account which he has left of his own life, Mr. Franklin has given a narrative of the method which he took in reforming the sottish habits of his fellow workmen in the second printing-office in which he was engaged in London, and which was situated in the neighbourhood of Lincoln's-inn-fields. He tried to persuade them that there was more real sustenance in a penny roll than in a pint of porter; at first the plan of economy which he proposed was treated with contempt or ridicule, but in the end he was able to induce several of them to substitute a warm and nourishing breakfast in the place of stimulating liquors. In 1726 he returned to Philadelphia, where he first engaged himself as clerk in a mercantile house; and in the course of a year he became the superintendant of Keimer's printing-office, where he acquired so much esteem, and so far improved his connections, that he resolved to embark in business for himself. He entered into partnership with a fellow workman named Meredith, whose friends were enabled to furnish a supply of money sufficient for the concern, which was no doubt very small; for Franklin has recorded the high degree of pleasure which he experienced from a payment of five shillings only, the first fruits of their earnings. "The recollection," says this noble spirited man, "of what I felt on this occasion, has rendered me more disposed, than perhaps I might otherwise have been, to encourage young beginners in trade." His habitual industry and undeviating punctuality obtained him the notice and business of the principal people in the place. He instituted a club under the name of "the Junto," for the purpose of the discussion of political and philosophical questions, which proved an excellent school for the mutual improvement of its several members. The test proposed to every candidate before his admission was this; "Do you sincerely declare that you love mankind in general, of what profession or religion soever? Do you think any person ought to be harmed in his body, name, or goods, for mere speculative opinions, or his external way of worship? Do you love truth for truth's sake; and will you endeavour impartially to find and receive it yourself, and communicate it to others." Mr. Franklin and his partner ventured to set up a new public paper, which his own efforts as writer and printer caused to succeed, and they obtained likewise the printing of the votes and laws of the assembly. In process of time, Meredith withdrew from the partnership, and Franklin met with friends who enabled him to undertake the whole concern in his own hands, and add to it the business of a stationer. A discussion concerning a new emission of paper-money taking place, he wrote an anonymous pamphlet in favour of the measure, which was received with applause, and which contributed to the success of the measure, and to the prosperity of the writer. In 1730 he married the lady to whom he had pledged his vows before he embarked for England, although, from his neglect of her, she had been before married to a man then dead. The establishment of a public library was one of the useful projects of Franklin, which he brought to effect in 1731, and he had the satisfaction of seeing it advance to that flourishing state which it has long maintained. In 1732 he began to publish "Poor Richard's almanac," a work which became remarkable by the number of excellent prudential maxims occasionally inserted in it, calculated, by their conciseness, to be readily and indelibly impressed on the memory. They have been since collected into a single piece, entitled "The way to wealth," which has been published in a variety of forms. The political career of Benjamin Franklin began in the year 1736, when he was appointed clerk to the general assembly of Pennsylvania; an office which he held for several years, till he was at length elected a representative. In the following year he obtained the valuable office of post-master to the city of Philadelphia. In 1738 he improved the police of the city, with respect to the dreadful calamity of fire, by forming a society called a fire company, to which was afterwards added an assurance office against losses by fire. In the French war of 1744 he stood forth and proposed a plan of voluntary association for defence, which was shortly joined by 10,000 persons. Franklin was chosen colonel of the Philadelphia regiment, which he did not accept, on account of the pursuits in which he was then engaged. Peter Collinson had sent to the library society of Philadelphia an account of the curious facts relative to electricity, which then absorbed the attention of the European philosophers, together with a tube for experiments, and directions for its use. Franklin, with some of his friends, immediately began to apply to the subject, and in a short time he made many valuable and highly important discoveries, an account of which he published in three pieces, entitled "New experiments and observations in Electricity, made at Philadelphia in America." Although we may generally refer to the articles

ELECTRICAL *Attraction* and *Repulſion*, ELECTRICITY, &c. for full information on this ſubject, yet we cannot forbear giving ſome account of Mr. Franklin's diſcoveries. Having been led to think, that in the excitation of the electric tube the fluid was conveyed from the perſon who rubbed it, to him who touched it, he deſignated the ſtate of the latter, by the expreſſion of being electrified *poſitively* or *plus*, as having received more than his original quantity, while the former was ſaid to be electrified *negatively* or *minus*, as having loſt a part of his natural portion. This led to the diſcovery of the Leyden phial, the theory of which is, that when one ſide of the glaſs is electrified plus, the other ſide is electrified minus; ſo that in charging it, all that is done is to throw the electricity from one ſide, and convey it to the other, while diſcharging it is the reſtoration of the equilibrium. He farther demonſtrated, by deciſive experiments, that the accumulated electricity in the charged ſide of the phial reſided not in the coating, but in the glaſs itſelf; but the moſt brilliant of his diſcoveries was that which proved the identity of the electric fluid and lightning. Their ſimilarity had been ſuſpected by the abbé Nollet, and ſome experiments had begun to be made in France towards the verification of the fact, but Franklin completed the proof of it entirely by his own experiments. In the year 1749 he conceived the idea of explaining the phenomena of thunder-guſts, and of the aurora borealis upon electrical principles; he pointed out many particulars, in which lightning and electricity agreed, and he adduced many facts and reaſonings, from facts, in ſupport of his poſitions. In the ſame year he thought of aſcertaining the truth of his doctrine by drawing down the forked lightning, by means of ſharp-pointed iron rods raiſed into the region of the clouds. Admitting the identity of electricity, and knowing the power of points in conducting away ſilently the electric fluid, he ſuggeſted the idea of ſecuring houſes, ſhips, &c. from the damages to which they were liable from lightning, by erecting pointed iron rods, which ſhould riſe ſome feet above the moſt elevated part, and deſcend ſome feet into the ground, or the water. The effect of theſe, he concluded, would be either to prevent a ſtroke by repelling the cloud beyond the ſtriking diſtance, or by drawing off the electrical fluid which it contained; or, at leaſt, conduct the ſtroke to the earth, without any injury to the building. It was not till the ſummer 1752, that Mr. Franklin was enabled to complete his grand experiment. The plan which he propoſed was, to erect on ſome high tower, or other elevated place, a ſort of hut, from which ſhould riſe a pointed iron rod, inſulated by being fixed in a cake of reſin. Electrified clouds paſſing over this would, he conceived, impart to it a portion of their electricity, which might be rendered evident to the ſenſes by ſparks being emitted, when the knuckle or other conductor was preſented to it. While he was waiting for the erection of a ſpire, it occurred to him, that he might have more ready acceſs to the region of clouds by means of a common kite; he accordingly prepared one for the purpoſe, affixing to the upright ſtick an iron point. The ſtring was, as uſual, of hemp, except the lower end, which was ſilk, and where the hempen part terminated, a key was faſtened. With this ſimple apparatus, on the appearance of a thunder ſtorm approaching, he went into the fields, accompanied by his ſon, to whom alone he communicated his intentions, dreading, probably, the ridicule which frequently awaits unſucceſsful attempts in experimental philoſophy. For ſome time no ſign of electricity appeared; he was beginning to deſpair of ſucceſs, when he ſuddenly obſerved the looſe fibres of the ſtring to ſtart forward in an erect poſition. He now preſented his knuckle to the key, and received a ſtrong ſpark. How exquiſite muſt his ſenſations have been at this moment? On this experiment depended the fate of his theory; repeated ſparks were drawn from the key, a phial was charged, a ſhock given, and all the experiments made, which are uſually performed with electricity. He immediately fixed an inſulated iron rod upon his houſe, which drew down the lightning, and gave him an opportunity of examining whether it were poſitive or negative, and hence he applied his diſcovery to the ſecuring of buildings from the effects of lightning. (See CONDUCTOR.) Previouſly to his experiments in electricity he applied his mechanical and philoſophical knowledge to the conſtruction of *fire-places* (which ſee), combining the qualities of an open grate with that of a ſtove. As a politician he had been elected a repreſentative of the city of Philadelphia to the general aſſembly of the province. His principles in favour of equality of rights led him always to take the popular ſide, and he quickly obtained ſuch an influence that he was regarded as the head of the party. The ability and punctuality which he had diſplayed in his office of poſt-maſter, cauſed him, in 1753, to be raiſed to the important employ of deputy poſt-maſter for the Britiſh colonies. He was uſeful in various other capacities to the government, and when in 1757 the militia was to be diſbanded by orders from England, he ſailed for London, in the capacity of agent for Pennſylvania, the aſſembly of which was involved in warm diſputes with the proprietary intereſt. After much diſcuſſion before the privy council, it was agreed, that the proprietary lands ſhould take their ſhare in a tax for the public ſervice, provided that Franklin would engage that the aſſeſſment ſhould be fairly proportioned. The meaſure was accordingly carried into effect, and he remained at the Britiſh court as agent for his province, and his reputation cauſed him alſo to be entruſted with the like commiſſion from Maſſachuſets, Maryland, and Georgia. The moleſtation received by the Britiſh colonies from the French in Canada induced him to write a pamphlet, pointing out the advantages of a conqueſt of that province by the Engliſh; and the ſubſequent expedition againſt it, and its retention under the Britiſh government, at the peace, were, it is believed, much influenced by the force of his arguments on the ſubject. About this period his talents, as a philoſopher, were duly appreciated in various parts of Europe. He was admitted a fellow of the Royal Society of London, and the degree of doctor of laws was conferred upon him at St. Andrew's, Edinburgh, and Oxford.

He returned to America in 1762, where he received the thanks of the aſſembly for his ſervices, and a remuneration for his labours undertaken and accompliſhed on their behalf. He reſumed his ſeat in that body, to which he had been annually elected during his abſence, and continued to diſtinguiſh himſelf as a friend to the cauſe of the people. The active part which he took againſt the proprietary intereſt occaſioned the loſs of his election in 1764, but he was immediately re-appointed agent for the province, and embarked again for England. It was at this period that the ſtamp-act excited ſuch violent commotions in America; and Dr. Franklin, almoſt immediately after his return to London, was called to the bar of the houſe of commons, to give evidence reſpecting the diſpoſitions of the people to ſubmit to it. His repreſentations had a conſiderable effect in producing the repeal of that obnoxious meaſure. In the years 1766 and 1767 he paid viſits to Holland, Germany and France, where he met with a very diſtinguiſhed reception. In 1773 he attracted the public attention by a letter on the duel between Mr. Whately and Mr. Temple concerning the publication of governor Hutchinſon's letters, avowing himſelf to be the perſon who obtained theſe letters and tranſmitted

mitted them to the legiſlature in America, which he had done from a ſenſe of duty as the agent of the colony. This occaſioned a violent clamour to be raiſed againſt him, and upon his attending before the privy council in the following January, to preſent a petition from the colony for the diſmiſſion of Mr. Hutchinſon, a moſt virulent invective was pronounced againſt him by Mr. Wedderburne, filled with all the abuſe which too frequently characterizes the eloquence of the bar. In a very ſhort time after this he was removed from his office of poſt-maſter-general for America. Finding all his efforts to reſtore harmony between Great Britain and the colonies uſeleſs, he returned to America in 1775, juſt after the commencement of hoſtilities, and being named one of the delegates of the continental congreſs, he had the principal ſhare in bringing about the revolution and declaration of independence on the part of America. In 1776, he was deputed by congreſs to Canada, to negociate with the people of that country, and to perſuade them to throw off the Britiſh yoke; but the inhabitants of Canada had been ſo much diſguſted with the zeal of the people of New England, who had burnt ſome of their chapels, that they refuſed to liſten to the propoſals made to them by Dr. Franklin. On the arrival of lord Howe in America in 1776, he entered upon a correſpondence with him on the ſubject of reconciliation. He was afterwards appointed, with two others, to wait upon the Engliſh commiſſioners, and learn the extent of their powers, but as theſe only went to the granting pardon upon ſubmiſſion, he joined his colleagues in conſidering them as inſufficient. Dr. Franklin was decidedly in favour of a declaration of independence, and was appointed preſident of the convention aſſembled for the purpoſe of eſtabliſhing a new government for the ſtate of Pennſylvania. When it was determined by congreſs to open a public negociation with France, Dr. Franklin was fixed upon to go to that country, and he brought about the treaty of alliance offenſive and defenſive, which produced an immediate war between England and France. Dr. Franklin was one of the commiſſioners who, on the part of the United States, ſigned the proviſional articles of peace in 1782, and the definitive treaty in the following year. Before he left Europe, he concluded a treaty with Sweden and Pruſſia. By the latter he obtained ſeveral moſt liberal and humane ſtipulations in favour of the freedom of commerce, and the ſecurity of private property during war, in conformity to thoſe principles which he had ever maintained on theſe ſubjects. Having ſeen the accompliſhment of his wiſhes in the independence of his country, he requeſted to be recalled, and after repeated ſolicitations Mr. Jefferſon was appointed in his ſtead. On the arrival of his ſucceſſor he repaired to Havre de Grace, and croſſing the Engliſh channel, landed at Newport in the Iſle of Wight, from whence, after a favourable paſſage, he arrived ſafe at Philadelphia, in Sept. 1785. Here he was received amidſt the acclamations of a vaſt and almoſt innumerable multitude, who had flocked from all parts to ſee him, and who conducted him in triumph to his own houſe, where in a few days he was viſited by the members of congreſs, and the principal inhabitants of Philadelphia. He was afterwards twice choſen preſident of the aſſembly of Philadelphia; but in the year 1788 the increaſing infirmities of his age obliged him to aſk and obtain permiſſion to retire and ſpend the remainder of his life in tranquillity, and on the ſeventeenth of April 1790 he cloſed, in ſerenity and reſignation, his active and uſeful life, having attained the great age of eighty-four years and three months. He left behind him one ſon, a zealous loyaliſt, and a daughter married to a merchant in Philadelphia. Dr. Franklin was author of many tracts on electricity, and other branches of natural philoſophy, as well as on political and miſcellaneous ſubjects. Many of his papers are inſerted in the Philoſophical Tranſactions of London; and his eſſays have been frequently reprinted in this country as well as in America, and have, in common with his other works, been tranſlated into ſeveral modern languages. Franklin's Life by himſelf. Prieſtley's Hiſt. of Electricity.

FRANKLIN, in *Geography*, a county of America, being the north-weſternmoſt in Vermont, bounded N. by Lower Canada, and W. by lake Champlain. It contains 20 townſhips, and 8781 inhabitants.—Alſo, a county in Pennſylvania, bounded N. by Mifflin, N.E. by Cumberland, E. by York, S. by Waſhington county in Maryland, W. by Bedford county, and N.W. by Hunterdon. It is computed to contain 800 ſquare miles, equal to 512,000 acres. It comprehends the middle part of the beautiful and rich valley of Conegocheague, watered by the creek of its name, which falls into Potowmack at Williams port in Maryland. Iron ore is found in this county ſufficient to furniſh work for a furnace and forge. The county is divided into 14 townſhips, containing 19,638 inhabitants.—Alſo, a poſt-town in Venango county, Pennſylvania; 322 miles from Waſhington.—Alſo, a poſt-town of Ohio; 560 miles from Waſhington.—Alſo, a poſt-town of Pendleton county, in Virginia; 191 miles from Waſhington.—Alſo, a poſt-town in Williamſon county, Teneſſee; 575 miles from Waſhington.—Alſo, a town in Ducheſs county, New York, on the Connecticut line, 10 miles N.W. of Danbury; containing 1546 inhabitants.—Alſo, a county of Kentucky, bounded N. by Scott county, N.W. and W. by Shelby, S.E. by Fayette, and S. by Woodford. It contains 4450 inhabitants, of whom 1109 are ſlaves. The chief town is Frankfort.—Alſo, a county in Halifax diſtrict, North Carolina, containing 8473 inhabitants, of whom 3667 are ſlaves. It is bounded N. by Greenville, S. by Johnſton, N.E. by Warren, S.W. by Wake, and W. by Orange county. The chief town is Lewiſburg.—Alſo, a county in Virginia, bounded N. by Bedford, N.W. by Botecourt, W. by Montgomery, S.W. by Henry, S. by Patrick, and E. by Campbell county. It is about 40 miles long, and 25 broad, and contains 7728 free inhabitants, and 1574 ſlaves. It is generally hilly, and is traverſed on the N.W. by a range of the Alleghany mountains.—Alſo, a county in Georgia, ſituated in the upper diſtrict, bounded E. and N.E. by Tugulo river, which ſeparates it from the ſtate of South Carolina; W. and N.W. by the country of the Cherokees; S. by the head branches of Broad river; and S.E. by Elbert county. It contains 6859 inhabitants, of whom 959 are ſlaves. The court-houſe is 77 miles from Waſhington.—Alſo, a townſhip in Norfolk county, Maſſachuſets, incorporated in 1778, and containing 17,000 acres of land, and 1285 inhabitants. It is bounded N. by Charles river, which ſeparates it from Medway, and lies 30 miles S. of Boſton.—Alſo, a ſmall iſle at the mouth of St. George's river, in Lincoln county, and ſtate of Maine; four leagues ſouthward of Thomaſton.—Alſo, a poſt-town in Delaware county, S.W. from, and bordering on, Harpersfield, and its W. line runs along the ſouth-eaſtern bank of the Suſquehannah river. This town was divided by an act of the legiſlature in 1747. It contains 1390 inhabitants.—Alſo, a townſhip in Weſtmoreland county, Pennſylvania.—Alſo, three others in the ſame ſtate, *viz.* in York county, Fayette county, and Waſhington county.—Alſo, a townſhip, being the northernmoſt in New London county, Connecticut, 6 miles N.W. of Norwich; containing 1210 inhabitants, who are chiefly wealthy farmers.—Alſo, a county in the ſtate of Ohio.

FRANKLIN *College*. See LANCASTER.

FRANKLIN, *Fort*, was erected in 1787 in Alleghany county, Pennſylvania, near the poſt called Venango, in order to defend the frontiers of Pennſylvania from the depredations of the neighbouring Indians. It is ſeated on the S.W. bank of Alleghany river, oppoſite to the mouth of the French creek; 53 miles S.S.E. of Preſque iſle, and 63 northward of Pittſburg. N. lat. 41° 1′ 40″. W. long. 79° 41′.

FRANKLINIA, in *Botany*, named by Marſhall in honour of the celebrated Dr. Benjamin Franklin. See GORDONIA.

FRANKS, in *Geography*, a town of Huntingdon county, Pennſylvania, on the Frankſtown branch of Juniatta river, 20 miles W. of Huntingdon, and containing 743 inhabitants.

FRANKS, *Francs*, *Frankis*, or *Franquis*, a name which the Turks, Arabs, Greeks, &c. give to all the people of the weſtern parts of Europe.

The appellation is commonly ſuppoſed to have had its riſe in Aſia, at the time of the croiſades, when the French made the moſt conſiderable figure among the croiſees; from which time the Turks, Saracens, Greeks, Abyſſinians, &c. uſed it as a common term for all the Chriſtians of Europe; and called Europe itſelf Frankiſtan.

The Arabs and Mahometans, ſays M. d'Herbelot, apply the term Franks, not only to the French, (to whom the name originally belonged,) but alſo to the Latins and Europeans in general.

But F. Goar, in his notes on Condinus, cap. 5. n. 43, furniſhes another origin of the appellation Franks, of greater antiquity than the former. He obſerves, that the Greeks at firſt confined the name to the Franci, *i. e.* the German nations, who had ſettled themſelves in France or Gaul, but afterwards they gave the ſame name to the Apulians and Calabrians, after they had been conquered by the Normans; and at length the name was farther extended to all the Latins.

In this ſenſe is the word uſed by divers Greek writers, as Comnenius, &c. who, to diſtinguiſh the French, call them the weſtern Franks.

Du-Cange adds, that about the time of Charlemagne, they diſtinguiſhed eaſtern France, weſtern France, Latin, or Roman France, and German France, which was the ancient France, afterwards called Franconia.

The origin and confederacy of the Franks, whoſe poſterity, in proceſs of time, conquered Gaul, and impoſed their own name on the country (ſee FRANCE), have been the ſubject of learned inveſtigation, and of various conjectures and opinions. It has been ſuppoſed that Pannonia, that Gaul itſelf, and that the northern parts of Germany gave birth to this celebrated colony of warriors. At length (ſays Gibbon, Hiſt. vol. i.) the moſt rational critics, rejecting the fictitious emigrations of ideal conquerors, have acquieſced in a ſentiment, whoſe ſimplicity perſuades us of its truth. They ſuppoſe, that about the year 240, probably under the reign of Gordian III. a new confederacy was formed under the name of Franks, by the old inhabitants of the Lower Rhine, and the Weſer. The diſtrict which they originally inhabited was bounded on the N. by the ocean, on the W. by the ocean and the Rhine, on the S. by the Main, and on the E. by the Weſer: ſo that according to this deſcription they poſſeſſed the preſent provinces of Weſtphalia, Heſſe, and ſome adjacent ſtates. The Chauci, Cheruſci, Catti, and other tribes of inferior power and authority, animated by the love of liberty, counted the enjoyment of it their richeſt treaſure; and of courſe the word that expreſſed this enjoyment was the moſt pleaſing to their ears. Accordingly they deſerved, they aſſumed, they maintained the honourable epithet of "Franks," or "freemen," which concealed, though it did not extinguiſh, the peculiar names of the ſeveral ſtates of the confederacy. Tacit conſent, and mutual advantage, dictated the firſt laws of the union; and it was gradually cemented by habit and experience. This league of the Franks in ſome reſpects reſembles that of the Helvetic body; in which every canton, retaining its independent ſovereignty, conſults with its brethren in the common cauſe, without acknowledging the authority of any ſupreme head, or repreſentative aſſembly. But the principle of the two confederacies was extremely different. A peace of 200 years has rewarded the wiſe and honeſt policy of the Swiſs; whereas the inconſtant ſpirit, the thirſt of rapine, and a diſregard to the moſt ſolemn treaties, diſgraced the character of the Franks. The Rhine, though dignified with the title of the ſafeguard of the provinces, proved to be an imperfect barrier againſt the daring ſpirit of enterpriſe with which the Franks were actuated; their rapid devaſtations ſtretched from the river to the foot of the Pyrenées; nor were they ſtopped by theſe mountains. Spain, which had never dreaded, was unable to reſiſt, the inroads of the Germans. When the exhauſted country no longer ſupplied a variety of plunder, the Franks ſeized on ſome veſſels in the ports of Spain, and tranſported themſelves into Mauritania. Their irruptions into Gaul were repulſed by Aurelian, when he was only tribune of the ſixth legion, when 700 of them were killed, and 300 made priſoners and ſold for ſlaves; and again, in the fourth year of Valerian they made another excurſion, and were defeated by Gallienus; and after the captivity of Valerian, they again invaded Gaul, and having ravaged the moſt wealthy provinces, made an irruption into Italy. At the death of Aurelian, the Franks, and ſome other German tribes, croſſed the Rhine and entered Gaul; and having reduced a great number of the chief cities, in two years conſidered themſelves as maſters of the country; but under the reign of Probus, about A. D. 277, the Franks and other German tribes were driven back into their moraſſes; from which deſcriptive circumſtances we may infer, that the confederacy known by the appellation of "free," already occupied the flat maritime country, interſected, and almoſt overflown by the ſtagnating waters of the Rhine, and that ſeveral tribes of the Friſians and Batavians had acceded to their alliance. The emperor, not ſatisfied with driving them out of Gaul, purſued them acroſs the Rhine, laid waſte their territories, and built ſome forts in their country; but upon their ſuing for peace, they obtained it on condition of their ſupplying the Romans yearly with a quantity of corn, and finding 16,000 men to ſerve in the Roman army. Some of theſe Franks were eſtabliſhed by Probus, on the ſea-coaſt of Pontus, with a view of ſtrengthening the frontiers againſt the inroads of the Alani; but as a fleet ſtationed in one of the harbours of the Euxine fell into their hands, they reſolved, through unknown ſeas, to explore their way from the mouth of the Phaſis to that of the Rhine. They eaſily eſcaped through the Boſphorus and the Helleſpont, and cruizing along the Mediterranean, indulged their appetite for revenge and plunder, by frequent deſcents on the unſuſpecting ſhores of Aſia, Greece, and Africa. The opulent city of Syracuſe was ſacked by a handful of barbarians, who maſſacred the greateſt part of the trembling inhabitants.

From the iſland of Sicily the Franks proceeded to the columns of Hercules, truſted themſelves to the ocean; coaſted round Spain and Gaul, and ſteering their triumphant courſe through the Britiſh channel, at length finiſhed their ſurpriſing voyage, by landing in ſafety on the Batavian

or Friſian ſhores. This event happened about the year 280. Their countrymen, inſtructed by their example to deſpiſe the dangers of the ſea, and animated by the hope of ſimilar ſucceſs, were led to purſue, in the indulgence of their enterpriſing ſpirit, a new road to wealth and glory. When Proculus revolted and aſſumed the title of emperor at Cologne, the Franks at firſt eſpouſed his cauſe, but afterwards abandoned him, and betrayed the uſurper into the emperor's hands. From this period to the fourth year of Diocleſian they continued quiet, till joining ſome Saxon pirates, they plundered the coaſt of Gaul, and carried off an immenſe booty, and an incredible number of captives; but Carauſius having, by the emperor's order, equipped a fleet at Boulogne, and gained ſome advantages over them, they retired for a time to their reſpective countries. In the following year Maximian croſſed the Rhine and deſolated their country; which ſtruck ſuch terror into the minds of the Franks, that two of their kings or chiefs ſubmitted to him, and requeſted to be confirmed by him in their reſpective kingdoms. Maximian granted lands in the vicinity of Treves and Cambray to great numbers of the Franks and Letes, who had ſubmitted themſelves; thoſe territories being almoſt quite deſtitute of inhabitants. A few years after this tranſaction, the Franks reduced Batavia, and that part of Flanders which is watered by the river Eſcaut; but Conſtantius, the father of Conſtantine the Great, marched againſt them and defeated them in battle; and, having obliged them to ſurrender at diſcretion, he tranſplanted them and their families into Gaul, where they were obliged to cultivate the lands which they themſelves had waſted, to pay the uſual tributes and taxes, as ſubjects of the empire, and to ſerve, when wanted, in the Roman armies. From this period, A. D. 293, they continued quiet till the year 306, the firſt year of Conſtantine's reign, when they ſeized the opportunity afforded them by his abſence in Britain to invade Gaul; but the emperor, on his return, purſued them with dreadful havoc acroſs the Rhine, and took many priſoners. During Conſtantine's reign they made ſeveral irruptions into Gaul, which drew upon them very ſevere puniſhment. When Conſtantius, in the blind fury of civil diſcord, about the middle of the fourth century, had abandoned to the barbarians of Germany the countries of Gaul, which ſtill acknowledged the authority of his rival, a numerous ſwarm of Franks and Alemanni were invited to croſs the Rhine by preſents and promiſes, by the hopes of ſpoil, and by a perpetual grant of all the territories which they ſhould be able to ſubdue. Theſe formidable allies the emperor found it difficult to diſmiſs; and, acting the part of undiſciplined robbers, they pillaged 45 flouriſhing cities, and ſeveral towns and villages, and reduced many of them to aſhes. The German barbarians, abhorring the confinement of walls, fixed their independent habitations on the banks of rivers, the Rhine, the Moſelle, and the Meuſe, and ſecured themſelves againſt ſurpriſe by a rude and haſty fortification of large trees, which were felled and thrown acroſs the roads. At this time the Franks occupied the iſland of the Batavians, together with an extenſive diſtrict of Brabant, which was then known by the appellation of Toxandria, a country of woods and moraſſes that extended from the vicinity of Tongres to the conflux of the Vahal and the Rhine, and which may be conſidered as the original ſeat of their Gallic monarchy. After Julian, A. D. 358, had repulſed the Alemanni from the provinces of the Upper Rhine, he turned his arms againſt the Franks, who were ſeated nearer to the ocean on the confines of Gaul and Germany; and who, on account of their number and intrepid valour, had ever been eſteemed the moſt formidable of the barbarians. Although they were ſtrongly actuated by the allurements of rapine, they profeſſed a diſintereſted love of war, which they conſidered as the ſupreme honour and felicity of human nature; and their minds and bodies were ſo completely hardened by perpetual action, that, according to the lively expreſſion of an orator, the ſnows of winter were as pleaſant to them as the flowers of ſpring. In the month of December, A. D. 358, Julian attacked a body of 600 Franks, who had thrown themſelves into two caſtles on the Meuſe. Having, with inflexible conſtancy, in the midſt of that ſevere ſeaſon, ſuſtained a ſiege of 54 days, they were at length exhauſted by hunger, and deſpairing of eſcape, they conſented, for the firſt time, to diſpenſe with the ancient law, which commanded them to conquer or to die. This obſtinate reſiſtance on the part of a ſmall number of Franks, appriſed Julian of the difficulties with which he was likely to encounter in the expedition meditated by him for the enſuing ſpring, againſt the whole body of the nation. His diligence and activity correſponded to the occaſion; and without allowing the Franks to deliberate or to unite, he ſpread his legions from Cologne to the ocean, and ſoon conſtrained the ſuppliant tribes to implore the clemency, and to obey the commands, of their conqueror. A treaty was ratified by ſolemn oaths; and perpetual inſpectors were appointed to reſide among the Franks, with the authority of enforcing the ſtrict obſervance of the conditions. Towards the commencement of the 5th century, the Franks diſtinguiſhed their zeal and courage in the defence of the Roman empire: when the limits of Gaul and Germany were ſhaken by the northern emigration, the Franks bravely encountered the ſingle force of the Vandals; and of theſe 20,000, with their king Godigiſclus, were ſlain on the field of battle. By this attachment to the Roman government, on the part of the Franks, as well as by the neutrality of the Alemanni, the peace of Germany was ſecured. In the laſt years of the emperor Honorius, the Franks, as well as the Goths and Burgundians, obtained a permanent ſeat and dominion in the provinces of Gaul; Treves, the capital of Gaul, was pillaged by their lawleſs bands; and the humble colony, which they ſo long maintained in the diſtrict of Toxandria in Brabant inſenſibly multiplied along the banks of the Meuſe and Scheldt, till their independent power filled the whole extent of the Second, or Lower Germany. It was about this time, A. D. 420, that Pharamond, ſuppoſed by ſome to be the ſon of Sunno, but more generally the ſon of Marcamir, the brother of Sunno, is ſaid to have reigned over the Franks: but the foundation of the French monarchy by Pharamond, the conqueſts, the laws, and even the exiſtence of that hero, have been juſtly arraigned, ſays Gibbon, by the impartial ſeverity of modern criticiſm. Pharamond, if we admit the exiſtence of ſuch a ſovereign among the Franks, was ſucceeded by his ſon Clodion in the year 428, the fourth of the reign of Valentinian III. From the report of his ſpies, the king of the Franks was informed that the defenceleſs ſtate of the ſecond Belgic muſt yield, on the ſlighteſt attack, to the valour of his ſubjects. He boldly penetrated the thickets and moraſſes of the Carbonarian foreſt, which is part of the great foreſt of the Ardennes, that lay between the Eſcaut or Scheldt, and the Meuſe; occupied Tournay and Cambray, the only cities which exiſted in the 5th century, and extended his conqueſts as far as the river Somme, over a deſolate country, whoſe cultivation and populouſneſs are the effects of more recent induſtry. While Clodion lay encamped in the plains of Artois, and employed himſelf in celebrating, with oſtentatious ſecurity, the marriage of one of his chiefs, perhaps of his ſon, the nuptial feaſt was interrupted by the unexpected arrival and aſſault of Ætius. The Franks were oppreſſed before they could recover their

arms or their ranks; and their unavailing valour was fatal only to themſelves. The king of the Franks, however, ſoon regained his ſtrength and reputation, and ſtill maintained the poſſeſſion of his Gallic kingdom from the Rhine to the Somme. Under his reign, and moſt probably from the enterpriſing ſpirit of his ſubjects, the three capitals, Mentz, Treves, and Cologne, experienced the effects of hoſtile cruelty and avarice. The diſtreſs of Cologne was prolonged by the perpetual dominion of the ſame barbarians who evacuated the ruins of Treves; and Treves, which in the ſpace of forty years had been four times beſieged and pillaged, was diſpoſed to loſe the memory of her afflictions in the vain amuſements of the circus.

The death of Clodion, after a reign of twenty years, expoſed his kingdom to the diſcord and ambition of his two ſons. Meroveus, the younger, was perſuaded to implore the protection of Rome; he was received at the imperial court as the ally of Valentinian, and the adopted ſon of the patrician Ætius; and diſmiſſed to his native country with ſplendid gifts, and the ſtrongeſt aſſurances of friendſhip and ſupport. During his abſence, his elder brother had ſolicited, with equal ardour, the formidable aid of Attila; and the king of the Huns embraced an alliance, which facilitated the paſſage of the Rhine, and juſtified, by a ſpecious and honourable pretence, the invaſion of Gaul. Meroveus died, as ſome ſay, in 456, but, according to others, in 458; after having lived and reigned, loved and honoured by his people as a common father; and from him the Franks in general were called Merovingians. In a genealogical table of the French kings, prefixed to a MS. life of Charles the Great, lodged in the royal library at Bruſſels, he is made the ſtock or head of the firſt race. Meroveus was ſucceeded by his ſon Childeric. As ſoon as he aſcended the throne he began to think of enlarging his dominions; and he is ſaid to have extended his conqueſts as far as the Loire, and to have reduced the city of Paris, after a ſiege of ten years. He likewiſe made himſelf maſter of Angers and alſo of Orleans. He died at Tornacum, now Tournay. In early life he was addicted to very licentious practices, and the Franks, incenſed by his conduct, puniſhed him with exile, and elected Œgidius, a Roman general, for their king. However, the nation, at the end of four years, repented of the injury which they had offered to the Merovingian family, and patiently acquieſced in the reſtoration of the exiled prince. While Childeric lived an exile in Germany, he was hoſpitably entertained by the queen as well as by the king of the Thuringians. After his reſtoration, Baſina eſcaped from her huſband's bed to the arms of her lover. Childeric is ſaid to have married her; but however that be, the offſpring of their union was Clovis; who, when he was no more than fifteen years of age, ſucceeded by his father's death, A. D. 482, to the command of the Salian tribe. The narrow limits of his kingdom were confined to the iſland of the Batavians, with the ancient dioceſes of Tournay and Arras; and at the baptiſm of Clovis, the number of his warriors could not exceed five thouſand. The kindred tribes of the Franks, who had ſeated themſelves along the Belgic rivers, the Scheldt, the Meuſe, the Moſelle, and the Rhine, were governed by their independent kings, of the Merovingian race; the equals, the allies, and ſometimes the enemies, of the Salic prince. But the Germans who obeyed, in peace, the hereditary juriſdiction of their chiefs, were free to follow the ſtandard of a popular and victorious general; and the ſuperior merit of Clovis attracted the reſpect and allegiance of the national confederacy. (See Clovis.) In the year 536, twenty-five years after the death of Clovis, the French monarchy in Gaul was finally eſtabliſhed. The Oſtrogoths of Italy, unable to defend their diſtant acquiſitions, had reſigned to the Franks the cities of Arles and Marſeilles; this tranſaction was confirmed by the imperial authority, and Juſtinian, generouſly yielding to the Franks the ſovereignty of the countries beyond the Alps, which they already poſſeſſed, abſolved the provincials from their allegiance; and eſtabliſhed on a more lawful, though not more ſolid, foundation, the throne of the Merovingians. (See France.) The Franks, or French, are the only people of Europe who can deduce a perpetual ſucceſſion from the conquerors of the weſtern empire. But their conqueſt of Gaul was followed by ten centuries of anarchy and ignorance.

The Franks were tall of ſtature, with light hair and blue eyes; and as to their military character, we may obſerve, that their love of freedom and of arms was felt, with conſcious pride, by the Franks themſelves, and it was obſerved by the Greeks with ſome degree of amazement and terror. "The Franks," ſays the emperor Conſtantine, "are bold and valiant to the verge of temerity; and their dauntleſs ſpirit is ſupported by the contempt of danger and of death. In the field, and in cloſe onſet, they preſs to the front, and ruſh headlong againſt the enemy, without deigning to compute either his numbers or their own. Their ranks are formed by the firm connections of conſanguinity and friendſhip; and their martial deeds are prompted by the deſire of ſaving or revenging their deareſt companions. In their eyes, a retreat is a ſhameful flight: and flight is indelible infamy." Gibbon's Hiſt. of the Decline, &c. of the Roman Empire. The Franks, as we have already remarked, inhabited foreſts and marſhes, where their women reſided; their cabins were of wood, conſtructed without art, and formed into ſcattered villages without order. Theſe ſavages united together under the command of a prince, and went with him to war, without acknowledging his dominion over them in time of peace: their princes were rather the chiefs of the ſoldiers than the kings of the people: they paid him no tribute, divided the ſpoils, and made him preſents. Such were the conquerors of Gaul, and the founders of the French monarchy. (See France.) In proceſs of time they became Chriſtians, and inſenſibly loſt their ancient manners. Their democracy was aboliſhed, and a military ariſtocracy ſucceeded.

FRANKSTADT, in *Geography*, a town of Moravia, in the circle of Prerau; four miles S. of Freyburg. N. lat. 49° 29'. E. long. 18° 17'.

FRANKWALD, or Puskowitz, a town of Sileſia, in the principality of Oels; four miles N.W. of Feſtenberg.

FRANQUEMONT, a town of Switzerland, in the canton of Porentru, ſeated on the Dou; 16 miles N. of Neufchatel.

FRANSCHE Hoeck, or *French Corner*, a ſubordinate diſtrict of the valley of Drakenſtein in ſouthern Africa, near the Cape of Good Hope, ſituated in the S.E. angle of the valley among the mountains; deriving its name from the French refugees who ſettled here, when they fled to this country after the revocation of the edict of Nantes. To theſe people the colony is indebted for the introduction of the vine. The eſtates here are commonly freehold property, and produce little elſe than wine and fruits.

FRANSERIA, in *Botany*, named by Cavanilles in honour of Dr. Antony Franſero, a phyſician of Madrid, rather, as it ſeems, from motives of perſonal regard, than from any botanical merits in his friend. Cav. Ic. 2. 78. Willd. Sp. Pl. v. 4. 378. Claſs and order, *Monœcia Pentandria*. Nat. Ord. *Compoſitæ nucamentaceæ*, Linn. *Corymbiferæ anomalæ*, Juſſ.

Gen. Ch. *Male Flowers* compound. *Cal.* Common Perianth of one leaf, flat, toothed, the length of the florets. *Cor.* compound, uniform, tubular, equal, forming a hemiſphere; partial erect, of one petal, funnel-ſhaped, five-cleft.

Stam.

Stam. Filaments five, very ſmall; anthers erect, parallel, diſtinct, furrowed. *Piſt.* Germen abortive; ſtyle thread-ſhaped; ſtigma peltate.

Female Flowers below the male, on the ſame plant. *Cal.* Perianth of ſeveral ovate leaves, containing a ſingle flower. *Cor.* none. *Piſt.* Germen ſuperior, ovate, muricated; ſtyles four; ſtigmas eight, oblong. *Peric.* Drupa dry, cloathed with rigid hooked briſtles, of four cells, with one oblong *ſeed* in each cell.

Eſſ. Ch. Male, Common calyx of one leaf, with many teeth. Corolla monopetalous, tubular, with five teeth. Receptacle naked.

Female, Calyx of many leaves, ſingle-flowered. Corolla none. Styles four. Drupa dry, briſtly, of four cells.

1. F. *artemiſioides*. Willd. Hort. Berol. v. 1, 2. t. 2. (Xanthium fruticoſum; Linn. Suppl. 418. Ambroſia arboreſcens; Mart. Mill. Dict. v. 1. n. 5. Lam. Dict. v. 1. 128.)—Leaves doubly-pinnatifid, toothed.—Native of Peru. It may be found in ſome curious gardens, and has of late been treated in England with ſome attention, from being ſuppoſed a white variety of *Chryſanthemum indicum*, but the miſtake was rectified when its miſerable flowers appeared. The *ſtem* is perennial, ſomewhat woody, leafy. *Leaves* deeply and doubly pinnatifid, pointed, toothed, moſt downy beneath. *Flowers* very late, greeniſh, the male reſembling thoſe of an *Artemiſia*, the female and the fruit being like a *Xanthium*.

2. F. *ambroſioides*. Willd. Sp. Pl. v. 4. 379. Cav. Ic. v. 2. 79. t. 200, excluding the ſynonyms. (Ambroſia maritima peruviana major; Hort. Reg. Pariſ. MSS.)—Leaves lanceolate, pinnatifid, toothed, with elongated points.—Native of Mexico and Peru. Larger than the laſt, with which Cavanilles confounds it. The *leaves* are much more elongated, and only ſimply pinnatifid, ſometimes undivided. The appendages on their *footſtalks*, on which Willdenow founds a part of his ſpecific character, ſeem to be only accidental and tranſient lobes.

This genus is akin on the one hand to *Ambroſia*, on the other to *Xanthium*, its habit and male flowers being moſt like the former, its fruit reſembling the latter; yet we do not ſee that it can ſatisfactorily be referred to either. How far the two ſpecies of *Franſeria* are permanently diſtinct may admit of ſome doubt, but they appear very different in foliage.

FRANTSILA, in *Geography*, a town of Sweden, in the government of Ulea; 30 miles S.E. of Braheſted.

FRANTZDORF, a town of Sileſia, in the principality of Neiſſe; four miles N. of Neiſſe.

FRANTZIUS, Wolfgang, in *Biography*, a learned German Lutheran divine, was born in Saxony in the year 1564. He received the early part of his education at Frankfort on the Oder, whence he was ſent to the univerſity of Wittemberg, where he was appointed profeſſor of hiſtory, and admitted to the degree of doctor of divinity in the year 1598: and in 1605 he was advanced to the theological chair in the ſame univerſity. He died in 1628, when he had attained his ſixty-fourth-year. He was a conſiderable writer, chiefly on theological ſubjects, and on the controverted doctrines of the day. Moreri.

FRANZBURG, in *Geography*, a town of Swediſh Pomerania, founded, in 1587, on the ſcite of a rich abbey; 14 miles S.S.W. of Stralſund. N. lat. 54° 10'. E. long. 12° 56'.

FRAPPE', *Fr.*, uſed ſubſtantively in *Muſic*, for the firſt note of a bar when the hand or foot *beats* the time. (See Thesis.) The French, in beating time, only mark the firſt note or accent of a bar, but indicate its other portions by different motions of the hand; as in compoſitions where the bar conſiſts of four crotchets, the firſt, or *down* part is beaten, at the ſecond, the hand is waved to the left, at the third lifted up, and at the fourth waved to the right. In triple time, if not very quick, at the firſt note the hand is beaten down, at the ſecond waved to the left, and at the third lifted up. The Italians *beat* the two firſt notes of a bar in triple time, and lift the hand *up* at the third. In common time of four crotchets they likewiſe *beat* the two firſt, and lift up the hand for the two others.

FRAPPING, in *Sea Language*, denotes the act of croſſing and drawing together the ſeveral parts of a tackle, or other complication of ropes, which had been already ſtraightened to their utmoſt extent, reſembling the operation of bracing up a drum, &c. The frapping increaſes the tenſion, and adds to the ſecurity acquired by the purchaſe. Hence the cat-harpings are no other than frappings to the ſhrouds.

Frapping *a Ship*, is the act of paſſing three, four, or five turns of a cable round the hull, or frame of a ſhip, in the middle, to ſupport her in a great ſtorm, when it is apprehended ſhe is not ſtrong enough to reſiſt the violent efforts of the ſea. This is ſeldom uſed, except in old ſhips. Falconer.

FRASCARUOLA, in *Geography*, a town of Italy, in the department of the Gogna; three miles N.E. of Valenza.

FRASCATI, or Frescati, an agreeable town, or rather village, in the Campagna di Roma, the ſee of a biſhop, who is a cardinal, ſeated on the declivity of a hill, about twelve miles from Rome. It derives its name from the coolneſs of the air, and freſh verdure of the fields about it; and it is celebrated for the palaces and country ſeats of Italian princes and cardinals, adorned with many beautiful paintings and ſculptures. The hills on which Freſcati is ſituated afford great abundance of water, which ſupplies fountains, caſcades, and water-works with which the villas are ornamented. This was the ſcite of the ancient Tuſculum, deſtroyed by the Romans in 1191, or very near it; and at the diſtance of about a mile and a half, it is generally believed, was the Tuſcan villa of Cicero, at a place now called Grotta Ferrata. Some Greek monks of the order of St. Baſil, flying from the perſecution of the Saracens in the 11th century, were permitted to build a convent on the ruins of Cicero's famous houſe; and they ſtill perform the ſervice in the Greek language. At a ſmall diſtance is the lake of Nemi, four miles in circumference, whoſe ſurrounding hills are covered with tall and ſhady trees. In ancient times there was a temple here, ſacred to Diana. The lake itſelf was called Speculum Dianæ, and Lacus Triviæ, and is the place mentioned in the 7th book of the Æneid, where the fury Alecto is deſcribed blowing the trumpet of war, at whoſe dreadful ſound the woods and mountains ſhook, and mothers, trembling for their children, preſſed them to their boſoms.

"Contremuit nemus, et ſylvæ intonuere profundæ,
Audiit et Triviæ longus lacus————
Et trepidæ matres preſſere ad pectora natos."

FRASERA, in *Botany*, ſo called by Walter, in honour of his indefatigable friend Mr. John Fraſer, nurſery and ſeedſman of Sloane-ſquare, to whom our gardens are indebted for many American plants. Walt. Fl. Carolin. 87. This is no other than *Swertia differmis* of Linnæus, which name was given it becauſe the flowers vary in number of parts from four to ſix; nor does it appear to us that it can be ſeparated from *Swertia*, though the corolla is much more ſtrongly and remarkably bearded than in S. *perennis*, and the ſtyles united into one.

FRASERBURGH, in *Geography*, a town in Aberdeenſhire, ſituated on the ſouth ſide of the promontory, called

Kinnaird's head, forty-one miles diſtant from Aberdeen, was erected into a borough of regality in 1613. The government is veſted in lord Saltoun, as provoſt, two bailiffs, a dean of guild, and council; and his lordſhip, as ſuperior, has the power annually of nominating and appointing the new governors, with the joint conſent of the old. The ſtreets are ſpacious and convenient, croſſing each other at right angles; the houſes well built, and, being covered with ſlate, give a neat and cheerful appearance to the place. Nearly in the centre ſtand two good public edifices, the town-houſe and priſon. In an area of about five hundred feet ſquare is an elegant croſs. This fine ſtructure conſiſts of an hexagonal pedeſtal, ſupported by three equidiſtant abutments of a ſimilar figure, and ſurmounted by a column twelve feet high, ornamented with the arms of Britain, and thoſe belonging to the family of Fraſer. At the weſt end of the town is an ancient quadrangular tower of three ſtories in height, which forms part of a building, intended for a college, but never carried further into effect. Sir Alexander Fraſer, in the year 1592, obtained a charter from the crown, empowering him to erect an univerſity "in ampliſſima forma," and in all reſpects like other univerſities within theſe realms; but from ſome latent and unauſpicious circumſtances the veſted powers of the charter were never executed. There are the remains alſo of ſeveral ancient towers, and veſtiges of religious ſtructures. According to the returns under the population act in 1801, the number of houſes was 490, and inhabitants 2215; of whom 217 were returned as employed in trade. The only manufacture is linen yarn, the quantity of which annually exported is to the amount of three or four thouſand pounds. Fraſerburgh poſſeſſes a ſmall, yet excellent harbour, having from eleven to ſixteen feet water, admitting ſhips of 300 tons burden to enter; and a good roadſtead contiguous, about one mile broad, and four in length, with ſafe anchorage ground; near which is the ſmall fiſhing village of Broadſea. Near the town is a caſtle, on a promontory called Kinnaird's head, bathed on two ſides by the ſea. On the top of this caſtle government lately erected a light-houſe, containing 20 lamps with reflectors. Fiſhing-banks for cod commence right off Kinnaird's head, ten leagues out at ſea. N. lat. 57° 33'. W. long. 1° 55.

In the immediate vicinity of the town ſtands Philorth houſe, ſurrounded by extenſive plantations, the ſeat of the right honourable George Fraſer, lord Saltoun and Abernethy.

FRASI, GIULIA, of Bologna, in *Biography*, a ſcholar of Brevio of Milan, came into England in 1743, the ſecond year of the earl of Middleton's opera regency, as third ſinger under Monticelli, and the Viſconti. Fraſi at this time was young and intereſting in her perſon, had a clear and ſweet voice, free from defects, and a ſmooth and chaſte ſtyle of ſinging; which, though cold and unimpaſſioned, pleaſed natural ears, and eſcaped the cenſure of critics. Galli arrived here at the ſame time, and after tranſplantation from Italy, they both took root in this country, and remained here in great public favour during many years. The firſt opera in which they appeared was Galuppi's "Enrico." Both theſe performers, by learning Engliſh, rendered themſelves important and neceſſary, on many occaſions, in our oratorios, theatres, and public concerts, when ſingers of a much higher claſs, without this qualification, could be of no uſe. In Italian ſinging, Fraſi's "Cheval de bataille" was the fine air, "Tremende occuri attroci," in Pergoleſi's Olimpiade, which Monticelli had ſung in the opera, but which ſuiting the compaſs and powers of Fraſi, ſhe ſung at concerts with great applauſe for ten years at leaſt, after the run of the opera was over. The great opera houſe being ſhut up this year on account of the rebellion, and popular prejudice againſt the performers, who being foreigners, were chiefly Roman catholics; an opera was attempted, April 7th, at the little theatre in the Haymarket, under the direction of Geminiani. Paſquali led the orcheſtra, and the celebrated and myſterious count St. Germain compoſed ſeveral new airs for it, particularly "Per pieta bell' idol mio," which was ſung by Fraſi, firſt woman, and encored every night. The reſt of his airs, and two by Brevio, Fraſi's maſter, which Walſh printed, were only remarkable for inſipidity. The firſt man's part was performed by Galli. The ſucceſs of this enterprize was inconſiderable, and the performances did not continue more than nine or ten nights. Prince Lobkowitz, who was here at this time, and conſtantly with count St. Germain, attended all the rehearſals, as well as the performances. In 1748 Fraſi performed the part of firſt ſerious woman in the comic opera at the Haymarket, when Pertici and Laſchi, the beſt buffos that we ever ſaw, were here, and Guadagni, then very young, was the firſt ſerious man. In 1750, there being a ſchiſm in the great theatre, the compoſer, Ciampi, and the performers, left the manager, Dr. Croza, and erected their ſtandard at the little theatre on the oppoſite ſide the way, where Fraſi performed the firſt woman's part in "Adriano in Siria," a new ſerious opera compoſed by Ciampi, in which Guadagni, then but a wild ſinger, with a very fine counter-tenor voice, appeared as firſt man; but after ſix thin houſes, this opera was ſuperſeded by the burlettas of the preceding winter. Though Fraſi was a great ſinger among the Engliſh vocal performers of theſe times, in 1754, ſhe was only rated as third woman at the great opera, giving place to the Viſconti and Paſſerini.

The next year, however, during the indiſpoſition of the Mingotti, Fraſi was often called upon as her *double*, till ſuſpicions ariſing that Mingotti's was a mere dramatic and political cold, the public was much out of humour, till ſhe reſumed her function in Metaſtaſio's admirable drama of "Demofoonte," in which ſhe acquired more applauſe, and augmented her theatrical conſequence beyond any period of her performance in England.

Fraſi's favour, however, was ſo eſtabliſhed in all our muſical performances elſewhere throughout the kingdom, that ſhe ſang at Ranelagh, at the triennial meetings at Worceſter, Hereford, and Glouceſter; at the two univerſities, and in London at the Swan, King's Arms, and Caſtle concerts, at the concert at Hickford's Room, Brewer-ſtreet, at all benefit concerts; and was the principal ſinger in Handel's oratorios during the laſt ten years of his life. Having come into this country at an early period of her life, ſhe pronounced our language in ſinging in a more articulate and intelligible manner than the natives; and her ſtyle being plain and ſimple, with a well-toned voice, a good ſhake, and perfect intonation, without great taſte and refinement, ſhe delighted the ignorant, and never diſpleaſed the learned. Yet with all this apparent proſperity, and a clear income of from 1100*l.* to 1800*l.* a year, ſhe literally died a beggar! And this in a great meaſure was occaſioned by poor Fraſi's too liberal ſpirit of hoſpitality towards the natives of Italy; who, coming to this country on mere ſpeculation, without any means of ſubſiſtence, preyed upon her, and conſtantly kept her in uneaſy circumſtances. By her want of economy, and little attention to her expences, they every year exceeded her income ſo much, that, at length, ſhe was obliged to quit this country to avoid being arreſted. Her youth and talents faded; her ſole reſources for her future ſubſiſtence were the penſions of ten or twelve Engliſh patrons, who ſubſcribed five guineas a year each during her and their proper lives. Among theſe was the late viſcount Barrington, and the ad-

miral his brother, the late lady Harrington, Meſſrs. Bradſhaw, Chamier, &c. For the convenience of receiving theſe benefactions ſhe ſettled at Calais, where, by the utmoſt parſimony, ſhe was able to ſupport a miſerable exiſtence, till, by the death of her benefactors, her income was at length reduced to ten or fifteen guineas a year, and we fear that her own death was ſomewhat accelerated by mere inanition!

Theſe melancholy particulars are here inſerted to warn our fair ſongſtreſſes againſt extravagance, and to remind them that faſhion and favour are ſeldom long-lived, no more than talents and beauty; and that expending their whole income in proſperous years is a ſure ſtep to indigence and miſery, if they ſhould arrive at old age. Such, alas! has been the fate, not only of Fraſi, but of the celebrated Cuzzoni, Galli, Gabrielli, Miſs Brent, &c. &c.

FRASIGNORE, in *Geography*, a town of Etruria; 7 miles N. of Piſtoia.

FRASLA, a town of the duchy of Stiria; 10 miles W. of Cilly.

FRASNES, a town of France, in the department of Jemmappe, and chief place of a canton in the diſtrict of Tournay. The place contains 3,094, and the canton 12,046 inhabitants, on a territory of 137½ kiliometres, in 13 communes.

FRASSEN, Claude, in *Biography*, was born near Peronne, in Picardy, in the year 1620; he was regularly educated in a convent belonging to the order of his native town, and after his profeſſion was ſent to purſue his ſtudies at the great Franciſcan convent at Paris. He took his degrees at the Sorbonne, and was admitted to that of doctor of divinity in the year 1662. He was frequently elected ſuperior to his order, and filled the office of theological profeſſor nearly thirty years. In 1682 he aſſiſted at a general chapter of his order, which was held at Toledo in Spain, and on account of his prudence and talents he was elected definitor general of the whole order. His wiſdom in conducting public official buſineſs was not confined to religious duties only; he was often conſulted by Lewis XIV., the parliament of Paris, the higher orders of the clergy, &c. on buſineſs of peculiar importance and intereſt. He died in 1711, in the ninety-fourth year of his age. He was author of "A ſyſtem of Philoſophy," in three volumes 4to. and of ſeveral theological and devotional pieces. Moreri.

FRASSETUM, in our *Old Writers*, is taken for a wood, or woody ground, where aſh grows. 1 Inſt. 4.

The word is a corruption of the Latin *fraxinetum*, which ſignifies the ſame.

FRASSINETO, in *Geography*, a town of Naples, in the province of Bari; 9 miles S.S.W. of Converſano.—Alſo, a town of Italy, in the Paduan; 2 miles N. of Montagnana.

FRATELLI, two ſmall iſlands in the Mediterranean; 25 miles W. from Scarpanto. N. lat. 35° 45'. E. long. 26° 22'.

FRATER Consanguineus, in *Law*, denotes a brother by the father's ſide; and *Frater uterinus*, a brother by the mother's ſide.

FRATERCULA, in *Ornithology*, a name by which Geſner and Aldrovand have called the *anas arctica cluſii*. See Alca *arctica*, and Puffin.

FRATER-HOUSE; the brethrens' hall, refectory, or eating-room in the ancient monaſteries was frequently called by this name.

FRATERIA, of *frater*, *brother*, a fraternity, brotherhood, or ſociety of religious perſons, who were bound to pray for the good health and life, &c. of their living brethren, and the ſouls of thoſe that were dead. In the ſtatutes of the cathedral church of St. Paul, London, collected by Ralph Baldock, dean, 1295, there is one chapter "De frateria beneficiorum eccleſiæ S. Pauli, &c."

Frateria, or *Phrateria*, in *Ancient Geography*, a town of Dacia, on the bank of the Mariza. Ptolemy.

FRATERNITY, Brotherhood, the relation or union of brothers, friends, partners, and aſſociates, &c.

Fraternity, in a *civil ſenſe*, is uſed for a guild, aſſociation, or ſociety of perſons, united into a body, for ſome common intereſt or advantage.

For the origin, uſe, &c. of fraternities, ſee Company and Gild.

Fraternity, in a *religious ſenſe*, is a ſociety of perſons meeting together to perform ſome exerciſes of devotion, or divine worſhip.

In the Romiſh church, ſuch fraternities are very numerous and conſiderable, being moſt of them eſtabliſhed by royal patents; as the fraternity of the Roſary; the fraternity of the Scapulary of St. Francis's Cord; ſee Cordeliers and Franciscans. The biſhop may hinder the eſtabliſhment of any ſuch fraternity in his dioceſe.

At Rome there is a fraternity, called the archi-fraternity, or grand fraternity, under the title of "Our Lady of the Suffrages," eſtabliſhed in favour of the ſouls in purgatory, approved and confirmed by a bull of pope Clement VIII. in 1594. See Brethren and Brothers.

There are nine different ſorts of fraternities, or confrairies, in France, *viz.* 1. Of Devotion. 2. Of Charity, or Mercy. 3. Of Penitents, under divers names. 4. Of Pilgrimage. 5. Of Merchants to procure the divine favour on their endeavours. 6. Of Officers of Juſtice. 7. Of the ſufferings of Chriſt. 8. Of Arts and Trades of divers kinds. And, 9. Of Factions.

Fraternities, in Latin called *ſodalitates*, derive their origin from the heathens, as is ſhewn by Polydore Virgil, in his book "De Inventoribus Rerum." But the good uſe made of them by the Chriſtians has effectually purged them of any impurities derived from ſo ill a ſource.

Numa Pompilius is ſaid to have eſtabliſhed fraternities of all arts and trades in ancient Rome, and to have preſcribed the ſacrifices each profeſſion was to perform to the patrons or tutelary gods he had aſſigned them.

Fraternity *of the holy Trinity*. See Trinity.

Fraternity is alſo a title or quality which kings and emperors gave to each other; ſo alſo do biſhops and monks. We meet with it frequently in authors under the eaſtern empire, both Greek and Latin: the Greek term is ἀδελφότης, *fraternitas*.

Fraternity *of Arms* was an alliance, or aſſociation in arms, anciently concluded between two knights, who thereby agreed to go together, ſhare their fortunes, and mutually aſſiſt each other againſt all the world.

Bertrand du Gueſclin and Oliver Cliſſon ſwore a fraternity of arms in the year 1579, laying their hands on the goſpels. Hiſt. de Bret. tom. i. p. 395.

Fraternity *of St. Catharine*. See Catharine.

FRATING, or Wrateni, in *Geography*, a town of Moravia, in the circle of Znaym; 22 miles W.N.W. of Znaym.

FRATINO, a town of Italy, in Friuli; 25 miles S.W. of Udina.

FRATRES Arvales. See Arvales.

Fratres *Conjurati*, in our *Ancient Law-books*, &c. denote ſworn brothers, or companions.

Sometimes they are ſo called who were ſworn to defend the king againſt his enemies, leg. W. 1. cap. 59. "Præcipimus, ut omnes liberi homines ſint fratres conjurati ad monarchiam

narchiam noſtram & regnum noſtrum contra inimicos pro poſſe ſuo defendendam."

FRATRES *Gaudentes*. See *Joyful* BROTHERS.

FRATRIAGE, FRATRIAGIUM, or *Frerage*, the partition among brothers, or coheirs, coming to the ſame inheritance or ſucceſſion.

FRATRIAGE is more particularly uſed for that part of the inheritance which comes to the youngeſt brothers.

Whatever the cadets, or younger brothers, poſſeſs of the father's eſtate, they poſſeſs *ratione fratriagii*, and they are to do homage to the elder brother for it; in regard he is to do homage for the whole to the ſuperior lord.

FRATRICELLI, in *Eccleſiaſtical Hiſtory*, an enthuſiaſtic ſect of Franciſcans, which roſe in Italy, and particularly in the marquiſate of Ancona, about the year 1294.

The word is an Italian diminutive, ſignifying fraterculi, or little brothers; and was here uſed as a term of deriſion, as they were moſt of them apoſtate monks, whom the Italians call *fratelli*, or *fratricelli*.

For this reaſon the term fratricelli, as a nickname, was given to many other ſects, as the Cathariſts, the Waldenſes, &c. however different in their opinions and in their conduct. But this denomination, applied to the auſtere part of the Franciſcans, was conſidered as honourable. See FRANCISCANS.

The founders were P. Mauraro, and P. de Foſſombroni, who having obtained of pope Celeſtin V. a permiſſion to live in ſolitude, after the manner of hermits, and to obſerve the rule of St. Francis in all its rigour, ſeveral idle vagabond monks joined them, who, living after their own fancies, and making all perfection to conſiſt in poverty, were ſoon condemned by pope Boniface VIII. and his ſucceſſor, and the inquiſitors ordered to proceed againſt them as heretics; which commiſſion they executed with their uſual barbarity. Upon this, retiring into Sicily, Peter John Oliva de Serignan had no ſooner publiſhed this Comment on the Apocalypſe, than they adopted his errors.

They held the Romiſh church to be Babylon, and propoſed to eſtabliſh another far more perfect one; they maintained, that the rule of St. Francis was the evangelical rule obſerved by Jeſus Chriſt, and his apoſtles.

They foretold the reformation of the church, and the reſtoration of the true goſpel of Chriſt, by the genuine followers of St. Francis, and declared their aſſent to almoſt all the doctrines which were publiſhed under the name of the abbot Joachim, in the Introduction to the Everlaſting Goſpel, a book publiſhed in 1250, and explained by one of the ſpiritual friars, whoſe name was Gerhard. Among other enormities inculcated in this book, it is pretended that St. Francis was the angel mentioned in Rev. xiv. 6. and had promulgated to the world the true and everlaſting goſpel of God; that the goſpel of Chriſt was to be abrogated in 1260, and to give place to this new and everlaſting goſpel, which was to be ſubſtituted in its room; and that the miniſters of this great reformation were to be humble and bare-footed friars, deſtitute of all worldly employments.

Some ſay they even elected a pope of their new church; at leaſt they appointed a general, with ſuperiors, and built monaſteries, &c. Beſide the opinions of Oliva, they held, that the ſacraments of the church were invalid; becauſe thoſe who adminiſtered them had no longer any power or juriſdiction.

They were condemned afreſh by pope John XXII., in conſequence of whoſe cruelty they regarded him as the true antichriſt; but ſeveral of them returning into Germany, were ſheltered by Lewis, duke of Bavaria, the emperor.

There are authentic records, from which it appears, that no leſs than two thouſand perſons were burnt by the inquiſition, from the year 1318 to the time of Innocent VI. for their inflexible attachment to the poverty of St. Francis. The ſeverities againſt them were again revived towards the cloſe of the fifteenth century by pope Nicholas V. and his ſucceſſors. However, notwithſtanding all the perſecutions which this ſect endured, they were not ſufficient to extinguiſh it; for it ſubſiſted until the times of the reformation in Germany, when its remaining votaries adopted the cauſe, and embraced the doctrine and diſcipline of Luther. And this has led the popiſh writers to charge the fratricelli with many enormities, ſome of which are recounted by M. Bayle, art. *Fratricelli*.

The fratricelli had divers other denominations; they were called fratricelli, according to ſome, becauſe they lived in community, in imitation of the primitive Chriſtians, or rather through the humility of the founder of the Franciſcan order, to which the fratricelli originally belonged; *dulcini*, from one of their doctors; *bizochi*, *beguins*, and *beghardi*.

FRATRICIDE, of *frater*, *brother*, and *cædo*, *I kill*, the crime of murdering one's brother. See PARRICIDE.

Cain committed the firſt fratricide; and the empire of Rome began with a fratricide.

FRATTA, in *Geography*, a town of Italy, in the duchy of Urbino; 32 miles S. of Urbino. N. lat. 43° 18'. E. long. 12° 18'.—Alſo, a town of Italy, in Friuli; 18 miles S.S.W. of Udina.

FRATTA, *La*, a town of Italy, in the Poleſino de Rovigo, on the Scortico, containing about 6000 inhabitants.

FRAUBRUNNEN, or FRAUENBRUN, a town of Switzerland, and ſeat of a bailiwick, in the canton of Berne, deriving its name from a celebrated monaſtery founded in the year 1246; 7 miles N. of Berne.

FRAUD, FRAUS, a ſecret, underhand deceit, or injury, done to any one. See CHEATS and DECEIT.

To export or import goods by fraud, or fraudulently, is to do it by indirect ways, in order to avoid the paying of duty, &c. if they be permitted goods; or if they be contraband goods, to avoid the penalties adjudged by the laws.

A fraudulent conveyance of lands or goods to deceive creditors, or to defraud purchaſers, is void in law; and the perſons juſtifying or putting off ſuch grants as good, ſhall forfeit a year's value of the lands, and the full value of the goods and chattels, and likewiſe be impriſoned for half a year. Stat. 3 Hen. VII. c. 4. Stat. 50 Ed. III. c. 6. Stat. 13 Eliz. c. 5. made perpetual by ſtat. 29 Eliz. c. 5. Stat. 27 Eliz. c. 4, made perpetual by ſtat. 39 Eliz. c. 18. The ſeveral marks of fraud in a gift or grant of goods are the following: 1. If it be general, without exception of ſome things of neceſſity. 2. If the donor ſtill poſſeſſes and uſes the goods. 3. If the deed be made in ſecret. 4. If there be a truſt between the parties. 5. If it be made while the action is depending. When a perſon is party to a fraud, all that follows thereupon will be intended to be done by him, though fraud ſhall not be preſumed or adjudged to be ſo, until it be found by a jury. 10 Rep. 56. All frauds and deceits, for which there is no remedy by the ordinary courſe of law, are properly cognizable in equity; and it is admitted, that matters of fraud were one of the chief branches to which the juriſdiction of chancery was originally confined. 4 Inſt. 84.

Among a variety of caſes, in which relief has been given againſt frauds, we may ſelect the following: Whenever fraud or ſurpriſe can be imputed to, or collected from the circumſtances of the tranſaction, equity will interpoſe and relieve againſt it. It is ſaid, however, that it muſt not be underſtood, from caſes of this kind being generally brought into

ſuto equity, that the courts of law are incompetent to relieve; for where the fraud can be clearly eſtabliſhed, courts of law exerciſe a concurrent juriſdiction with courts of equity, and will relieve by making void the inſtrument obtained by ſuch corrupt agreement or fraud. 1 Burr. 396. Wood's Inſt. 295. Therefore, where the obligor was an unlettered man, and the bond was not read over to him, he was allowed to plead this circumſtance in an action on the bond. 9 Hen. V. 15, cited 11 Co. 27 *b*.

So if the bond be in part read to an unlettered man, and ſome of its material parts be omitted or miſrepreſented. 2 Rol. Abr. 28. p. 8. It is obſervable that lord Coke, in the ſame paſſage where he confines the juriſdiction of courts of equity to ſuch "frauds, covin, and deceit, for which there is no remedy by the ordinary courſe of law," ſeems to admit that all frauds were not relievable at law. See 3 Inſt. 84. The chancery may decree a conveyance to be fraudulent, merely for being voluntary, and without any trial at law; yet it has been maintained, that fraud, or not, was triable only by a jury. Pre. Ch. 14, 15. Although courts of equity will not relieve againſt agreements merely on the ground of the conſideration being inadequate, yet if there be ſuch inadequacy as to ſhew, that the perſon did not underſtand the bargain he made, or was ſo oppreſſed that he was glad to make it, knowing its inadequacy, it will ſhew a command over him which may amount to a fraud. 2 Bro. C. R. 175. 1 Bro. C. R. 558. 2 Vez. 155. 2 P. Wms. 203. It ſeems agreed, tha if a woman, on the point of marriage, charge or convey her property to a mere ſtranger, for whom ſhe was not under even a moral obligation to provide, ſuch conveyance will be deemed a fraud on the marital rights. 2 C. R. 41. 2 Vez. 264. If A. has a prior incumbrance on an eſtate, and is a witneſs to a ſubſequent mortgage, but does not diſcloſe his own incumbrance, this is ſuch a fraud in him for which his incumbrance ſhall be poſtponed. 2 Vern. 151. 554. So if A. having a mortgage on a leaſehold eſtate, lends the mortgage deed to the mortgagor, with an intent to borrow more money; that is ſuch a fraud in the mortgagee, for which his mortgage ſhall be poſtponed to the ſubſequent incumbrance. 2 Vern. 726. 1 Eq. Abr. 321. If a ſecurity be obtained from a perſon by fraud, upon a pretence of a demand that is fictitious, it will be relieved againſt in equity. 2 Vern. 123. 632. There are likewiſe ſeveral inſtances where a parol agreement intended to be reduced into writing, but prevented by fraud, has been decreed in equity, notwithſtanding the ſtatute of frauds and perjuries; as where upon a marriage-treaty, inſtructions were given by the huſband to draw a ſettlement, which he privately countermanded, and afterwards drew in the woman by perſuaſions and aſſurances of ſuch ſettlement to marry him, it was decreed, that he ſhould make good the ſettlement. 1 Eq. Ab. 19. So where a parol agreement was concerning lending of money as a mortgage, and the covenants propoſed were an abſolute deed from the mortgagor, and a deed of defeaſance from the mortgagee, and after the mortgagee had got the deed of conveyance, he refuſed to execute the defeaſance; it was decreed againſt him on the point of fraud. 1 Eq. Ab. 90.

The ſtatute of frauds, 29 Car. II. cap. 3. requires that contracts and agreements, leaſes, and deviſes of land, be in writing. And deviſes of land, rents, &c. are deemed fraudulent and void againſt creditors, upon bonds or other ſpecialties, 3 and 4 William and Mary, cap. 14. made perpetual by ſtat. 6 William III. c. 14.

And every ſuch creditor ſhall have his action of debt upon his bonds and ſpecialties againſt the heir at law of ſuch obligor, and ſuch deviſees jointly. This ſtatute, however, excepts diſpoſitions for the payment of debts and raiſing portions for children, in purſuance of marriage contracts made before marriage; it farther provides, that where any heir at law ſhall be liable to pay his anceſtor's debts, in reſpect of lands deſcended to ſuch heir, and ſhall alien the ſame before action brought, ſuch heir ſhall be anſwerable to the creditor in an action of debt to the value of the land aliened; but the lands *bonâ fide* aliened before action brought ſhall not be liable. Every deviſee, however, made liable by the ſtatute, ſhall be chargeable in the ſame manner as the heir, though the lands deviſed ſhall be aliened before action brought.

It may be laid down as a general rule, that without the expreſs proviſion of any act of parliament, all deceitful practices in defrauding, or endeavouring to defraud, another of his known right, by means of ſome artful device, contrary to the plain rules of common honeſty, are condemned by the common law, and puniſhable according to the heinouſneſs of the offence. Co. Litt. 36. Dyer 295. It is alſo a rule, that a wrongful manner of executing a thing ſhall avoid a matter that might have been executed lawfully. Co. Litt. 35. 357. Rol. Abr. 420. 549. Poph. 64. 100. As to frauds in contracts and dealings, the common law ſubjects the wrong-doer, in ſeveral inſtances, to an action on the caſe; as if a perſon, having the poſſeſſion of goods, ſell them to another, affirming them to be his own, when in truth they are not, an action on the caſe lies. 1 Rol. Abr. 90. Cro. Jac. 474. If on a treaty for the purchaſe of a houſe, the defendant affirms the rent to be more than it is, whereby the plaintiff is induced to give more than the houſe is worth, this is a fraud. 1 Salk. 211. 1 Lev. 102. 1 Sid. 146. 1 Keb. 510. 518. 522. S. P.

FRAUDULENT DEEDS. See DEED.

FRAUDULENT *Deviſes*. See the article FRAUD. See alſo DEVISE and WILL.

FRAUENBERG, or PRZINDA, in *Geography*, a town of Bohemia, in the circle of Pilſen; 5 miles S. W. of Hayd.

FRAUENBERG, or *Hluboka*, a town of Bohemia, in the circle of Prachatitz; 12 miles S. E. of Woodnian.

FRAUENBERG, a town of Pruſſia, in the province of Ermland, ſituated on the Friſch-haff, built in the year 1279. The celebrated Copernicus was a canon of this church, and died here in 1543; 16 miles N. E. of Elbing. N. lat. 54° 20'. E. long. 19° 10'.—Alſo, a town of the duchy of Courland; 30 miles W. of Mittau.

FRAUENDORF, a town of Germany, in the biſhopric of Bamberg; 14 miles N. N. E. of Bamberg.—Alſo, a town of the New Mark of Brandenburg; 10 miles S. of Cuſtrin.

FRAUENFIELD, a ſmall town, or rather village of Switzerland, and nevertheleſs the capital of the bailliage of Thurgau, containing ſcarcely 1000 inhabitants; and only remarkable as the place where, ſince 1712, the deputies of the Swiſs cantons have been accuſtomed to aſſemble at the general diet; 20 miles N. E. of Zurich.

FRAUENMARCK, a town of Hungary; ſix miles N. E. of Levens.

FRAUENPRIESNITZ, a town of Germany, in Thuringia; 15 miles W. of Weimar.

FRAUENSTEIN, a town of Germany, in the circle of Erzgeburg, on the Mulda; 18 miles S. S. W. of Dreſden. N. lat. 50° 43'. E. long. 13° 31'.

FRAUENTHAL, a town of the duchy of Stiria; 10 miles S. of Voitzberg.—Alſo, a town of the principality of Anſpach; five miles N. E. of Creglingen.

FRAU-

FRAUENWALD, a town of Germany, in the county of Henneberg; four miles N. E. of Schleuſingen.

FRAUHOFEN, a town of Bavaria; three miles S. of Landſhut.

FRAUNBERG, a town of the duchy of Stiria; ſeven miles E. S. E. of Oberwoltz.

FRAUREUTH, a town of Germany, in the county of Reus; ſix miles N. E. of Greitz.

FRAUS Legis; if a perſon, having no manner of title to a houſe, procure an affidavit of the ſervice of a declaration in ejectment, and thereupon gets judgment; and, by virtue of a writ of *hab. fac. poſſeſſionem*, turns the owner out of poſſeſſion of the houſe, and ſeizes and converts the goods therein to his own uſe, he may be puniſhed as a felon; becauſe he uſed the proceſs of the law with a felonious purpoſe, *in fraudem legis*.

FRAUSTADT, or Frauenstadt, in *Geography*, a town of the duchy of Warſaw, on the frontiers of Sileſia, where, in the year 1706, the Saxons were defeated by the Swedes. It contains three proteſtant churches, and is chiefly inhabited by Germans, who trade principally in cattle and wool; 170 miles N. N. W. of Breſlaw.

FRAXINELLA, in *Botany*, the diminutive of *Fraxinus*, a little aſh, alluding to the form of the leaves. See Dictamnus.

Fraxinella, in the *Materia Medica*, is the Dictamnus *albus*, which ſee. The root, which is the only part directed for medicinal uſe, has, when freſh, a moderately ſtrong, not diſagreeable ſmell; and to the taſte diſcovers a pretty ſtrong and very durable bitterneſs, which is taken up by both watery and ſpirituous menſtrua; and on inſpiſſating the filtered tinctures, remains entire in the extracts; the aqueous extract is in much larger quantity than the ſpirituous, and proportionably weaker in taſte. This root was formerly uſed as a ſtomachic, tonic, and alexipharmic, and was ſuppoſed to be an efficacious medicine in removing uterine obſtructions, and deſtroying worms; but it ſunk almoſt entirely into diſuſe, till Baron Stoerck brought it into notice by publiſhing ſeveral caſes of its ſucceſs in tertian intermittents, worms, (lumbrici,) and menſtrual ſuppreſſions; in which caſes he employed the powdered root to the extent of a ſcruple twice a day. He alſo uſed a tincture, prepared of two ounces of the freſh root digeſted in 14 ounces of ſpirit of wine; of this 20 to 50 drops, two or three times a-day, were ſucceſsfully preſcribed in epilepſies, &c. and when joined with ſteel, this root, it is ſaid, was of great ſervice to chlorotic patients. Nevertheleſs, though the dictamnus is a medicine of conſiderable power, we may ſtill ſay with Haller, "Nondum autem vero pro dignitate exploratus eſt." Woodville, Med. Bot.

FRAXINUS, in *Botany*, the Aſh; ſo called by the Romans, whether from φραττω, to hedge in or encloſe, or from *fragoſus*, rough and rocky; the former alluding to its poſſible, though not general, uſe, and the latter to its occaſional, though not uſual, places of growth; we really cannot decide, but we have nothing better to offer. Linn. Gen. 550. Schreb. 736. Sm. Fl. Brit. 12. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 444. Juſſ. 105. Tourn. t. 343. Gærtn. t. 49. Claſs and order, *Diandria Monogynia*. (*Polygamia Dioecia*; Linn.) Nat. Ord. *Sepiariæ*, Linn. *Jaſmineæ*, Juſſ.

Gen. Ch. *Cal.* either wanting, or a ſmall Perianth of one leaf, in four deep ſegments, upright and acute. *Cor.* either wanting, or in four long, linear, acute, upright ſegments. *Stam.* Filaments two, erect, much ſhorter than the corolla; anthers erect, oblong, with four furrows. *Piſt.* Germen inferior, ovate, compreſſed; ſtyle cylindrical, upright; ſtigma thickiſh, cloven. *Peric.* Capſule ovate-oblong, leafy in the upper part, of two cells, one of which is generally abortive. *Seeds* ſolitary, pendulous, lanceolate, compreſſed, cloathed with ſhining powder.

Eſſ. Ch. Calyx none, or deeply four-cleft. Corolla none, or deeply four-cleft. Capſule ſuperior, of two cells, leafy at the top, compreſſed. Seeds ſolitary, pendulous. Some flowers have no ſtamens, ſome no ſtigma.

E. *excelſior* has neither calyx nor corolla. Its flowers have always a greater or leſs proportion of female ones intermixed.—*F. Ornus*, though aſſerted by Linnæus to bear perfect or united flowers only, was found by Sibthorp to have ſome few with an abortive germen and no ſtyle, and ſtill more with a perfect piſtil, but no ſtamens.

1. F. *Ornus*. Manna, or Flowering Aſh. Linn. Sp. Pl. 1510. Sm. Fl. Græc. Sibth. v. 1. 4. t. 4. Woodv. Med. Bot. t. 36. Willd. Baumz. 115. Ehrh. Pl. Off. 270. Arb. 160. Leaflets elliptic-oblong, pointed, bluntly ſerrated. Flowers with a corolla.—Native of the warmeſt parts of Europe. Common on the higheſt moſt rocky mountains of Greece, and not rare in the ſouth of Italy. This is the μελια of the ancient Greeks, μέλεσς of the modern inhabitants of the ſame country. Manna is obtained from the ſap that flows from wounds in the trunk, and according to the information of Mr. Hawkins, recorded in the Flora Græca, is collected at preſent in the peninſula of Mina only. The tree is ſometimes ſeen in our ſhrubberies, and in May or June, when covered with its innumerable light delicate whitiſh bloſſoms as with a muſlin veil, affords a very agreeable ſpectacle. The *leaves* conſiſt of two or three pair, with an odd one, of oppoſite, ſlightly ſtalked, leaflets, various in breadth, ſmooth, light green; their ſerratures ſmall, rounded, numerous and obtuſe. *Panicles* about the ends of the branches, axillary, much-compounded, many-flowered. *Capſules* ſmaller than thoſe of the common aſh, ſeldom ripened in England.

2. F. *rotundifolia*. Round-leaved Aſh. Mill. Dict. ed. 8. n. 2. Ait. Hort. Kew. v. 3. 445. Lam. Dict. v. 2. 546. Willd. Baumz. 116. t. 6. f. 1.—Leaflets roundiſh, acute, ſharply ſerrated. Flowers with a corolla.—Native of the Levant. Manna ſeems to be collected from this indifferently with the preceding. It is known by the ſharp ſpreading ſerratures of the *leaflets*. Their breadth or roundneſs is a variable circumſtance in the former, and poſſibly in the preſent ſpecies. Miller makes a whimſical miſtake in terming the flowers *coloured*, from a wrong tranſlation, and indeed a wrong tranſcript, of the words *floribus corollatis* in Linnæus. Plukenet's *F. alepenſis*, Phyt. t. 182. f. 4, ſeems manifeſtly this ſpecies, as Lamarck makes it, though Willdenow refers it to *parvifolia*, n. 9.

3. F. *americana*. American Aſh. Linn. Sp. Pl. 1510. Willd. Baumz. 116. (F. acuminata; Lam. Dict. v. 2. 547.)—Leaflets ſtalked, oblong, pointed, ſlightly ſerrated; glaucous beneath. Capſules cylindrical at the baſe.—Native of Carolina, Pennſylvania, &c.—The taper-pointed *leaflets*, very ſlightly ſerrated, glaucous beneath, and of an oblong lanceolate figure, diſtinguiſh this ſpecies. The *capſules* are remarkable for being ſcarcely at all compreſſed, but nearly cylindrical, in the part where the ſeed is lodged. A jagged permanent *calyx* is viſible on the fruit, which leads us to ſuppoſe it has alſo a *corolla*, but of that we have no account. This aſh is ſaid to thrive in moiſt low ſituations. It grows to a conſiderable height, and makes a handſome tree.

4. F. *juglandifolia*. Walnut-leaved Aſh.—Lam. Dict. v. 2. 548. Willd. Baumz. 117.—"Leaflets ſtalked, ovate, opaque, toothed; glaucous, with downy veins beneath. Branches ſmooth. Flowers with a calyx."—Native of North

North America. It bloſſoms at the end of April or beginning of May, and is a middle-ſized tree, not remarkable for beauty. The *leaves* are large, reſembling thoſe of a Walnut, and differ from the laſt in being toothed, and not ſo much pointed. The *buds* are ſmall, compreſſed and reddiſh. The *flowers* have a calyx, but we find no mention of a corolla. *Lamarck, Willdenow.*

5. F. *caroliniana.* Narrow-leaved Carolina Aſh.—Lam. Dict. v. 2. 548. Willd. Baumz. 119. (F. carolinenſis, foliis anguſtioribus, utrinque acuminatis, pendulis; Cateſby's Carolina, t. 80?)—"Leaflets ſtalked, lanceolate, toothed, ſhining, ſmooth. Branches ſmooth. Flowers with a calyx."—Native of North America. Differs from the preceding in having narrower, more pointed *leaves*, not white beneath, toothed, of a bright ſhining green. Lamarck deſcribes a variety with ſtill narrower leaves, of a brighter green beneath, and of an agreeable aſpect, which he conceives to be probably what Cateſby has figured.

6. F. *pubeſcens.* Downy-leaved Aſh.—Lam. Dict. v. 2. 548. Willd. Baumz. 119. Walt. Carol. 254?—"Leaflets ſtalked, elliptic-ovate, ſerrated; downy beneath, as well as the footſtalks and branches. Flowers with a calyx."—A *tree* twenty feet high, of little beauty, native of North America. The leaflets are rather more numerous than in any of the other American kinds, being uſually ſeven or nine, finely ſerrated, clothed underneath with ſoft down. The *footſtalks* and young *branches* are likewiſe downy. *Flowers* with a calyx, but no corolla. *Lamarck, Willdenow.*

7. F. *ſambucifolia.* Elder-leaved Aſh.—Lam. Dict. v. 2. 549. Willd. Baumz. 121.—"Leaves ſeſſile, ovato-lanceolate, ſerrated, rugged, ſhining; branchings of their veins downy beneath."—Native of North America. A *tree* of vigorous growth, twenty or twenty-five feet high, known by its ſeſſile *leaflets*, and their dark-green colour. The terminal one only is ſtalked. The whole number of leaflets is ſeven. They are naked, except the ribs at the back. Of the flowers we have no account.

Of this and the three immediately preceding we have no knowledge but from the works of Lamarck and Willdenow. The former ſaw them growing in the garden at Paris. They may perhaps all be to be found among our nurſeries in England, but botaniſts have not taken the pains to ſtudy them. As ſo much has been done to clear up the far more difficult genera of *Salix* and *Pinus*, it is to be hoped thoſe of *Fraxinus* and *Quercus* will one day receive elucidation, from ſome ſcientific hand. The plants muſt be obſerved, and ſpecimens collected, when in flower, in early and in full-grown foliage, with the fully formed capſules.

8. F. *excelſior.* Common Aſh. Linn. Sp. Pl. 1509. Lam. Dict. v. 2. 544. Engl. Bot. t. 1692.—Leaflets ſlightly ſtalked, elliptic-lanceolate, pointed, ſerrated. Flowers without calyx or corolla.—Native of Europe and the north of Aſia, in a light ſpringy (but not marſhy) ſoil, eſpecially if marly or calcareous. When planted in bogs, it contributes much to drain them. It will grow in almoſt any ſituation, even in hard clay and dry gravel, though Lamarck juſtly obſerves that poor dry ſandy ground is fatal to this tree. Its ſmooth ſtately *ſtem* riſes to a great height, with ſpreading, rather drooping, branches. *Buds* ſhort, thick, black and downy. *Leaves* compoſed of five or ſix pair of nearly ſeſſile, ovate, or ovato-lanceolate, pointed, ſerrated, ſmooth leaflets. The *flowers* come forth in April, before the leaves, from lateral buds, below the leaf-buds, and are greeniſh and inconſpicuous, without any traces of calyx or petals. *Capſules* pendulous, compreſſed, often twiſted, pointed.

a. Weeping Aſh. This is a variety, whoſe branches are quite pendulous, and ſweep on the ground. It is well adapted for bowers, and is now common in the gardens of this country.

b. Simple-leaved Aſh. Fraxinus ſimplicifolia; Willd. Baumz. 121. t. 3. f. 2. We have heard of wild plants of this kind in Cambridgeſhire and in Kent. The large ſimple *leaves* give it a totally different aſpect from the Common Aſh, but have rather ſingularity than beauty to recommend them. Some of them however are occaſionally pinnate. Willdenow eſteems this Aſh a diſtinct ſpecies, and we have heard ſurmiſes to the ſame purpoſe, which we have not yet materials to refute or confirm. Propagation by ſeed ſhould decide the queſtion.

F. *excelſior* is valuable for its tough and hard wood, which ſerves for many different purpoſes. The varieties are propagated by grafting.

9. F. *parvifolia.* Small-leaved Aſh. Lam. Dict. v. 2. 546. Willd. Baumz. 124. t. 6. f. 2. (F. rotundifolia; Ehrh. Pl. Off. 280.)—Leaflets ſlightly ſtalked, ovate, pointed, ſerrated; wedge-ſhaped at the baſe. Flowers without calyx or corolla. Capſules cylindrical at the baſe.—Native of the Levant. This has been confounded with the Manna Aſh, from which it is very diſtinct, being much more like the Common Aſh in its *buds*, and agreeing with the latter in the colour and ſtructure of its *flowers*, which have neither calyx nor corolla. The *capſules*, according to Lamarck, are narrow, and nearly cylindrical, their wing dilated upwards, and abrupt. The *leaflets* are ſhorter and broader than in *F. excelſior*. Ehrhart appears to have confounded the ſpecies before us with Miller's *F. rotundifolia*, our n. 2, and ſeveral perſons miſtake it for the tree which produces Manna, F. *Ornus*, n. 1.

FRAXINUS, in *Gardening*, compriſes plants of the hardy deciduous tree kind, of which the ſpecies cultivated for timber are: the common aſh-tree (F. excelſior), the manna aſh-tree (F. rotundifolia), the flowering aſh-tree (F. ornus), and the American aſh-tree (F. americana).

Of the firſt ſort there are varieties, with ſimple leaves, lobed, and even ternate; with pendulous branches; or weeping aſh, with variegated leaves, yellow and white; or gold-ſtriped and ſilver-ſtriped.

And of the third ſort there is a variety, the dwarf flowering aſh.

Of the fourth ſort there are the white American aſh, and the red American aſh. And there is a third variety named the black aſh, in which the ſtem is erect, branching, twenty or thirty feet in height, with large very dark leaves compoſed of three or four pairs of lobes and an odd one, ſmall flowers of a greeniſh colour, and broad blackiſh fruit. Other varieties may alſo be found in the nurſeries which are not leſs curious than thoſe that have been mentioned above.

Method of Culture.—Theſe plants may all of them be increaſed with facility by ſeeds, which in the common ſort ſhould be ſown in the autumn; and in the others, as ſoon as they can be obtained in the ſpring, on beds of light mould over the ſurface, raking them into the depth of nearly an inch. The young plants ſhould be afterwards kept clear from weeds, and when they have had one or two years growth they ſhould be removed into nurſery rows, and placed two feet aſunder, and one diſtant in the rows, where they muſt remain till fit for being planted, where they are to grow in the natural ground.

The three laſt ſorts may likewiſe be raiſed by budding or ingrafting upon common aſh ſtocks, when of the ſize of a good bean ſtem. This buſineſs ſhould be performed about

the latter end of ſummer; but the plants raiſed in this mode are not ſo fine as thoſe from ſeed, on account of the ſtocks growing with more rapidity than the heads of the plants.

Theſe are the only methods by which the variegated varieties can be increaſed.

All the ſorts may be introduced as ornamental trees; but thoſe of the American kind are the moſt proper in ſmall plantations, ſhrubberies, and other ornamented grounds.

The firſt ſort is highly uſeful as a timber-tree, and ſhould be much more attended to than has lately been the caſe, as wood of the aſh kind is becoming extremely ſcarce in many ſituations. For various uſes in huſbandry, and ſeveral other purpoſes, there is no other ſort of wood that can ſupply its place. It grows well in dry places where the ſoil is mellow, though it may not have any great depth, but ſucceeds beſt in ſouthern expoſures. See Ash-*tree*.

FRAY literally ſignifies to fret; as cloth or ſtuff does by rubbing, or over-much wearing.

Among hunters a deer is ſaid to fray his head, when he rubs it againſt a tree, to cauſe the ſkins of his new horns to come off.

FRAYLES, in *Geography*, an iſland near the coaſt of New Andaluſia, in Terra Firma.

Frayles, *Los*, a cluſter of ſmall iſlands in the Weſt Indies, about 6 miles N.E. from the iſland of Margarita. N. lat. 11° 15'. W. long. 63° 46'.

FREA, Freia, or *Frigga*, in *Mythology*, the wife of Odin, and, next to him, the moſt revered divinity among the heathen Saxons, Danes, and other northern nations. As Odin was reputed to be the father, Frea was eſteemed the mother of all the other gods. In the moſt ancient times, Frea was the ſame with the goddeſs Hertha, or Earth, which was devoutly worſhipped by the Angli and other German nations. See Hertha and Odin. From the name of this divinity, ſome have derived that of Friday, the ſixth day of the week.

FREAM, in *Agriculture*, a term applied to ſuch arable or ploughed land as is worn out or exhauſted, and is laid fallow till it recovers.

Fream, among *Sportſmen*, a term uſed for the noiſe of a boar in rutting time.

FRECHILLA, in *Geography*, a town of Spain, in the province of Leon; 17 miles N.W. of Palencia.

FRECKELBEN, a town of Germany, in the principality of Anhalt-Deſſau; 30 miles W.S.W. of Deſſau.

FRECKLE, in *Agriculture*, a term applied to ſuch wheat and other crops as are ſpotted by a ſort of mildew in the ſtraw, &c. See Mildew.

Freckles, in *Medicine*, ſmall brown or duſky ſpots, which are ſprinkled on the ſkin, eſpecially of the face, neck, hands, and ſuch parts as are expoſed to the ſun and air. They are moſt frequent in women, and eſpecially in thoſe of fair complexion, with red or auburn hair. They occur in various degrees as to ſize and denſity, but are never productive of any inconvenience. In ſome perſons they appear only during the ſummer, and diſappear with the return of cold weather; but in others they are permanent. The Latins denominated them *lentigines*, from their fancied reſemblance to lentils; the Germans call them *ſommerſproſſen*, and *ſommerflecken*, from the appearance in hot weather; by the French they are termed *rouſſeurs*; and *roſſore* and *lentigine* by the Italians. The humoral phyſicians found an eaſy explanation of the origin of freckles, in the depoſition of the oily, or bilious portions of the fluids in the ſkin, in conſequence of the evaporation of the thinner parts, which the ſummer heat was ſuppoſed to occaſion. But as neither oil, nor bile, nor "fuliginous vapour" (as Turner ſuppoſes) exiſt in the blood, theſe hypotheſes are mere abſurdities. In truth, we are equally ignorant of the nature of theſe cutaneous ſpots, as of the means of removing them when formed. Various diſtilled waters, as of elder-flowers, bean-flowers, &c.; infuſions of theſe flowers in goat's milk, alum, the preparations of lead, &c. have been recommended by different writers, as efficacious in the removal of freckles; but we believe their remedial powers to be purely imaginary. As the freckles appear only on parts expoſed to the air and light, the moſt obvious means of preventing or removing them muſt conſiſt in excluding the operation of thoſe agents upon the ſkin as much as poſſible. See Sennert. Opera, lib. v. p. iii. § i. cap. iii. Turner on the Skin.

FREDDO, in *Geography*, a river of Sicily, in the valley of Demona, which runs into the ſea.—Alſo, a river of Calabria, which runs into the ſea. N. lat. 39° 18'. E. long. 16° 15'.

FREDEBURG, a town of Germany, in the kingdom of Weſtphalia; 52 miles E. of Cologne.

FREDEGAIRE, in *Biography*, the moſt ancient of the French hiſtorians, flouriſhed in the ſeventh century. Of his hiſtory nothing is known. He compoſed a chronicle in five books, containing a chronological hiſtory from the creation to the fourth year of Clovis II. which has been continued by other authors to the year 768. It is very defective as a hiſtory, but is indiſpenſible in the account of three of the early kings. Moreri.

FREDEGONDE, a woman famous in the early period of French hiſtory, was deſcended from an obſcure family in Picardy. She entered into the ſervice of Audouaire, firſt wife of Chilperic I., king of France, and procured her divorce. Chilperic then married Galſuintha, daughter of the Viſigoth king of Spain, who was ſoon after found dead in her bed. About the year 568 he raiſed Fredegonde to the throne. In this high ſituation ſhe uſed her power to the worſt purpoſes: ſhe cauſed Sigebert, brother of Chilperic, to be aſſaſſinated in the midſt of his army. She afterwards brought to a like end Merovèe, the ſon of Chilperic by his firſt wife. A venerable biſhop of Rouen was her next victim, whom ſhe cauſed to be ſtabbed at the altar. Reſolved to make the way clear for her own children, ſhe contrived the death of Clovis, younger brother of Merovèe, which was followed by that of their mother Audouaire. There ſeemed no end to her cruelty, till at length her temper was ſomewhat affected by the loſs of three of her own children by an epidemic diſtemper, and ſhe then perſuaded the king to repeal ſome oppreſſive impoſitions laid upon his ſubjects. In 584 Chilperic himſelf was aſſaſſinated by an unknown hand, but the ſuſpicion fell on Fredegonde, whoſe criminal paſſion for another perſon, the king is ſaid to have detected. Fredegonde being now driven from the throne, fled with her remaining ſon, Clotaire II., then an infant, and took refuge at the court of the king of Burgundy, whom ſhe found means to intereſt in her favour. An attempt was made by Childebert to poſſeſs himſelf of the eſtates of young Clotaire, but his mother raiſed troops, put herſelf at their head, gained a victory, and triumphed over her enemies. She died in 597, leaving the affairs of her ſon in good condition. Moreri.

FREDELAND, in *Geography*, a town of Pruſſia, in Pomerania; 60 miles S.S.W. of Dantzic.

FREDENSBORG, a town of Denmark, in the iſland of Zealand; 18 miles N. of Copenhagen. N. lat. 55° 59'. E. long. 12° 25'.

FREDENWALDE, a town of Brandenburg, in the Ucker

Ucker Mark; 40 miles N. of Berlin. N. lat. 53° 7'. E. long. 13° 50'.

FREDERIC I. ſurnamed *Barbaroſſa*, in *Biography*, emperor of Germany, born in 1121, was the ſon of Frederic duke of Swabia, and ſucceeded his uncle Conrad III. on the imperial throne in 1152. His enterpriſing and martial diſpoſition led him to aſſert all the prerogatives claimed by the German empire. Soon after he came to the crown he ſettled a diſpute between two rivals for the crown of Denmark, and obliged Sueno, the ſucceſsful one, to do him homage. To ſhew his independence on the pope, with whom he began to have diſputes, he repudiated, by his own authority, his wife Adelaide, on account of conſanguinity. The troubles of Italy called him into that country in 1155, where he received the ſubmiſſion of moſt of the Italian great lords and cities. At Pavia he was crowned king of Italy, and had an interview with pope Adrian IV. to whom he paid homage. He then re-eſtabliſhed the pontiff in Rome, whence he had been expelled by a tumult, received the imperial crown from his hands, and then returned to Germany, and called a diet at Beſançon. The pope's legates, who attended this meeting, gave ſo much offence by reading a letter from him, in which he pretended that he had conferred the empire upon Frederic by his own free grace, that they were driven out with ignominy and contempt, and the emperor publicly gave the lie to the pope's aſſertions. This diſpute was compromiſed, and Frederic reduced to obedience Boleſlaus, duke of Poland, who had aſſerted his independence. Having pacified Germany, he proceeded again into Italy with a powerful army. Here he invaded the republics of Lombardy with the arts of a ſtateſman, the valour of a ſoldier, and the cruelty of a tyrant. "The recent diſcovery of the pandects," ſays the hiſtorian, "had renewed a ſcience moſt favourable to deſpotiſm; and his venal advocates proclaimed the emperor the abſolute maſter of the lives and properties of his ſubjects." He every where arrogated the rights of unlimited ſovereignty, and carried fire and ſword through thoſe places which ventured upon oppoſition. On the death of Adrian IV. there was a violent ſchiſm with regard to a ſucceſſor, and the emperor was excommunicated by Alexander III. who had been choſen pope by the cardinals. Frederic in revenge made himſelf maſter of Milan in 1163, and gratified his reſentment by razing the city to the ground, ſparing nothing but the churches. Theſe ſevere examples put an end to all farther oppoſition in Lombardy, and he returned to Germany, and ſet out to meet Lewis the Young, king of France, at a council to be held for terminating the papal ſchiſm, but it proved ineffectual. He was obliged again to croſs the Alps to puniſh his enemies, and upon his return to Germany pope Alexander was eſcorted to Rome by the king of Sicily, and took poſſeſſion of his ſee. Frederic reviſited Rome, and the pope thought it prudent to eſcape in the habit of a pilgrim to Beneventum. The antipope was now ſeated in his chair, and he crowned the emperor with his empreſs Beatrice. His ſucceſs was of ſhort duration, for the plague made ſuch ravages in the army that he was obliged to make a rapid retreat. With the utmoſt difficulty he reached Alſace with the wreck of his army, while the confederates in Lombardy ſtrengthened themſelves, and pope Alexander received ſuccours from the Greek emperor Manuel. Frederic appeaſed the diſorders of Saxony, where the nobles had taken up arms againſt their duke, and procured the election of his eldeſt ſon Henry to the dignity of king of the Romans. He again marched into Italy, reduced ſeveral towns, till at length fortune ſeemed to turn againſt him, and he was totally defeated in a battle at Signano; and about the ſame time his ſon Henry was defeated in a ſea-fight with the Venetians, and taken priſoner. The cauſe of Frederic now in Italy was ſuch, that he propoſed an accommodation with pope Alexander. They had an interview at Venice in 1177. The emperor was very humble before his holineſs, who abſolved him from all eccleſiaſtical cenſures, and communicated with him. This reconciliation produced the treaty of Conſtance, in which Frederic confirmed the freedom of twenty-four cities with a reſervation of his rights as ſovereign. In 1183 the treaty of Placentia confirmed the agreement made between the emperor and the Lombard towns. Nevertheleſs, new troubles were perpetually ariſing from ſources frequently unexpected: twice on the emperor's rejecting the popes' Lucius III. and Urban III. the ſovereignty of the counteſs Matilda's eſtates, called St. Peter's patrimony. He ſeized the greater part of this property, and by the marriage of his ſon Henry with the heireſs of William king of Sicily, ſo far ſtrengthened his intereſt in Italy, that the popes, though they had many cauſes of complaint againſt him, were afraid to proceed to extremities. At length the news of the capture of Jeruſalem by Saladin ſuſpended domeſtic quarrels among the Chriſtians, and the emperor, as firſt prince of Chriſtendom, took the croſs in 1188, with his ſon Frederic, and a number of the principal nobles of Germany. Aſſembling an army of 160,000 men in the plains of Hungary, he proceeded to the territories of the Greek emperor, who did all in his power to impede their march, ſo that Frederic was compelled to act againſt him as an enemy, and to make his way by force. With a reduced army he reached the Turkiſh frontier, took the city of Iconium, croſſed mount Taurus, and was proceeding in the career of victory, when Frederic, tempted by the great heat of the climate to bathe in a river of Cilicia, was carried away by the current and drowned. The enterprize in which he had engaged would probably have proved fatal, even had he eſcaped this misfortune, for his ſon and the greateſt part of his army afterwards periſhed of a peſtilential diſeaſe before the walls of Acre. Frederic died in 1190 in the ſixty-ninth year of his age. Beſides the vigour and capacity which he diſplayed in action, Frederic poſſeſſed ſome literary talents, and drew up memoirs of his own life, which he gave to Otho the hiſtorian. Gibbon. Univ. Hiſt. Moreri.

FREDERIC II. grandſon of the preceding, and ſon of the emperor Henry VI. by Conſtance of Sicily, was born in 1194. He was created king of the Romans in his cradle, but the premature death of his father prevented his ſucceſſion at the firſt vacancy. He was educated with great care by his mother, and acquired the Greek, the Latin, German, French, and Turkiſh languages. He aſcended the throne when he was about eighteen years of age, in the full poſſeſſion of thoſe accompliſhments which are expected to give luſtre to a diadem, and to render a nation happy. His hereditary poſſeſſions were very conſiderable, including the kingdoms of Naples and Sicily, the dukedom of Swabia, and other German territories. When the emperor Otho was excommunicated by the pope, Frederic was declared emperor, and became peaceable poſſeſſor of the imperial throne by the retreat and death of Otho. He was ſolemnly crowned at Aix-la-Chapelle in 1215. As an acknowledgment of the favours which divine Providence had hitherto beſtowed upon him, he made a vow to go in perſon to the Holy Land. The firſt four years of his reign having been ſpent in arranging the affairs of the empire, and curbing the rebellious ſpirit of Otho's adherents, he made a progreſs into Italy in the ſummer 1220, and received the imperial crown from Honorius III. He alſo cauſed his ſon Henry to be declared king of the Romans, and promiſed upon oath that he would

lead an army into Aſia, at any time his holineſs ſhould appoint. He was, however, ſo tardy in the execution of his vow, that Honorius threatened to excommunicate him: a rupture enſued, which threatened very ſerious conſequences, for the emperor not only remonſtrated with the pope, but publiſhed a ſevere manifeſto for the juſtification of his own conduct, and ordered his troops to march to the frontiers of the eccleſiaſtical ſtate. Honorius now perceived the raſhneſs of his own conduct, apologized, and a reconciliation took place, in which Frederic agreed to marry Yolanda, daughter of the king of Jeruſalem; and promiſed to ſet out with an army in two years for the recovery of Paleſtine. Notwithſtanding theſe renewed engagements, Frederic ſtill heſitated to take the croſs: Honorius again remonſtrated, and a literary correſpondence commenced, in which he accuſed the emperor of ingratitude and cruelty to his father-in-law, who had ceded his title to the kingdom of Jeruſalem. On the death of Honorius, and the elevation of Gregory IX. to the apoſtolic chair, Frederic avowed his intention of performing his engagement, and actually ſet ſail, with a powerful armament; but about three days after he had put to ſea, a ſlight indiſpoſition ſerved as an excuſe for his return. The pope now without heſitation excommunicated him, and ſuch commotions enſued, that Frederic thought proper to ſet out immediately for the Holy Land, but as he did not carry with him the pope's abſolution, he was coldly received at Jeruſalem; the cruſaders peremptorily refuſed to acknowledge him as their chief, and he concluded a treaty with the Saracens. He then cauſed himſelf to be crowned at Jeruſalem, and returned to Naples with a title which has ſince been preſerved by the Sicilian monarchs. Frederic now employed himſelf in attempting to reduce the revolted cities in Lombardy; but while thus engaged, his ſon Henry, king of the Romans, formed a confederacy againſt him, which obliged him to viſit Germany. A diet was held at Mentz, in which his ſon was convicted of rebellion, and was in conſequence ſent to Sicily; but upon freſh conſpiracies being detected, he was made cloſe priſoner in the caſtle of Apulia, where he ſoon after died. He then invaded the dominions of the duke of Auſtria, his ſon's accomplice, took Vienna, where he founded the univerſity, and procured the election of his ſon Conrad as king of the Romans. After this he returned to Italy with a powerful army, gained a conſiderable victory over the Lombard league, and became ſo formidable, that the pope openly took part againſt him, and renewed his excommunication. A moſt fatal war ſucceeded, which ſpread through Italy, and in the courſe of which almoſt every town was ravaged by the hoſtile armies. Gregory died; but his ſucceſſor, pope Innocent IV., continued the quarrel, and excommunicated the emperor in 1245. The pope's party being triumphant, they elected a new king of the Romans; an attempt was made to poiſon the emperor, but it was rendered abortive by a timely diſcovery. At the ſiege of Parma, undertaken by Frederic, he met with a total defeat, which cauſed his party to be almoſt entirely diſperſed in the north of Italy. He was now obliged to retire to the kingdom of Naples, where he died of a fever in the fifty-fifth year of his age, and thirty-fourth of his reign. Frederic II. appears to have been a prince of great courage, genius, and fortitude; but his more ſplendid qualities were tarniſhed by ambition, violence, and an inordinate attachment to the fair ſex. He married ſix wives, of whom the laſt was daughter of John king of England. He was addicted to the follies of judicial aſtrology, and though he has been charged with maintaining atheiſtical tenets, yet as the charge was made through the medium of the popes, with whom he was perpetually at variance, it is ſcarcely to be relied on. He was unqueſtionably a patron of learning, and cauſed the works of Ariſtotle and others of the ancients to be tranſlated from the Greek and Arabic into Latin. He himſelf compoſed poems, and ſome proſe works, and he is ſaid to have had a ſhare in the famous treatiſe "De tribus Impoſtoribus." It was a fundamental maxim of his conduct, never to poſtpone any buſineſs till to-morrow which he could poſſibly perform in the current day. Moreri. Univ. Hiſt.

FREDERIC III., emperor, ſon of Erneſt, duke of Auſtria, ſucceeded his couſin Albert II. in the year 1440. He was now in his twenty-fifth year, and one of his firſt acts was to convoke a diet for the purpoſe of terminating the ſchiſms then ſubſiſting in the papal ſee, but as his propoſitions were totally diſregarded, he left the matter to the contending popes to ſettle as they pleaſed. In 1451 Frederic viſited Italy in order to receive the imperial crown from the pope. This ceremony was performed with due pomp, but did not enable him to recover any of the rights of the empire which had been torn from it by various uſurpers, and his viſit left a very unfavourable impreſſion of his talents on the minds of the Italians. An attempt was made to rouſe him to exertion when Conſtantinople was taken by the Turks, but he could not be prevailed on to make any efforts in the Chriſtian cauſe. He was engaged ſome time in domeſtic wars for the poſſeſſion of the duchy of Auſtria, which on the death of Albert he obtained. In 1468 he viſited Rome, held ſeveral conferences with the pope concerning means for reſiſting the progreſs of the Turks; but nothing of importance followed. Frederic was, however, very intent upon the aggrandizement of his family, and the marriage of his ſon Maximilian to the heireſs of the rich houſe of Burgundy, and thus had the good fortune to be the author of the greateſt acceſſion of dominion that his race ever acquired. From this period he repoſed upon Maximilian the chief weight of the government, who was ſoon after elected king of the Romans. Upon the death of Matthias he obtained from his ſon Ladiſlaus the reſtitution of Auſtria, and afterwards regained Tyrol from the duke of Bavaria; at length he quitted the reins of empire, and retired to Lentz, where he occupied himſelf in ſcientific ſtudies. He died at the age of ſeventy-nine years, in conſequence of an amputation of his leg. He was a prince of an agreeable air and majeſtic countenance: he was plain in his apparel, moderate in his paſſions, and ſo remarkably abſtemious, that his life is ſaid to have reſembled a continual faſt. From his natural averſion from war he was ſurnamed the "Pacific," yet the inconſtancy of his temper often prompted him to embark in quarrels. He was endowed with a remarkably tenacious memory, but was deſtitute of courage, reſolution, and generoſity. He had a favourite maxim to which he had perpetual recourſe, *viz.* "that the beſt remedy for irretrievable loſſes is oblivion." Moreri. Univer. Hiſt.

FREDERIC I., king of Denmark, was born in 1473, and ſucceeded to the throne on the abdication of his nephew Chriſtian II. At a general diet of the Danes, convoked for the purpoſe, he was declared king, and the ſtates of Norway likewiſe proclaimed him monarch with the uſual formalities. Being of an ambitious and aſpiring mind he was anxious for reuniting the three kingdoms, and for that purpoſe wrote to ſome of the principal nobility of Sweden; but Guſtavus Vaſa was capable of defending the crown that was firmly fixed on his head, and therefore Frederic readily gave up his claims, and formed a treaty of alliance with that monarch. The iſle of Gothland, ſeized by admiral Norby, was afterwards the object of contention between the two

crowns; but Frederic, by his vigour and policy, finally annexed it to his dominions. The progreſs of the reformation in the laſt reign had brought religious differences to a criſis in Denmark, and, 1527. Frederic openly declared in favour of Lutheraniſm: while, however, he gave the aſcendancy to that perſuaſion, he determined that every ſubject of his dominions ſhould be at liberty to embrace either the doctrines of Luther or of Rome; that no perſon ſhould be perſecuted or moleſted on account of his religion, and that the religious of all denominations ſhould be permitted to marry: in conſequence of this wiſe and truly liberal decree, the abbeys and cloiſters were deſerted, all auſterities diſregarded, and Lutheraniſm was every where publicly preached and embraced. The depoſed Chriſtian II. in 1531 made an attempt for the recovery of his crown, but being defeated in his object, he was obliged to ſurrender himſelf priſoner, and was committed to cloſe cuſtody by his uncle. Frederic I. died, after a reign of ten years, at the age of ſixty. His conduct obtained him the title of "Pacific," and contemporary hiſtorians juſtly praiſe the prudence and moderation of his government, which rendered his reign proſperous and happy. At his death the clergy, who had been offended at his innovations, were left in a ſtate of uncertainty, in conſequence of which the proteſtant religion gained ground and gathered ſtrength. Frederic left children by both his wives, one of whom was the daughter of the elector of Brandenburg, the other of the duke of Pomerania. Univer. Hiſt. Moreri.

FREDERIC II., king of Denmark, ſon of Chriſtian III., was born in 1534, and ſucceeded to the throne on the death of his father in 1558. The firſt years of his reign were paſſed in the din of war, with the people of Dithmarſh, who had made themſelves independent, but who, after a brave reſiſtance, were forced to ſubmit to the law of the conqueror: he next engaged in a conteſt with Eric king of Sweden, whoſe embaſſadors, as they were paſſing into Germany, he arreſted in violation of the ſafe conduct he had granted them. This war was commenced in 1563, and was carried on with mutual detriment, and the moſt cruel devaſtations of both countries, till the depoſition of Eric by his own ſubjects in 1568. Peace was then made, but upon terms ſo unfavourable to Sweden that war was renewed in 1569. The Hanſeatic towns, which were claimed by both parties, took an active part in the hoſtilities, and the city of Lubec embraced the occaſion of revenging itſelf on Sweden for the many reſtrictions impoſed upon it, and upon the commerce of the city. They concluded a treaty with the king of Denmark, and joined his fleet with a powerful ſquadron. After this, Frederic held the balance between thoſe commercial towns, and intereſted himſelf more than his predeceſſors in acquiring an influence over the affairs of Europe. He rendered commerce flouriſhing, reſpected the rights and property of his ſubjects, and obtained the eſteem and affection of his people. Frederic married the daughter of the duke of Mecklenburg, and thenceforth attended to the preſervation of peace, and promoted the proſperity of his dominions. He augmented the univerſity of Copenhagen, and was the active patron of learning and learned men, among whom was the celebrated aſtronomer Tycho Brahe. He died in 1588, leaving behind him a high character, as well among his own people as with neigbouring nations. So highly was he eſteemed by foreign princes, that queen Elizabeth ſent him the order of the garter, and James VI. king of Scotland, entered into a treaty with him for obtaining in marriage his daughter Anne. Univer. Hiſt. Moreri.

FREDERIC III., king of Denmark, born in 1609, was ſon of Chriſtian IV. and ſucceeded to the crown in the year 1648, but his authority as a monarch was greatly curtailed by the power which the great lords of his kingdom aſſumed. One of his firſt meaſures was a treaty with the Dutch, the friendſhip of whom he acquired by ſeizing in the port of Copenhagen a fleet of Engliſh merchant ſhips laden with naval ſtores; which ſtep, while it involved him with England, obtained for him a ſubſidy and league of alliance from Holland. In 1657 Frederic, ſtimulated by the Dutch, declared war againſt Sweden, but the warlike Charles Guſtavus ſoon repreſſed the progreſs of the Danes, and paſſing over the ice to Zealand, laid ſiege to Copenhagen. Notwithſtanding the courage and vigour of Frederic, he was compelled to make peace upon very diſadvantageous terms. War, however, ſoon broke out again, and Copenhagen was a ſecond time cloſely inveſted by ſea and land. The Swedes took the fortreſs of Cronenburg, and the capital was ſaved only by the arrival of the Dutch fleet. In this conteſt Frederic evinced a bravery not often paralleled: he was always prepared to act, and he perſonally watched over every meaſure which was to be adopted for the purpoſe of maturing the ſucceſſes, and reaping from them their full advantage. By his incitements, and by his own example, the citizens of Copenhagen became intrepid ſoldiers, bravely fought in ſmall boats againſt the ſhips of the beſiegers, and ruſhed forward through a tempeſt of flames. Their wives and children ſeconded their ardour, and the queen animated them by her preſence and example. That memorable ſiege furniſhed inſtances of almoſt every ſpecies of heroiſm. After Charles was compelled to retreat, Frederic rewarded the valour and fidelity of the citizens by well merited privileges. Peace was concluded in the year 1660: its terms were the reſtitution of all the Daniſh iſles of the Baltic, with the diſtrict of Drontheim, while Sweden retained the iſle of Rugen, and the provinces of Bleking, Halland, and Schonen. The moſt important event of Frederic's reign was the change of the conſtitution from an elective and limited, to an hereditary and abſolute monarchy. This was brought about by the diviſions between the different ſtates of the kingdom, and the hauteur and ſelfiſhneſs of the nobles, who would not conſent to take their ſhare with the commons of the public burthens. The king ſecretly fomented the diſcontents, till the commons, ſtimulated by the ill treatment of the nobles, reſolved, in conjunction with the clergy, to lay the liberties of the nation at the king's feet. Frederic gladly made uſe of the occaſion, and, by means of the army, overawed the nobles to a concurrence in the project. In this manner all the rights and privileges of the ſtates were ſolemnly ſurrendered, and the king and royal family received the homage of the different orders in a public theatre prepared for the purpoſe. This important revolution was effected without bloodſhed, and Frederic never abuſed the gift: he regulated the ſeveral parts of government, eſpecially the mode of ſucceſſion, and iſſued what has been denominated the "royal law." This has been conſidered ever ſince as the national code in all things pertaining to the ſucceſſion and the power of the monarch. No ſooner had he obtained poſſeſſion of abſolute authority, than he moderated that paſſion for glory which he had formerly betrayed. The remainder of his reign was ſpent in forming political alliances, and reſtoring proſperity to his country by the arts of peace. He applied himſelf to reſtore, by his own example, the ancient ſimplicity of dreſs and frugality at table; to re-eſtabliſh his finances; to encourage merit, induſtry, and commerce; to reward thoſe who had ſerved him with fidelity; to redreſs grievances; to protect the oppreſſed; to relieve the indigent; and to become the father of his ſubjects. The intimate connection between Holſtein and Sweden was the principal cauſe of his diſquiet;

diſquiet; and he was preparing to ſupport his cauſe by arms when he was carried off by a chronical diſorder in 1670. Univer. Hiſt. Moreri.

FREDERIC IV., king of Denmark, was born in 1671, and ſuccceded his father Chriſtian V. in 1699. He immediately made an attack upon the dominions of the duke of Holſtein, but was ſoon called back to defend Copenhagen from the attack of Charles, who began his wounderful career by a ſpirited invaſion of Zealand. Frederic ſued for and obtained peace on condition that he repaired all the wrongs he had done to the duke of Holſtein, and yielded him full ſovereignty of his dominions. Frederic was more ſucceſsful at ſea and land in the years 1714 and 1715, when they gained great advantages, drove the Swedes out of Norway, and took ſeveral places. In 1720 peace was concluded under the mediation of England, upon terms favourable to Frederic, who retained the duchy of Sleſwick. From that time he governed his dominions in peace, and attended to their internal proſperity. He died in 1730, leaving the character of an able prince, but too much addicted to enterprize, and too readily liſtening to the ſchemes of projectors. He is charged with having diſtributed thepublic treaſure with a too laviſh hand among his courtiers. Univer. Hiſt.

FREDERIC V., king of Denmark, was born in 1723, and ſucceeded his father Chriſtian VI. in 1746. On his acceſſion he formed the reſolution of diſcharging all the debts of the crown. The principal creditors of the ſtate, wiſhing to divert him from his purpoſes, offered to reduce the rate of intereſt rather than have their money paid. "The wealth," replied the monarch, "locked up in my coffers would be of no uſe to the public, but when I ſhall have repaid it, you will do me a pleaſure, and render me a ſervice, by lending thoſe ſums at a low intereſt to my ſubjects, who may thus be enabled to extend their commerce and ſupport their manufactures." He preſerved his dominions in peace, and promoted commerce and the manufactures, ſo as to make a large increaſe to the wealth of his people, and his own revenues. He eſtabliſhed a Greenland company; laid open to all his ſubjects the trade to the American colonies; encouraged agriculture, and the working of the mines, and made new roads. He was the zealous patron of the arts and ſciences: founded ſeveral academies and other places of inſtruction for the Laplanders; and inſtituted ſocieties for the improvement of painting, ſculpture, and architecture, and ſent a miſſion of learned men into the Levant for the purpoſe of making diſcoveries in natural hiſtory and antiquities. He died January 1766, and could conſole himſelf on his death-bed with the pleaſing and delightful reflection, that "he had never injured a ſingle individual, and had not a drop of blood to anſwer for." Frederic was twice married, firſt to Louiſa daughter of George II. of England, and ſecondly to Juliana Maria, daughter of the duke of Brunſwick Wolfenbuttle. Univer. Hiſt.

FREDERIC AUGUSTUS I., king of Poland and elector of Saxony, ſon of the elector John George III. by a daughter of Frederic III. king of Denmark, was born in 1670, and ſucceeded to the crown of Poland in 1697. For this high honour there were many candidates, but in a ſhort time the competition was confined to Frederic and the prince of Conti. As a preliminary ſtep he openly abjured the proteſtant religion, and by laviſhing the Saxon treaſures, he was able to counterbalance the art and eloquence of abbé de Polignac, the French negociator. On the day of election the nobles and others, to the number of a hundred thouſand men, aſſembled on the plain of Warſaw, each palatinate being divided into companies, and ranged under their proper banners, with all the electors on horſeback, armed with lances. The ſenators having taken their ſtations, each in front of his diviſion, commenced their harangues: and the cry of "long live Conti," was almoſt univerſal, till the palatine of Culm pronounced with a firm voice the word "Veto," which ſtopped the proceedings of the aſſembly, and the election was poſtponed to the enſuing day. Early in the morning both parties preſented themſelves nearly equal in ſtrength. A double election was made, and Poland was thrown into general diſorder by the efforts of the opponents. At length Frederic marched a German army into the country, and gained poſſeſſion of Cracow, where he was immediately crowned, and univerſally acknowledged as lawful king by the Poliſh nation. In ratifying the election of Frederic Auguſtus his own partizans limited the number of forces that he ſhould be allowed to introduce into Poland, and ſpecified the circumſtances which ſhould authorize him to require the aſſiſtance of his Saxon troops. In defiance, however, of theſe reſtrictions, he ſurrounded himſelf with Saxons, becauſe, as being his native ſubjects, he could place greater confidence in them than in the Poles; and to attach them the better to his own perſon, he loaded them with favours, and beſtowed upon them the moſt honourable and lucrative offices of the ſtate. The Saxons became extremely odious, and when the diet aſſembled, a demand was made that the Saxon troops ſhould be withdrawn. Frederic reſiſted, and was, as a conſequence, deprived of his right and title to the crown of Poland. This degradation was inflicted by Charles XII. of Sweden, who impoſed the moſt rigorous conditions on the depoſed monarch, and, beſides compelling him to acknowledge Staniſlaus as the legitimate ſovereign of the republic, and to renounce all right to the crown and dominions of Poland, required him to write a letter of congratulation to the new king, upon his acceſſion to the throne. Auguſtus complied, but by the ſtyle of his epiſtle, he evinced his regret, and the violence which he offered to his inclinations. The event of the battle of Pultowa determined Auguſtus to avow his intentions by a public declaration of breaking the treaty he had contracted with Charles XII. and of re-aſcending the throne of Poland, and he concluded with requeſting the aſſiſtance of all Chriſtian kings and princes. Staniſlaus, who ſaw himſelf abandoned by his friends, his protector a fugitive, and his rival ſupported by the moſt powerful monarch of the north, was no ſooner informed of the approach of Frederic, than he declared that as he had taken the ſceptre with no other view than the preſervation of liberty, he was now ready to reſtore it, provided that ſacrifice would promote the tranquillity and peace of the country. Frederic aſcended the throne without oppoſition. For ſome years his reign was diſquieted by jealouſies on the part of the Poles who could never be reconciled to the preſence of the Saxon troops: at length, however, the civil diviſions were terminated, and the remainder of the reign was paſſed in peace. Frederic died at the age of ſixty-three. He had for ſome years previouſly to his deceaſe reſided in his electoral ſtates, where he was much beloved. He introduced an improved code of laws, founded ſeveral profeſſorſhips, and a college for educating the nobility at Dreſden, and was the author of other uſeful and ſplendid eſtabliſhments. Though he had, as we have ſeen, conformed to the Romiſh religion, he protected the Poliſh proteſtants from perſecution. His conſort continued to profeſs the reformed religion till her death, and was, on that account, never crowned queen of Poland. Univer. Hiſt. Moreri.

FREDERIC AUGUSTUS II., king of Poland and elector of Saxony, ſon of the preceding, was born in 1696, and ſucceeded his father in 1733 to his electoral and hereditary dominions.

dominions. On the death of the firſt Frederic, the French party ſet up Staniſlaus Leſzinſky, but the Auſtrians and Ruſſians ſupporting the late monarch's ſon, Frederic Auguſtus, he was crowned king at Cracow in 1734, and after a ſhort conteſt was left in the quiet poſſeſſion of his crown. This reign is not ſignalized by many important events, but in the year 1745 the king of Pruſſia took poſſeſſion of his electoral dominions, though he was not able to retain them. He again occupied the ſame territory in 1756, and kept them till the peace of 1763. In the autumn of the ſame year Frederic Auguſtus died, leaving behind him ſeveral children, among whom was the dauphineſs of France, and mother to the unfortunate Lewis XVI. Frederic poſſeſſed many private virtues, but was not active and enterpriſing as a king. Univer. Hiſt. Moreri.

Frederic, king of Sweden, prince of Heſſe Caſſel, was born in 1676. He married for a ſecond wife the ſiſter of Charles XII. king of Sweden, who upon the deceaſe of her brother, in 1719, was elected by the ſtates his ſucceſſor, upon condition of great limitation of the royal authority. In the following year ſhe obtained the conſent of the ſtates to reſign the crown to her huſband, who accepted it with all thoſe ſtipulations which rendered it the moſt limited monarchy in Europe. The inſufficiency of his powers rendered him unable to reſiſt the invaſion of the Ruſſians in 1741, who pillaged the country, and did great injury to the iron and copper mines. On a ſubſequent war the ſuperiority of the Ruſſians was ſtill more manifeſt: the Swedes were routed at every encounter, great part of their army was made captive, and all Finland loſt. Frederic died, without poſterity, in 1751. Univer. Hiſt.

Frederic-William, elector of Brandenburg, ſurnamed the "Great Elector," ſon of the elector George-William, was born in 1620 at Berlin, and the ſucceſſion to hereditary eſtates fell to him in 1640. He was brought up to the profeſſion of arms, and ſerved in the camp of Frederic-Henry, prince of Orange. When he ſucceeded to his dominions, he found them almoſt ruined by the Swedes and other powers, who had ravaged them without mercy in the late adminiſtration. The commencement of his own government was marked with great prudence and wiſdom; he corrected abuſes of various kinds, and reſtored the finances to order. In 1642 he received the inveſtiture of Pruſſia from the king of Poland, and in the next year he made a truce with the Swedes, on the expreſs condition that they ſhould evacuate the greateſt part of his ſtates, ſo that in a ſhort time he recovered the whole of his dominions. To oppoſe or counteract the ambitious projects of Charles-Guſtavus, king of Sweden, he entered into an alliance with Holland, and was extremely deſirous of obtaining the friendſhip of Cromwell and Lewis XIV. In 1655 he concluded a treaty with the Swedes, whoſe army he joined in the invaſion of Poland, contributed very much to the victory gained near Warſaw, and obtained for his ſervices the entire ſovereignty of Pruſſia. In conſequence of a powerful league formed againſt the king of Sweden, the elector deſerted his party, and made peace with the Poles on the ſame condition reſpecting Pruſſia; he now exerted himſelf moſt vigorouſly in favour of his new allies, and the war in the north ſubſiſted, with various ſucceſs, till the death of Charles-Guſtavus in 1659, an event that was ſoon followed by a general peace which guaranteed Pruſſia to the elector. Some years of public peace gave the elector an opportunity of diſplaying his character as a promoter and patron of thoſe arts which render a nation great. Of this opportunity he took every advantage: he rebuilt the dilapidated towns and the ruined villages; converted foreſts and deſerts into cultivated fields; he facilitated commerce and navigation by canals, and other projects and eſtabliſhments calculated for that purpoſe. Nor was he leſs attentive to exterior concerns, and omitted no occaſion to ſecure and extend his territorial poſſeſſions. When the ambition of Lewis XIV. threatened Holland, the elector concluded a treaty with the United States, by which he engaged to furniſh them with an army of twenty thouſand men in caſe of an attack. Joined by the imperial troops, he began his march in 1672, but was ſtopped by marſhal Turenne, who took poſſeſſion of all his territories in Weſtphalia. At this moment a wretch offered to rid him of his formidable enemy by aſſaſſination, which he rejected with the utmoſt horror and indignation, and inſtantly ſent word to Turenne of his danger. Soon after this, prudential motives obtained the aſcendancy in his mind, and he made a ſeparate peace with France, by which he gained all his loſt provinces. He had in this treaty reſerved to himſelf the right of defending the empire if it ſhould be attacked, which he exerciſed in 1674 by joining the allies with a body of troops in Alſace. The French, to free themſelves from this enemy, inſtigated the Swedes to make a diverſion in their favour by invading the marches of Brandenburg; a meaſure that forced the elector back to the defence of his ſubjects, and in June 1675 he obtained a ſignal victory over a ſuperior Swediſh army. In another inſtance, he was ſummoned to defend Pruſſia againſt the ſame enemy; he marched in the midſt of winter, croſſed the gulf of Courland with his army on ſledges over the ice, ſurprized the Swedes in their quarters, and forced them to a precipitate retreat from Pruſſia, with the loſs of the greater part of their forces. He now ſuffered ſome ſerious reverſes from the French arms, and reluctantly agreed to the peace of St. Germain in 1679, by which he reſtored all his conqueſts upon the Swedes, and abandoned the king of Denmark; and in return the French evacuated the Weſtphalian dominions, and paid him a ſum of money. From this time we hear no more of Frederic as a warrior, but we ſee him in a more elevated character, attending to the improvement of his country, and to the augmentation of its happineſs; and the reputation he had acquired for wiſdom and equity cauſed him to be choſen mediator on various occaſions between contending ſovereigns. The revocation of the edict of Nantes gave him a valuable acceſſion of induſtrious ſubjects, who enriched his country with their arts and manufactures. A French colony was formed at Berlin, which flouriſhed extremely in conſequence of the privileges which he conferred upon it. Frederic died of the dropſy at the age of ſixty-eight, in the year 1688. He beheld the approaches of death with compoſure, and employed his laſt hours in anxious cares for the public good. In private life he was kind and generous, fond of ſociety, quick in his temper, but readily appeaſed. He is conſidered as the boaſt and glory of his houſe, and the chief founder of its greatneſs. Gen. Biog.

Frederic I., king of Pruſſia, was ſon of the preceding, and born at Konigſberg in 1657. The conſtitution of this prince was weak and ſickly, and his education greatly neglected; at one time the prejudices of his father ran ſo ſtrong againſt him, that he had determined to change the order of the ſucceſſion, and made a will, by which he deviſed all the acquiſitions of territory he had himſelf made to be divided among the children which he had by his ſecond wife, to the prejudice of the ſubject of this article. This diſpoſition was not allowed to take place, and Frederic ſucceeded to the whole inheritance in the year 1688. Naturally ambitious, but not poſſeſſing ſufficient vigour to raiſe himſelf above his neighbours, who were equally powerful with himſelf, Frederic attempted to ſupply this defect by the pomp of titles, and

and turned his thoughts to the acquiſition of the regal dignity; this was the great object of his ambition, and the miniſters who oppoſed the project as chimerical and frivolous were quickly diſgraced. In the war carried on reſpecting the Spaniſh ſucceſſion, he ventured to unfold his deſign, and made it a principal condition of his co-operation with the emperor, that he ſhould be recognized king of Pruſſia, and a treaty to this effect was concluded at Vienna in 1700. It was ſoon concurred in by the powers of the north and by England, and the coronation was performed in 1701, in memory of which event he inſtituted the order of the knights of the black eagle. At the ſolemnity, it was remarked that he put the crown on his own head, and it is certain that no monarch was ever leſs clogged with conditions on the part of the people. Hiſtorians have conſidered this ſtep as a maſterſtroke of policy, and that which raiſed the houſe of Brandenburg to its independence on that of Auſtria; but at the time when the piece was acting, it was generally believed that Frederic had ſolicited an honour which his power was inadequate to ſupport. Even his conſort, Sophia-Charlotta of Hanover, ſiſter of our George I., a woman no leſs diſtinguiſhed for her literary merit, than for the characteriſtic virtues of her ſex, was ſo little pleaſed with her elevation to the rank of queen, that ſhe declared ſhe felt extremely mortified to be forced to go to Pruſſia and act the part of a ſtage-queen in preſence of her Æſop, alluding to the deformity of Frederic; and to the celebrated Leibnitz ſhe wrote, "Do not imagine that I prefer this pageantry and pomp of crowns, which are here ſo much eſteemed, to the charms of philoſophical retirement." Frederic, now a king, diſplayed all the magnificence of which he was capable, and was profuſe to a degree, which his country was ill able to ſupport. He was, however, at the deſire of his queen, the inſtitutor of the Royal Academy of Sciences at Berlin, becauſe ſhe perſuaded him that it was a fit appendage to royalty to patronize the ſciences. When Charles XII. of Sweden became formidable by his victories, Frederic obtained a neutrality for Pruſſia: but in the ſucceſſion war, his troops ſerved againſt France, and he even declared war againſt Lewis XIV. In 1705 his queen Sophia Charlotta died with the utmoſt calmneſs, recollection and compoſure: "Weep not for me," ſaid the dying queen to one of her attendants, "I am now going to ſatisfy my curioſity reſpecting the principles of things which even Leibnitz has never been able to explain to me; and I am preparing for the king my huſband the exhibition of a funeral pomp, in which he will have full opportunity of diſplaying all his oſtentation and magnificence." In truth ſhe was not miſtaken; the king honoured her with a ſplendid funeral, and in the pomp he compenſated, in his own mind, for the loſs of a wife whoſe death could not be ſufficiently deplored, and in 1709 he took another, which was his third. In the enſuing year his Pruſſian dominions ſuffered greatly from a peſtilential diſorder, which carried off multitudes of his ſubjects, but the court attempted no means of relief, being too much abſorbed in vain and oſtentatious expences. Amidſt the ſubſequent diſturbances of the north, Frederic employed his efforts to reconcile the different parties, and preſerve his own dominions in peace. He died in 1713. "He was," ſays his royal deſcendant "magnificent and generous; but at what price did he purchaſe the pleaſure of gratifying his paſſions! He trafficked in the blood of his people with the Engliſh and the Dutch, like the wandering Tartars, who ſell their herds to the butchers of Podolia." It has been ſaid of him that "he was great in little matters, and miſerably little in great concerns." He has, however, the misfortune to hold his ſtation in hiſtory, between a father and a ſon, by whoſe great and tranſcendant abilities his merit is eclipſed. Univer. Hiſt.

Frederic William, king of Pruſſia, with both names is conſidered as the I^st., but as "Frederic" only, he is the II^d. of that name. He was ſon of the preceding by Sophia Charlotta, and born in 1688. At an early age he diſplayed a paſſion for military exerciſes, and highly diſtinguiſhed himſelf in the allied army againſt the French. In 1706 he married the princeſs Sophia Dorothea, daughter of the elector of Hanover, afterward king George I. of England. On the death of his father in 1713 he ſucceeded to the throne, and exhibited a character in every reſpect the reverſe of that already delineated. He made great reductions, ſacrifices as they would be termed by little minds, in all the eſtabliſhments of royal pomp, and applied his whole attention to render his country great, by maintaining a full treaſury and a powerful army. In his own perſon he was extremely plain, and in his manners ſimple and eaſy of acceſs. He aboliſhed all uſeleſs expenditures, retained but few perſons about himſelf, and reduced his private expences to a very moderate ſum. He was accuſtomed to ſay, "that a prince ought to ſpare not only the blood, but the property of his ſubjects;" and in this reſpect he might be regarded as a philoſopher on the throne; and the frugality which he exerciſed was worthy the character of an ancient Roman in the beſt age of the republic. By this moderation, and by his reforms in the finances and expenditure, he was enabled to keep up a great military eſtabliſhment, and he was the founder of that exact diſcipline and regularity for which the Pruſſian troops have been ſo much admired. He was remarkably deſirous of tall men for his army, and he indulged the paſſion to a degree of ridiculous extravagance. He had a regiment compoſed ſolely of giants, whom he picked up from all the neighbouring countries at a vaſt expence, and without any regard to the means by which they might be obtained: he ſent to purchaſe them from the extremities of Europe to the borders of Aſia: many of them were entrapped into his ſervice, and others involved in quarrels, for the ſake of having a pretence to their future ſervices. He was equally attentive to propagate the breed by matching them with the talleſt women in his dominions, who were compelled to the union. Nothing, indeed, could be more deſpotic than his whole military ſyſtem. In other reſpects he ſtudied the happineſs of his ſubjects, and the proſperity of the ſtates. Soon after his acceſſion he was recognized as king of Pruſſia in a treaty with France. Tired of the humiliations which his father had frequently ſuffered from the Swedes and Ruſſians, who marched their troops through his dominions with impunity, he determined to protect his ſubjects from the conſequences of any future rupture that might happen among his neighbours. The mind of the monarch was excited to the formation of his plans by the obſervations which he had heard, when young, from two Engliſh generals, one of whom boldly aſſerted that the king of Pruſſia could not maintain a force of fifteen thouſand men without the aid of foreign ſubſidies, while the other contended that he was able to ſupport twenty thouſand. The prince, though a ſtripling, ſaid with a degree of warmth that ſurprized the diſputants, "The king, my father, is able to maintain a force of thirty thouſand men, if he thinks proper." In the firſt year of his own reign he contrived almoſt to double that number without the help of foreign ſubſidies. Notwithſtanding the peace of Utrecht, war continued in the north between Charles XII. and the emperor of Ruſſia, and the kings of Poland and Denmark; into this Frederic did not wiſh to enter, but was compelled by an attack of Charles, who made five hundred of the Pruſſian

Pruſſian ſubjects priſoners of war. Frederic, now affected by the inſult, exclaimed, "What! ſhall a prince whom I ſo much eſteem compel me to become his enemy?" He immediately declared war, put himſelf at the head of his army, and joined the Saxons and Danes with twenty thouſand troops. After compelling the king of Sweden to abandon his territories, and to ſeek refuge in a foreign land, the conquerors divided among them the ſpoils of the conquered. Nevertheleſs, when Frederic heard of the news of the premature death of Charles (ſee CHARLES XII.) he ſhed tears, and did juſtice to the noble qualities of that prince, whoſe enemy he had moſt reluctantly become. After this, Frederic interfered with effect in favour of the proteſtants of ſome neighbouring countries, who were oppreſſed and perſecuted by their catholic ſovereigns. Frederic liberally rewarded the induſtry and ingenuity of the introducers of new arts; and many of the richeſt fabrics in the country owe their eſtabliſhment to him; but his patronage was entirely confined to what he deemed uſeful. Being void of ſcience and ornamental literature, and not knowing how they could be connected with the public proſperity, he regarded them with contempt, and treated their profeſſors with every ſpecies of diſcouragement. Poetry and abſtract philoſophy were equally his averſion. He baniſhed a man of letters for ſome Latin verſes over the gate of the palace, and expelled the celebrated Wolf for his metaphyſical opinions; and his eldeſt ſon, the prince royal, who had acquired a great partiality for polite literature and muſic, was ſo continually thwarted by the king, and rendered ſo extremely uncomfortable, that he took the reſolution of privately quitting the Pruſſian dominions for France or England. His deſign was diſcovered, its execution prevented, and the prince himſelf, with two young officers who were his confidants, were proceeded againſt as criminals. One of them had the good fortune to eſcape; but the other, a very amiable youth, was condemned to death by the ſtern and ſavage monarch, who forced his own ſon to be a ſpectator of the bloody deed. The prince himſelf very narrowly eſcaped a like puniſhment, but after ſeveral months' cloſe impriſonment he was ſet at liberty. Such a father, however, could not expect to inſpire in the heart of his ſon any other feelings than thoſe of horror, and the more ſo, becauſe about the ſame time he cauſed a young woman, ſuſpected only of an intrigue with the prince, to be publicly whipped through the ſtreets of Berlin. In every inſtance he was moſt rigorous in his puniſhments, and always ſhewed an inclination to aggravate rather than mitigate them. In the year 1734 Frederic-William fell into a bad ſtate of health, which increaſed the natural violence and irritability of his temper: to his phyſicians he even behaved with great brutality, though he held the celebrated Hoffman in ſome reſpect. At length he became tranquil and reſigned to his approaching fate, and died in the year 1740, and in the fifty-ſecond year of his age. At this time he probably relented and was grieved for his conduct towards his ſon, with whom he held many conferences previouſly to his deceaſe, teſtifying the greateſt regard for him, and in his arms he at length expired. Frederic-William left behind him an army of ſixty-ſix thouſand men, and an abundant and increaſing treaſury. All his affairs were in the greateſt order and regularity, and to the labours and pre-eminent wiſdom of this prince we are to look for the ſources of that proſperity and ſucceſs, which diſtinguiſhed the houſe of Brandenburgh till it was humbled by the talents of the preſent emperor of France, before whom the monarchs of Europe have appeared almoſt as nothing. Univ. Hiſt.

FREDERIC III, king of Pruſſia, generally denominated "The Great," was ſon of the preceding, and born at Berlin January 24, 1712. In the progreſs of his education he enjoyed very few advantages, for his father wiſhed to make him a complete ſoldier at the expence of every literary accompliſhment. As, however, he grew towards manhood, he diſplayed a taſte for the liberal arts, which, as we have ſeen, had nearly coſt him his life. This taſte was formed by the peruſal of French books which were put into his hands, and to which all his reading was confined. The tyranny which he experienced from his father was the means of turning his attention to ſcientific purſuits, and being unwilling to incur the king's diſpleaſure, from which he had already ſuffered ſo much, he retired in a meaſure from the world, and purſued his ſtudies in private; and to the amuſing branches of literature he added the ſolid attainments of the mathematics and philoſophy. In 1733 he married, by order of the king his father, Elizabeth-Chriſtiana, a princeſs of the houſe of Brunſwic-Wolfenbuttle; but it is certain, though obliged to marry, that he never cohabited with her, though it is generally ſuppoſed that it was not mere perſonal diſlike that prevented a cloſer union, but that ſome phyſical cauſe exiſted with reſpect to the prince. Frederic had not long been ſeated on the throne before he manifeſted an inclination to uſe his utmoſt efforts for enlarging his dominions. His father's ſuccour to the imperial army in 1734 had given him an opportunity of converſing with prince Eugene on military affairs, and a viſit in the following year to Staniſlaus, king of Poland, then a fugitive at Konigſberg, gratified him with the friendſhip of an amiable and lettered ſovereign. His connection with literary characters was extended, and in the year 1736 he began a correſpondence with the celebrated Voltaire, who contributed ſo much in forming his opinions and his taſte, and who impreſſed him with that ſpirit of toleration which diſtinguiſhed the whole reign of Frederic. And notwithſtanding the obliquity of Voltaire's mind with reſpect to religion, he did not fail to inculcate upon his pupil the duty of promoting as much as poſſible the happineſs of the people committed to his charge, by the practice of juſtice and humanity, and by the encouragement of the arts of peace. (See VOLTAIRE.) Many perſons of literary diſtinction formed a part of the prince's court, which has been repreſented as the ſeat of the muſes and the graces; and the character of Frederic at this period was that of one of the moſt polite and faſcinating young men in Germany. He aſcended the throne in May 1740, and immediately obtained the poſſeſſion of all that popularity which uſually waits upon a young ſovereign who ſucceeds to an unamiable predeceſſor. The firſt act of the new king was to diſband the regiment of giants; at the ſame time he inſtituted an order "of Merit," which admitted perſons of real worth in arms or arts, without diſtinction of birth or country. He invited many learned foreigners to ſettle in his dominions; he recalled Wolf, and appointed him to be the head of the univerſity at Halle. Maupertuis and Algarotti accepted his invitation, and took up their reſidence with him. While he was a prince only he wrote, and afterwards publiſhed, his "Anti-Machiavel," which was intended to refute the baſe maxims of that author relative to the morals of ſovereigns: but "it was unfortunate," ſays his biographer, "that one of his firſt practical comments upon it ſhould be the ſeizure, by military force, of ſome diſtricts in the biſhopric of Liege, upon which he had an obſolete claim, and which he afterwards readily reſtored for a ſum of money." This was not the only inſtance, by many, in which Frederic, by his own acts, ſhewed how little he regarded the common rules of morality, when they ſtood in the way of his wiſhes as king. On the death of the em-

peror Charles VI. which occurred in October 1740, a vaſt inheritance had come to his daughter, which, though guaranteed by almoſt all the powers of Europe, was regarded by many of the ſovereigns, among whom was Frederic, as a tempting prey. At the time he did not fully avow his motives, but declared that he had thought proper to cauſe his troops to enter Sileſia, in order to cover it from being invaded or attacked, and the rather becauſe the duchy ſerved as a barrier to his dominions, whither the flames of war, which now threatened Europe, might be extended, and expoſe them to danger. He has, however, ſince that period, in an account of himſelf, honeſtly declared that he was probably induced to take this meaſure becauſe he had "an army quite fit to march, a treaſury ready prepared, and, perhaps, the ambition of acquiring renown." He aſſembled a choice army of 30,000 men, at the head of which he put himſelf, though ſcarcely recovered from an intermittent fever, in the middle of December, beginning his march the morning after a grand maſked ball. A feeling of propriety induced him to eraſe the word *Deo* from the motto of his ſtandard, in which it was joined with *pro Patria*, and he cauſed the appropriate Roman eagle to be borne before his regiment of guards; and it is ſaid, that on mounting his horſe, and taking leave of the marquis de Beauveau, the French miniſter, he obſerved, "I believe I am going to play your game for you; if the aces turn up, we will divide." He penetrated Sileſia with little oppoſition, and levied heavy contributions on the inhabitants, under pretence of ſubſiſting his troops. The Sileſians, not poſſeſſing a force ſufficient to oppoſe the Pruſſians, were compelled to ſubmit. He ſoon, however, found his progreſs arreſted by an Auſtrian army, which engaged him at Molwitz, and in this engagement he was himſelf carried away in the rout of his cavalry, and his behaviour at the inſtant ſubjected his courage to ſome imputations, which, however, his future heroiſm abundantly obliterated. The Pruſſians were finally victorious in this combat, and the king took poſſeſſion of Breſlaw, the capital of the province, where he received the homage of the ſtates. He returned in triumph to Berlin towards the cloſe of the year, having firſt ſent a detachment of troops to aid the French and elector of Bavaria in their invaſions of Bohemia and Moravia. At length he made a ſeparate treaty at Breſlaw with the queen of Hungary, who was glad to free herſelf from ſo dangerous an enemy by ceding to him all Sileſia, except three duchies, and alſo the principality of Glatz in Bohemia. Thus was Frederic's firſt attempt crowned with complete ſucceſs. He employed the interval of peace in improving the internal government of his dominions, and forming eſtabliſhments calculated to promote their proſperity. He renovated the Academy of Sciences at Berlin, gave it a more enlarged plan, and provided for it an acceſſion of new members. In the year 1744 a war broke out between France and England, and the latter power was ſuppoſed to have entered into a defenſive alliance with Saxony and Auſtria, which Frederic thought might become offenſive againſt Pruſſia, and as he thought it was his intereſt to depreſs Auſtria, ſo he reſolved to effect it. The refuſal of the queen of Hungary to concur in the election of Charles VII. to the empire, was the immediate pretext for hoſtilities, and in Auguſt 1744 Frederic marched with an army of 80,000 men into Bohemia, and laid ſiege to Prague, which ſurrendered after a very ſevere bombardment. Notwithſtanding this ſucceſs, the campaign was ſo little to his mind that he forbade all perſons for ever from mentioning it in his preſence. In the following ſpring he returned to the ſcene of action, and obtained over his opponent, prince Charles of Lorraine, a moſt deciſive victory. While he was purſuing his ſucceſſes in Sileſia, his general, prince Anhalt, entered Saxony, and gave a very ſignal defeat to the Saxon army at Keſſeldorff. The king then joined him and proceeded to Dreſden, which immediately ſurrendered. He entered that capital and laid it under very heavy contributions: a treaty of peace was, however, concluded between the kings of Poland and Pruſſia, in which Vienna was included. The queen of Hungary was admitted as a party in the treaty of Dreſden, and confirmed the ceſſion of Sileſia according to the terms of the peace of Breſlaw, while Frederic agreed to acknowledge her huſband, the duke of Tuſcany, for emperor. After the terms of this peace were ſettled the Pruſſian troops evacuated Saxony, and Frederic returned to Berlin, where he was received by his ſubjects with the loudeſt acclamations.

The king now employed himſelf in improving his ſtates and in reforming the judicial proceedings, which he hoped not only to ſimplify, but to render uniform throughout all the different parts of his dominions. For this purpoſe he wrote and publiſhed "The Frederician Code: or a body of Law for the dominions of the king of Pruſſia, founded on reaſon and the conſtitution of the country." By this code torture, for the purpoſe of forcing confeſſion, was aboliſhed: the number of capital crimes greatly diminiſhed; and the rites of the catholic religion were tolerated. Frederic, about this period, appeared as the author of "Memoires pour ſervir à l'hiſtoire de la Maiſon de Brandebourg." This contains a conciſe account of his electoral and royal houſe, written in a good ſtyle, and with apparent impartiality. His reflections are often juſt and philoſophical; but he has occaſionally given way to his prejudices, and miſrepreſents incidental matters of fact; nevertheleſs, in the dedication of this work to the prince royal of Pruſſia, he ſays, "I have treated the ſubject with freedom and impartiality, ſo as to exhibit the princes of your houſe in real colours. The ſame pen, which has drawn the civil and military virtues of the great elector, has glanced at the foibles of the firſt king of Pruſſia, and thoſe paſſions, which, in the order of providence, contributed afterwards to raiſe this houſe to its preſent pitch of grandeur. I have diveſted myſelf of all manner of prejudice, and conſidered princes, kings, and relations only as ordinary men. Far from being biaſſed by the weight of power, or from idolizing my anceſtors, I have freely condemned their vices, becauſe vice ſhould find no patronage on the throne. I have praiſed virtue wherever I have found it, but, at the ſame time, have guarded againſt that enthuſiaſm which it naturally inſpires; to the end that nothing but truth, in her plain and native dreſs, ſhould reign throughout this hiſtory." His next publication was a "Poem on the Art of War," in ſix books, which is his largeſt poetical production, and which may rank among the moſt ſplendid and beſt planned didactic works in verſe. In this work he has celebrated the talents and courage of many ancient and modern generals; has beſtowed the higheſt encomiums on prince Eugene, and referred to the battle of Blenheim, yet he has never once mentioned the name, nor hinted at the glory of our illuſtrious countryman the duke of Marlborough. (See CHURCHILL.) "It is not to be ſuppoſed," ſays a contemporary writer, "that this ſilence with reſpect to the duke proceeded from invidious motives: we rather think that his Pruſſian majeſty conſidered *him* as a general who underſtood *only a part of his profeſſion*, having never given any proof of his ſkill *in conducting a retreat!!*" To this cutting and ſarcaſtic obſervation Frederic fairly expoſed himſelf by his want of candour. The compoſition of theſe and other literary pieces, his various ſtudies and amuſements, and the journeys which he undertook to different parts of his dominions, oc-

cupied all the leiſure he could command from thoſe royal duties which he always performed with the greateſt punctuality. His hours of relaxation were devoted to muſic: he indulged his taſte for the fine arts in decorating palaces, and erected ſplendid edifices at Berlin and Potzdam, which during his reign became equal, in their exterior, to the fineſt places in Europe. Frederic thought it due to his character and conſequence to inſiſt upon the right of free navigation for his ſubjects, without moleſtation from the contending fleets of other nations, and is regarded as the original author of the ſyſtem of armed neutrality, which has ſince produced ſo many important events.

At the commencement of the war in 1755 between England and France, the former made a treaty with the king of Pruſſia, which produced an alliance between France, Auſtria, and Ruſſia. Thus the whole political ſyſtem of the continent was changed: the ſeeds of a new war were plentifully ſcattered, and they ſoon ripened into events more extraordinary and intereſting than Europe had for a long time witneſſed. The ſeven years' war began in 1756 with the march of the king of Pruſſia, who was fully apprized of the confederacy which had been formed againſt him, in caſe of his giving riſe to a new war. He nevertheleſs demanded of the empreſs-queen the intention of certain armaments and warlike preparations which were making in her dominions, and whether they did not immediately concern him. Her anſwer was not ſo explicit as Frederic wiſhed, and he inſtantly commenced hoſtilities, and involved himſelf in a long and hazardous war, in the courſe of which he acquired a high degree of military fame, but which occaſioned, what is little regarded by continental ſovereigns, a miſerable effuſion of human blood, and was productive of much calamity to the Pruſſian dominions, as well as to the neighbouring countries. Frederic demanded a paſſage for his army through the electorate of Saxony, and did not wait for permiſſion to enter the country. The king of Poland, the elector, who had already experienced his power, aſſembled his troops at the ſtrong camp of Pirna, and repaired thither in perſon, leaving his queen at Dreſden. Frederic, who by the treachery of a Saxon ſecretary had been informed of the king's negociations with his enemies, thought himſelf juſtified in ſeizing to his own uſe all the public revenues of Saxony, and breaking open the ſecret cabinet in the royal apartments, notwithſtanding the perſonal efforts of the queen to prevent him. He next aſſumed the entire government of the electoral dominions, diſmiſſed the Saxon council and miniſters of ſtate, obtained poſſeſſion of the camp of Pirna, and compelled the common men of the Saxon army to enter among his own troops. At the beginning of 1757 the enemies of Frederic were aſſembling forces againſt him on all ſides, and every method adopted to excite a general abhorrence of his conduct, and he was put under the ban, or curſe of the empire, with all the cuſtomary formalities. The king, though menaced, was undiſmayed, and determined to carry war into the enemies' country: he advanced with four ſeparate bodies into Bohemia, which he united under his command, and on the 5th of May he fought the battle of Prague, which proved very bloody, but at length terminated in favour of the Pruſſians. The Auſtrians were obliged to take ſhelter in the city, which Frederic immediately inveſted, but, after committing terrible havock among the inhabitants and army, he was forced, by the great marſhal Daun, to raiſe the ſiege, and retreat in the beſt manner he was able. The king's affairs were now in an extremely critical ſituation: he was hemmed in on all quarters, and no activity and reſolution ſhort of what he poſſeſſed could have extricated him; nevertheleſs, at the cloſe of the year he ſaw himſelf victorious, and freed from the enemies which had ſo cloſely preſſed him. The ſplendour of the king of Pruſſia's actions had rendered him the object of general admiration: in England he was regarded as the proteſtant hero fighting for the cauſe of religion and liberty, and a ſubſidiary treaty was concluded by which England engaged to pay a ſum of ſix hundred and ſeventy thouſand pounds ſterling to the king of Pruſſia, for which he was bound to no ſpecific ſervices, but only to keep up his forces, and act for the common cauſe. In the campaign of 1758 the king penetrated into Moravia, and laid ſiege to Olmutz, which was ſaved by Daun: thence he was called to oppoſe the Ruſſians, and fought them at Zorndorff, and after a moſt obſtinate combat gave them a terrible defeat. To a ſimilar diſaſter he was himſelf expoſed at Dreſden. On the 12th of Auguſt in the following year the moſt deſtructive and horrible battle of Cunnerſdorff was fought. At firſt the king made ſure of ſucceſs, and announced his expectations in a billet to the queen; but having commenced a ſecond attack, the fortune of the day turned ſo completely againſt him, that he diſpatched a ſecond note ſaying, "Remove from Berlin with the royal family: Let the archives be carried to Potzdam. The town may make conditions with the enemy." Berlin however did not fall, and by the high military ſkill and great preſence of mind of the king, he repaired his own loſſes, and completely awed his enemies.

Though Frederic had exhibited the greateſt talents and moſt conſummate proweſs; though he had obtained the moſt ſplendid victories, and made exertions ſo extraordinary, that to common and ſuperficial minds they appeared the effect of miraculous interpoſitions rather than the ordinary courſe of events, yet he became ſenſible that the longer hoſtilities continued the more difficulties increaſed. His army was not compoſed of the ſame troops as thoſe with which he commenced hoſtilities, he had loſt vaſt numbers of men, not only in action, but by diſeaſes, by the rigour of the ſeaſons, and by perpetual hardſhips and fatigues. He was therefore, in the year 1761, induced to act chiefly on the defenſive. An event now took place, which was highly favourable to the affairs of the king of Pruſſia. This was the death of the empreſs of Ruſſia, with whoſe ſucceſſor the emperor Peter III. he inſtantly formed a treaty of alliance. This was followed by a peace with Sweden, and though the dethronement and death of Peter deprived him of the aid of Ruſſia, yet his ſucceſſor Catharine II. obſerved a neutrality in the remaining conteſt. In 1763, a treaty of peace was concluded, called the peace of Hubertſburg, from the caſtle of that name, in which the articles were drawn up and ſigned. This treaty was formed on the baſis of thoſe of Breſlaw and Berlin, and confirmed to Frederic his former Sileſian acquiſitions. The empreſs-queen, and the king of Pruſſia, renounced all claims upon each other's territories, and the only compliance made by the latter was a promiſe to vote for electing the archduke Joſeph king of the Romans. The electoral king of Poland was at the ſame time reſtored to his waſted dominions without any compenſation. Thus terminated what has uſually been called the ſeven years' war, between the Pruſſian monarch and the great and powerful princes with whom he was engaged in hoſtilities. It was one of the moſt ſanguinary conteſts that ever deſolated the globe, and though the military fame acquired by Frederic was very great, yet it muſt be conſidered as a trifling compenſation to his ſubjects, for the evils and calamities that they had ſuffered, and for the vaſt effuſion of human blood which had been produced by his ambition, and by that jealouſy which his numerous ſtanding army, and his conduct towards his neighbours had naturally and univerſally

inſpired. Peace being eſtabliſhed, Frederic returned to his capital, from which he had been abſent more than ſix years. The king, for ſome time ſubſequent to this period, cultivated the arts of peace, without neglecting thoſe of war. He concurred, in 1764, in exerting his intereſt to promote the election of count Staniſlaus Poniatowſki to the throne of Poland, in the room of Auguſtus III. who died ſoon after his reſtoration to his electoral dominions. Frederic received a viſit from the emperor of Germany, in the year 1769, at Neiſs in Sileſia, where they treated each other in a cordial and friendly manner; and, after ſpending two days in each other's company, parted with the ſtrongeſt profeſſions of mutual regard, eſteem, and confidence. They dined together in company with ſome general officers, among whom was the celebrated Laudohn, who had greatly diſtinguiſhed himſelf againſt the king of Pruſſia in the late war, and who was going to place himſelf at the lower end of the table, but Frederic exclaimed "I muſt beg the favour of general Laudohn to come and ſit by me, for I can aſſure him I had rather have him on my ſide, than oppoſite to me." Although the king kept up an army of two hundred thouſand men, fully equipped and diſciplined, yet he was extremely attentive to his treaſury, and was in every reſpect a good public economiſt. He had, however, recourſe to the ſcandalous and villainous meaſure of debaſing the coin which he iſſued from the mint, and then actually refuſed to take it in impoſts at its nominal value. He patronized many ſchemes for the promotion of manufactures and commerce, but was ignorant of the true ſpirit of trade. He violated the privileges of the free city of Dantzic, and practiſed, without heſitation or ſhame, the moſt wicked extortions. He planned the partition of Poland, and received for his ſhare of the booty Weſtern Pruſſia, the moſt commercial, though the ſmalleſt portion of the firſt diviſion. Previouſly to this he had, without remorſe, committed great exactions in the Poliſh territories, from which he had carried off the inhabitants in order to people the uncultivated parts of his own dominions. On ſome diſtricts he had impoſed a very ſingular tax, that of a proportion of their marriageable young women, each provided with a dowry, who were thus torn away from their country and friends, to be ſettled among ſtrangers, and often coupled with beings little better than barbarians. After he had taken poſſeſſion of that part of Poland, which the royal robbers had aſſigned to Pruſſia, he impoſed a variety of new and arbitrary regulations on the inhabitants of the uſurped provinces; and the Jews were obliged, by the ſevere treatment they experienced, to quit the diſtricts that had been ſeized by Auſtria and Pruſſia, and to retire into the provinces allotted to Ruſſia. To the Jeſuits, in other parts of his dominions, Frederic was more favourable, and though the pope had aboliſhed the order, he afforded them, as men of talents and real learning, an aſylum in the Pruſſian territories. One of the moſt important of the remaining public events of Frederic's life, was that which related to the project of diſmembering the electorate of Bavaria, by the court of Vienna. On this occaſion Frederic was the aſſertor of the liberty and independence of the Germanic body, and the oppoſer of lawleſs ambition: he took the field in perſon in 1778, with a powerful army, and was oppoſed by the emperor Joſeph and Laudohn, with an equal force. No action however enſued, and, in 1779, a treaty was entered into, which produced an abandonment of the deſigns of the Auſtrian court. In 1785, a plan was formed by the emperor for exchanging, with the elector-palatine, the low countries for Bavaria, which the king of Pruſſia defeated, by propoſing a confederation for maintaining the indiviſibility of the empire, and the laws of the Germanic conſtitution, which was immediately joined by ſeveral of the principal members of the empire. About this period the Pruſſian court remonſtrated with the ſtates of the United Provinces concerning the limitations of the power of the ſtadtholder, which were then in agitation. The Pruſſian miniſter preſented a memorial to the States-general, in which he requeſted, in the name of his maſter Frederic, that they would take ſuch meaſures as might effectually put a ſtop to the perſecutions that were then carried on againſt the ſtadtholder, and that they would maintain him in the enjoyment of thoſe prerogatives, which, it was ſaid, were the rightful attributes of his perſon and family. In 1786, a treaty of amity and commerce was concluded between Pruſſia and the United States of America, which was a model of liberal policy reſpecting the rights of two independent nations both in peace and in war.

Frederic, as he advanced in years, became milder and more humane, more attentive to the real welfare of his ſubjects, and more diſpoſed to prefer the uſeful to the ſplendid. His exertions in promoting agriculture, manufactures, and thoſe arts of life by which the lower and middle ranks of life are rendered comfortable and flouriſhing, were unrivalled by thoſe of any ſovereign of his time, and the increaſe of population and commerce in the Pruſſian dominions during the latter part of Frederic's reign, is a ſubſtantial evidence of the general fact. His public cares were unremitted even after he had begun to ſuffer moſt ſeverely under the ſymptoms which attended a gradual decline. He viewed with philoſophic ſerenity his approaching end, and continued to exerciſe with his accuſtomed regularity the functions of royalty, till within two days of his death. He remained in the full poſſeſſion of thoſe uncommon powers of underſtanding, by which he was diſtinguiſhed, till the 15th of Auguſt, and reſigned his breath Auguſt 17, 1786, in the ſeventy-fifth year of his age, and the forty-ſeventh of his reign.

Frederic had unqueſtionably a claim to be ranked among thoſe princes who are called *Great:* as a general, though liable to error, yet his enterprize and comprehenſion, the accuracy with which he directed complicated plans, his foreſight in providing for all wants and exigencies, the boldneſs of his deſigns, and the vigour of his execution, have rarely been ſurpaſſed ſince the time of Cæſar. That he was laviſh in the lives of his ſoldiers, has been imputed to a defect rather of feeling than of judgment. He conſidered them as the inſtruments put into his hands for the purpoſe of playing a great game, and he made it finally a winning one. His political talents were conſiderable, and adapted to the rank he held in the world as an abſolute monarch. In perſon he was ſomewhat below the middle ſtature, but his limbs were well formed, and he poſſeſſed a healthful and vigorous conſtitution. His intellectual powers were great, and his acquirements in literature were very reſpectable. He had much general knowledge of the ſciences, and was converſant with the beſt French writers on polite literature: but his ſkill in the ancient authors was derived through the medium of French tranſlations; his character and conduct varied very much with the ſituations which he was called to fill; his predominant paſſion was the love of glory, and he was ambitious to unite in his own perſon the reputation of a great king, a wiſe legiſlator, an illuſtrious hero, an accompliſhed general, a fine poet, and an enlightened philoſopher. His judgment was naturally ſolid, but in ſome degree perverted by his early prejudices in favour of the French ſchool, and this will eaſily account for his diſbelief of revealed religion; his notions with reſpect to natural religion ſeem to have fluctuated; but his morals were uniformly guided by no other rule than his pleaſure, and what

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he believed to be his intereſt. He was capable of ſevere and very cruel actions, and hence he was characterized by Voltaire, once his friend and idol, from a marble table that ſtood by him, as *hard* and *poliſhed*. (See VOLTAIRE.) The love of juſtice and the principles of humanity took their turns in his mind, and examples are recorded of his clemency and placability; theſe are, however, but few in compariſon of the cruelties which the inhabitants of Saxony, of Poland, and other conquered places can teſtify againſt the Great Frederic, to ſay nothing in this place of enormities practiſed on individuals. (See TRENCK, *Baron*.) As an author, beſides the works already referred to, he publiſhed "Military Inſtructions," and other pieces on miſcellaneous topics, compoſing four volumes octavo under the general title of "Œuvres Primitives." After his death appeared his poſthumous works in 15 vols. of which the principal are "The Hiſtory of his own Time:" "The Hiſtory of the ſeven years' War:" and "Memoirs from the peace of Hubertſburg to the partition of Poland in 1775." To theſe we have had occaſion to refer, but the reader is particularly directed for an able account of this great man and illuſtrious monarch, to Dr. Towers's "Mem. of Frederick king of Pruſſia."

FREDERICA, in *Geography*, a port town of America, in the ſtate of Georgia and county of Glyan, pleaſantly ſituated in St. Simon's iſland, on an eminence upon a branch of Alatamaka river, which forms a bay before the town, and affords a ſafe and commodious harbour for veſſels of the largeſt burden, which may lie along the wharf. It was ſettled by ſome Scots highlanders about the year 1735, who accepted an eſtabliſhment both here and at Darien to defend the colony, if needful, againſt the neighbouring Spaniards. N. lat. 31° 15'. W. long. 80°.

FREDERICIA, a ſtrong ſea-port town of Denmark, in North Jutland, and dioceſe of Ripen; ſituated on the Little Belt, with a cuſtom houſe, where all veſſels pay toll. The circumference is extenſive, but not filled with houſes or people. It was founded in 1651 by Frederic III.; and in 1682 Chriſtian V., in order to increaſe the number of its inhabitants, granted a charter, which rendered it an aſylum for all bankrupts, both natives and foreigners, and allowed the Calviniſts, Papiſts, and Jews, free exerciſe of their religion. Fredericia has ſeveral commercial privileges, but as it wants a good harbour, they are incapable of much improvement. It has two Lutheran churches, a Calviniſt church, a Popiſh church, a ſynagogue, a grammar ſchool, and good arſenal. A quantity of tobacco is planted both within and without the walls. N. lat. 55° 35'. E. long. 9° 44'.

FREDERICK, a county of Maryland, in America, bounded N. by Pennſylvania, W. and N.W. by Waſhington, E. by Baltimore, and S.W. by Potowmack river. On the Monocacy river and its branches are about 37 griſt mills, a furnace, iron forge, and a glaſs manufactory, called the "Ætna glaſs works," which are in a thriving ſtate. This county is more than 30 miles each way reckoning from the extreme parts, and is divided into 12 towns and villages. The Cotoctiny mountain extends from the Potowmack in a N. direction through this county into Pennſylvania, between the ſouth mountain and Monocacy creek; the eaſtern parts are generally level. It contains 30,791 inhabitants, including 3641 ſlaves. The lands of this county are generally rich, producing wheat, rye, barley, corn, hemp and flax. Mines of copper have been diſcovered. It comprehends about 537,600 acres. Its chief town is called Frederick town.—Alſo, a county of Virginia, bounded north by Berkeley, S. by Shanandoah, W. by Hampſhire, and E. by Shanandoah river, which ſeparates it from London county. It is 30 miles in length, and 20 in breadth, and contains 16,257 white inhabitants, and 5118 ſlaves. It abounds with iron ore, and works have been erected which produce 160 tons of bar iron, and 650 tons of pig, annually. Both this and Berkeley county have a good ſoil. Between the waters of Opeckan creek and the Shanandoah is the richeſt lime ſtone land in the eaſtern parts of the ſtate. Near the north mountain in this county is a curious cave, by ſome called "Zancy's cave." After entering this cave a few feet, the mercury, which, in the open air, was at 50, roſe to 57 of Fahrenheit's thermometer. Beſides this, there is a natural well of unknown depth. The chief town of the county is Wincheſter.

FREDERICK *Henry's Bay*, a bay on the coaſt of New Holland, diſcovered by Taſman in 1642. S. lat. 43° 10'.

FREDERICK-*Henry Cape*, the north point of Adventure bay, in New Holland. S. lat. 42° 42'. E. long. 147° 37'.

FREDERICK *Houſe*, a trading ſtation in Upper Canada, on the head water of Abbitibbe river. N. lat. 48° 35'. W. long. 82° 6'.

FREDERICK, a fort in Waſhington county, Maryland, ſituated on the N.E. bank of Potowmack river, near the S. line of Pennſylvania.—Alſo, a townſhip in Montgomery county, Pennſylvania, containing 697 inhabitants.—Alſo, a town on the N. ſide of Saſſafras river in Cecil county, Maryland, and ſeparated by that river from George town, in Kent county. It lies ſix miles S.W. of Warwick. N. lat. 39° 22' 30".

FREDERICK *Point*, in Upper Canada, lies on the W. ſide of Kingſton harbour, and on the weſt ſide of Haldamand Cove, which is made by this point, and point Henry.

FREDERICKENBURG, a town of Germany, in the principality of Anhalt Zerbſt; one mile S.W. of Zerbſt.

FREDERICKRODE, a town of Saxony, in the principality of Gotha; ſix miles S. of Gotha.

FREDERICKSBORG, a town of Denmark, in the iſland of Zealand; 18 miles N.N.W. of Copenhagen. N. lat. 55° 56'. E. long. 12° 20'.

FREDERICKSBURG, a town of Germany, in the duchy of Pomerania; 25 miles N.N.E. of Stargard.

FREDERICKSBURG, a poſt town of America, in Spotſylvania county, Virginia, on the S.W. bank of Rappahannock river, 110 miles from its mouth in Cheſapeak bay. It is an incorporated town, and laid out into ſeveral ſtreets, of which the principal runs parallel with the river, and contains about 300 houſes, two tobacco warehouſes, and ſeveral ſtores of well aſſorted goods. Its public buildings are, an epiſcopal church, an academy, court houſe and gaol. It is a place of conſiderable trade, and contains about 2000 inhabitants. It has a forge in its vicinity; which works about 300 tons of bar iron in a year, from pigs imported from Maryland. It is 50 miles S.W. of Alexandria, 102 S.W. of Baltimore, and 205 S.W. of Philadelphia. N. lat. 38° 22'. W. long. 77° 36'.

FREDERICKSBURG, a townſhip in the county of Lenox, Upper Canada, which lies to the weſt of Erneſt town, in the bay of Quinté.—Alſo, a townſhip of Dutcheſs county, in New York, ſituated between Franklin and Phillipstown, and containing 1661 inhabitants. N. lat. 41° 31'. W. long. 73° 38'.—Alſo, a town of Africa, on the Gold coaſt. N. lat. 6° 40'.

FREDERICKSHALL, a ſea-port town of Norway, on the frontiers of Sweden, at the mouth of the river Tiſſe, in a bay called the Swineſund; the harbour would be ſafe and commodious, if it were not for the quantity of ſaw-duſt brought down the river from the ſaw-mills up the coun-

country, which it is neceſſary to remove yearly. The town contains about 3000 inhabitants. The ſtreets are airy; and the houſes are built of wood painted red, and a few white. The principal commerce of the town conſiſts in the exportation of planks to England. The wood is floated down the Tiſte ſometimes above 100 Engliſh miles from the interior parts of the country, and ſawed here; for which purpoſe 36 ſaw-mills are erected on the banks of the river, which forms a ſeries of cataracts. The port poſſeſſes a few immunities; goods landed for exportation pay no duty, unleſs opened for home conſumption; and then they are charged with the uſual impoſts. On the ſummit of an almoſt perpendicular rock, which overhangs the town, ſtands the ſtrong and hitherto impregnable fortreſs of Frederickſtein, rendered memorable by the death of the northern lion, as Charles XII. is ſometimes emphatically ſtyled; 52 miles S. of Chriſtiania.

FREDERICKSHAM, a town and fortreſs of Ruſſia, in the government of Wiburgh or Viborg, formerly belonging to Sweden when it was only a ſmall village, in the province of Finland, but ceded to the Ruſſians by the peace of Abo. The town is ſmall and regular; in the centre is a ſquare, from which the ſtreets extend at right angles. The houſes, excepting one of brick, are all built of wood in the neateſt manner. The fortifications are ſtrong; and the garriſon and ſeveral companies of ſoldiers, quartered in the neighbouring villages, amount to 6000 troops. The inhabitants carry on a ſmall commerce with England and Holland, exporting planks and tallow, and importing ſalt and tobacco. In 1783, Frederickſham was the ſcene of an interview between Catharine empreſs of Ruſſia and Guſtavus king of Sweden, which continued three days. The empreſs, with a magnificence, before unknown to theſe northern regions, erected a wooden palace, which contained a grand ſuite of apartments, and a theatre, in which French plays were acted. This town is diſtant 50 miles W. from Viborg or Wiburgh. N. lat. 60° 36'. E. long. 28° 18'.

FREDERICKSHOLM, a fortreſs of Norway; three miles S. of Chriſtianſand.

FREDERICKSTADT, a fortreſs and ſea-port town of Norway, ſituated on the river Glomme, nearly 26 Engliſh miles from Frederickſhall. This is the moſt regular fortreſs in this part of Norway, and contains an arſenal amply ſupplied with arms for the militia, in caſe of a rupture with Sweden. It was built in 1567 by Frederic II., ſtrengthened by Frederic III., and ſince gradually enlarged and fortified, according to the modern ſyſtem. The ramparts incloſe a circumference of $\frac{3}{4}$ of a mile, and the population of the town, including the two ſuburbs, amounts to no more than 800 perſons. The inhabitants export planks, and a few ſmall maſts. Cloſe to Frederickſtadt is the new fortreſs of Kongſteen, on a rocky eminence, capable of containing a garriſon of 300 men; ſeveral convicts are here condemned to hard labour. The greateſt offenders have an iron cap, chains round their arms, legs, and bodies; the chains round their arms are rivetted to a wheel-barrow, which is never looſened. Frederickſtadt is 43 miles S. of Chriſtiania. N. lat. 59° 2'. E. long. 11° 1'.

FREDERICKSTADT, a town of Denmark, in the duchy of Sleſwick, ſituated on the north coaſt of the Eider; founded by ſome Dutch Arminian emigrants immediately after the ſynod of Dort. The inhabitants conſiſt of Arminians, Lutherans, Calviniſts, Anabaptiſts, Quakers, and Jews. They are chiefly employed in ſilk or woollen manufactures navigation, and commerce; 18 miles W.S.W. of Sleſwick. N. lat. 54° 28'. E. long. 9° 11'.

FREDERICKSTADT. See BERLIN.

FREDERICKSTHAL, a town of Saxony, in the margraviate of Meiſſen; ſix miles W. of Senftenberg.

FREDERICKSUND, a ſea-port town of Denmark, in the iſland of Zealand, ſituated in the gulf of Roſchild. Its chief trade is in corn; 19 miles N.W. of Copenhagen. N. lat. 55° 50'. E. long. 12° 5'.

FREDERICKSVORN, a town of Norway, in the province of Aggerhuus; 3 miles S. of Laurvig.

FREDERICKSWALDE, a town of Germany, in the duchy of Pomerania, on the Ihna; five miles N.W. of Stargard.

FREDERICKSWERK, a ſea-port town of Denmark, ſituated near the Iſe-fiord, a bay of the ſame ſea on the northern ſhore of Zealand, where general Clauſſen, in the year 1756, eſtabliſhed various manufactories, a foundery for cannon, and other works for ſupplying the Daniſh army and navy with ſtores. He alſo new-formed the canal, connecting a ſmall lake with the Iſe-fiord, which had been begun in 1717 by order of Frederic IV., in order to prevent the inundation of the lakes from overflowing the royal eſtates; and hence the place was called Frederickſwerk. The general alſo planted the adjacent country, for the ſpace of ſeveral miles, which was either a moraſs, or covered with drifted ſand; and thus he has ſucceeded in performing a work which Frederic IV. had attempted in vain, *viz.* that of fertilizing this waſte. By theſe means a tract of country which before only fed thirty-two cows, now yields, beſides a large quantity of fire-wood, in a favourable ſeaſon, above 500 loads of hay.

FREDERICKSWERTH, a town of Germany, in the principality of Gotha; 5 miles N.W. of Gotha.

FREDERICKTON, a conſiderable townſhip of America, in the province of New Brunſwick; 90 miles up St. John's river, which is ſo far navigable for ſloops.

FREDERICKTOWN, a poſt-town of Maryland, and capital of Frederick county, ſituated on both ſides of Carrol's creek, a ſmall ſtream that diſcharges itſelf into Monocacy river, over which are two bridges. The ſtreets are regularly laid out, interſecting each other at right angles. The dwelling houſes are about 200 in number, of which ſeveral are commodious and handſome. The public edifices are one church for Preſbyterians, two churches for German Lutherans and Calviniſts, and one for Baptiſts, an elegant court-houſe and gaol, and convenient market-houſe. Its trade is conſiderable with the back country. The Ætna glaſs works are ſituated four miles above the town, in Tuſkarora creek. It is 47 miles W. by N. from Baltimore, and 148 S.W. by W. from Philadelphia. N. lat. 39° 24'.

FREDOLFO, a torrent of Switzerland, in the county of Bormio, which, paſſing by the town of Bormio, falls at a ſmall diſtance into the Adda.

FREDON, Fr. in *Muſic*, an old word for a rapid paſſage or diviſion. *Roulade* is at preſent uſed for the ſame purpoſe, with this difference, that the *roulade* is of longer duration, and is written, whereas the *fredon* was an extemporaneous flouriſh at a pauſe, *ad libitum*.

FREDONIA, in *Geography*, a generic name which is ſuggeſted in Dr. Morſe's Gazetteer as proper for comprehending the whole territory now under the government of the United States; bounded N. by Upper and Lower Canada, E. by New Brunſwick and the Atlantic ocean, S. by Florida and the gulf of Mexico, W. by New Mexico and the Shining mountains, which divide the weſtern waters of the Miſſiſippi from thoſe which fall into the Pacific ocean. This territory lies between 28° and 50° N. lat. and 66° and 116° W. long.

long. from Greenwich. Its extreme length from E. to W. is upwards of 2000 miles, and its extreme breadth about 1500. It is eſtimated to contain nearly 2,000,000 ſquare miles, or about four-fifths as many as are contained in all Europe. It is about twice the ſize of the Chineſe empire, and if we except Ruſſia, it is by far the largeſt territory on earth, whoſe inhabitants live under the ſame general government. The Miſſiſippi river divides Fredonia nearly in its centre, leaving 1,000,000 ſquare miles E. of it, in the preſent United States, and nearly the ſame number of ſquare miles W. of it. The vale, if it may be ſo called, between the Alleghany and Shining mountains, which is interſected by the Miſſiſippi, and watered by its numerous and large eaſtern and weſtern branches, contains nearly a million and a half ſquare miles, and may be reckoned among the fineſt portions of the globe. Fredonia has a ſea-coaſt of many thouſand miles in extent, along which are but few iſlands of much importance, but full of harbours, many of them equal to any in the world. Its mountains, lakes, and rivers, are all upon a large ſcale. Its climate and ſoil are adapted to almoſt all the variety of productions which the earth affords. Over the vaſt ſurface of Fredonia are ſcattered, in ſome parts (particularly New England) thickly, but generally very ſparingly, about five millions and a half of inhabitants, excluſively of Indians, a ſeventh part of whom is in ſlavery. The Fredonians, except the aboriginal inhabitants, and the negroes imported from Africa, and their deſcendants of every ſhade, are a people collected from almoſt every nation in Europe, and their poſterity. For a deſcription of *Louiſiana*, ſee that article. The great difference in climate, in the modes of obtaining ſubſiſtence, in language, religion, and political opinions, and conſequently in the feelings and intereſts of the inhabitants throughout this vaſt territory, may for ever prevent any great ſimilarity of character. The unavoidable induſtry and hardihood of the north will always form a harſh contraſt to the eaſe and indulgence of the ſouth. What effect, however, ſays Dr. Morſe, a generic name would have in forming an uniform national character, in defiance of all theſe obſtacles, remains to be tried. Such a name has long been a deſideratum. The author has formed an article Fredonia as a ſpecimen of the advantage and convenience of ſuch a name.

FREDONNER, Fr. in *Muſic*, this word is only uſed in deriſion, as we ſay *quavering*.

FREDOREA, in *Geography*, a ſmall iſland on the eaſt ſide of the gulf of Bothnia. N. lat. 63° 1′. E. long. 20° 59′.

FREDUM, in *Antiquity*, a compoſition made by a criminal to be freed from proſecution, a third part of which was paid into the fiſcus or exchequer; or it was the price paid to the magiſtrate for protection againſt the violences of reſentment. In ſome extraordinary caſes, where it was more difficult to protect the perſon who had committed violence, the fredum was augmented. Monteſq. de l'Eſprit des Loix, lib. xxx. cap. 20. and Robertſon's Hiſt. vol. i. chap. v. p. 361.

FREE, a term variouſly uſed; but generally in oppoſition to conſtrained, confined, or neceſſitated. (See FRANK.) Thus, a man is ſaid to be free, who is out of priſon; and a bird is free when let out of the cage: free from pain, *i. e.* void of pain; we ſay, a free air, a free paſſage, &c.

FREE, in ſpeaking of things endowed with underſtanding, has a more peculiar relation to the will, and implies its being at full liberty.

The Stoics maintain that their ſage or wiſe men alone are free. See LIBERTY.

FREE is alſo uſed in oppoſition to ſlave.

The moment a ſlave ſets foot on Engliſh ground, he becomes to ſome purpoſes free. The fineſt legacy the ancient Romans could leave their ſlaves, was their freedom. See LIBERTY.

FREE, *aboard a Ship*. The ſeamen ſay the pump frees the ſhip, when it throws out more water than leaks into her; but, on the contrary, when it cannot throw out the water as faſt as it leaks in, they ſay the pump cannot free her: alſo bailing or lading out water out of a boat is called freeing the boat.

FREE *Agent*. See AGENT.

FREE *Bench*, or *Franc Banc*, ſignifies that eſtate in copyhold lands, which the wife hath after the deceaſe of her huſband, for her dower, according to the cuſtom of the manor.

Fitzherbert calls free banc a cuſtom, whereby, in certain cities, the wife ſhall have her huſband's whole lands, &c. for her dower.

Thus, at Orleton, in the county of Hereford, the relict of a copyhold tenant is admitted to her free bench, *i. e.* to all her huſband's copyhold land, during her life, at the next court after her huſband's death.

In the manors of Eaſt and Weſt Enbourne, in Berks, if a cuſtomary tenant die, the widow ſhall have a free bench in all his copyhold lands, only *dum ſola & caſta fuerit*: if ſhe commits incontinency, ſhe forfeits her eſtate; but if ſhe will come into court, riding backwards on a black ram, with his tail in her hand, rehearſing a certain form of words, in the nature of a confeſſion and petition, the ſteward is bound by the cuſtom to reſtore to her her free bench. The words are theſe:

> "Here I am
> Riding upon a black ram,
> Like a whore as I am:
> And for my crincum crancum
> I have loſt my bincum bancum.
> And for my tail's game
> Have done this worldly ſhame.

Therefore, pray, Mr. Steward, let me have my land again."

The like cuſtoms hold alſo in the manor of Chadleworth, in Berks; that of Tor, in Devonſhire; and in ſome other parts of the weſt.

FREE-*booter*, or *Flibuſter*, a name given to the pirates who ſcour the American ſeas; particularly ſuch as make war againſt the Spaniards.

The French call them *flybuſters*, deducing the word from the Engliſh *flibote*, or *flybote*; becauſe the firſt adventurers of this kind were the people of St. Domingo, who made their excurſions with flybotes, which they had taken from the Engliſh. See BUCCANEER.

Free-booter is a perſon who, without regard to any laws, poſſeſſes himſelf of whatever property chance may throw in his way, and for the aquiring of which he joins with others of a ſimilar deſcription, in order that they may be capable of undertaking various enterpriſes, and to make more certain of ſucceſs. The free-booter is the ſame on ſhore that the pirate is on the ſeas; though inſtances may be adduced in which the latter not only made prize of whatever fell in their way while cruiſing on the ocean, but held authority over territorial poſſeſſions, and thus by carrying on their depredations in both ſituations, become free-booters; of this claſs were the buccaneers, ſo long celebrated for their daring exploits.

Some nations are nothing better than free-booters: thus

we ſee that the Arab hordes which frequent the deſerts make no diſtinction whatever in regard to the difference of nations. Theſe people, while in one quarter they profeſs to be at peace with all the world, in other ſituations deem all to be enemies who poſſeſs property to ſuch amount as may be worth contending for.

Unfortunately, we have of late years ſeen, that the rulers of great and populous kingdoms could ſo far diſregard every principle of juſtice, and ſo abuſe that confidence which had placed them on the throne, as to become free-booters in the moſt literal ſenſe of the deſignation. With ſuch, no tie, no claim could induce to forbearance where there ſeemed an opening for the plundering of contiguous, or even remote nations, notwithſtanding they might, by their generoſity, or by their forbearance, have eſtabliſhed a claim, not only to exemption from rapine, but to the moſt grateful acknowledgments.

The free-booter, like the pirate, is an outlaw among all the civilized nations of the world, and when in the power of any, ought, on no conſideration, to experience the ſmalleſt portion of lenity. Men inured, as they conſtantly are, to the perpetration of the moſt barbarous deeds, and who conſider the univerſe to be their property, can never be reclaimed: conſequently humanity, as well as policy, dictates, that a war of extermination ſhould be carried on againſt them. We ſpeak of this as alluding to profeſſed banditti, obſerving that in the boſom of every nation with which we are acquainted a gang of free-booters will be found, whether under the deſignation of gypſies, or under the more common title of paupers, to infeſt various parts, where, owing to local circumſtances, they are too often more than tolerated. The perſon who may propoſe an efficient remedy for this evil will richly deſerve the thanks of his country.

FREE *Bord, franc bord.* In ſome places three feet, in others more, and in others leſs, is claimed by way of free bord, beyond or without the fence.

"Et totum boſcum, quod vocatur brendewode, cum franc bordo duorum pedum & dimid. per circuitum illius boſci." Mon. Ang. 2d part, fol. 241.

FREE *Chapel*, is a chapel founded by the king, and by him exempted from the juriſdiction of the ordinary. See CHAPEL.

A ſubject may alſo be licenſed by the king to build ſuch a chapel, and by his charter may exempt it from the viſitation of the biſhop, &c.

FREE *Coals*, are ſuch as do not crozle or cement together in the burning, but remain in ſeparate lumps.

FREE or *Imperial Cities*, in Germany, are thoſe not ſubject to any particular prince; but governed, like republics, by their own magiſtrates.

There were free cities, *liberæ civitates*, even under the ancient Roman empire: ſuch were thoſe to which the emperor, by the advice or conſent of the ſenate, gave the privilege of appointing their own magiſtrates, and governing themſelves by their own laws. See CITY.

FREE *Fair*. See FAIR.

FREE *Fee*. See FEE and FRANK.

FREE *Fiſhery*. See FISHERY.

FREE *Martin*, in *Rural Economy*, a term ſignifying a barren heifer that has been a twin with a bull-calf.

FREE-*maſon*. See MASON.

FREE *Port*. See PORT.

FREE *Service*. See SERVICE.

FREE *Socage*. See SOCAGE.

FREE *State*, is a republic governed by magiſtrates elected by the free ſuffrages of the inhabitants.

FREE-*ſtone*, a whitiſh ſtone, dug up in many parts of England, that works like alabaſter; but is more hard and durable, being of excellent uſe in building, &c.

It is a kind of the gritt ſtone, but finer ſanded, and a ſmoother ſtone; and is called free-ſtone, from its being of ſuch a conſtitution as to be cut freely in any direction. This is a ſpecies of the pſaduria of Hill.

The qualities of the ſeveral kinds of free-ſtone, in common uſe in the ſeveral parts of Europe, are very different. They all agree in this general property indeed, that they are ſofter while in the quarry than when they have been ſome time expoſed to the air: but even this general property differs greatly in degree. They have a ſort of grey free-ſtone in uſe at Paris, of which we do not ſeem yet to have met with any quarries in England, though probably enough there are ſuch, which has this property in ſo eminent a degree, that the expence of working it is in a great meaſure ſaved.

This ſtone lies every where on the ſouth ſide of the river Seine, and is of a coarſe and large gritt. It is ſo ſoft when newly taken out of the ſtrata, that they cut it very conveniently with a ſort of broad axe, and faſhion as many ſtones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this ſtone is as ſoft as dry clay when firſt taken up, it is found to harden ſo conſiderably in the air, that it becomes more than equal to our ordinary free-ſtone.

Our Portland ſtone, of the fineſt kind, which is white, and of a cloſe gritt, is very fit for hewing or carving, but it will neither reſiſt water nor fire, which is a very ſingular circumſtance in ſo denſe a ſtone; while the free-ſtone of Kent, which is leſs beautiful to the eye, and is of a greyiſh colour, and conſiderably cloſe, though of a larger grain, reſiſts the air and water very well.

The free-ſtone of Derbyſhire, on the other hand, is ſo brittle as to be unfit for any fine working, and ſo coarſe and open in its texture that it lets water through; yet it bears the fire extremely well, and is fit for ovens, hearths, &c. Phil. Tranſ. N 93.

FREE *Stool*. See FRIDSTOLL.

FREE-*thinker*. See DEIST.

FREE-*warren*. See WARREN.

FREE-*will*. See WILL.

FREE-BOOTER's POINT, in *Geography*, a cape at the weſtern extremity of the iſland of Anagada in the Weſt Indies.

FREEDOM, the quality or ſtate of being free. See FREE.

FREEDOM *of a City, Town*, &c. denotes a right or capacity of exerciſing a certain trade or employment in that city or town corporate, and of being elected to the dignities and offices thereof. It is procured regularly, by ſerving an apprenticeſhip; but ſometimes purchaſed with money, and ſometimes conferred as a favour or compliment.

FREEDOM *of the Will*, a ſtate or faculty of the mind, wherein all the motions of our will are in our power, and we are enabled to determine on this or that; to do good or evil, without any force or conſtraint from any external cauſe whatever. See LIBERTY, and NECESSITY.

FREEDOM *of Conſcience*. See LIBERTY, and TOLERATION.

The ſchoolmen diſtinguiſh two kinds of this freedom, *viz.*

FREEDOM *of Contradiction*, whereby we are at our choice to will, or nill; to love, or not to love, &c.

Thus, if I give my friend a power to take my horſe, that friend has freedom of contradiction with reſpect to the horſe; ſince it is in his own power either to uſe him, or let him alone.

FREEDOM *of Contrariety*, or of *Contraries*, is that whereby

we are at our choice to do good or evil, to be virtuous or vicious.

Thus, if I offer my friend a horſe, or a lion, and give him his option of the two, he is ſaid to have a liberty of contrariety over the horſe and lion.

But the logicians charge this as a faulty or unartful diviſion, becauſe one member of the diviſion is contained in the other, as a ſpecies in the genus; for whatever is free, in reſpect of contradiction, is alſo free in reſpect of contrariety, though not *vice verſâ*: for if it be free for my friend to take the horſe, or the lion, it is alſo free for him to let them both alone; but he may be free to take one of them, without a freedom of chuſing which to take.

Yet the diſtinction is of ſome uſe; as it intimates, that the will is not always poſſeſſed of both kinds of freedom, and that the matter or ſubject of the two is different.

The will, though it ſhould be allowed to be free, has not a liberty of contrariety: thus, any evident truth being propoſed to the mind, *e. gr.* that the whole is greater than a part, though we may have a power of not aſſenting thereto, by diverting our attention to ſomething elſe, yet we have not a power of diſſenting from that propoſition, and judging that the whole is not greater than the part.

Hence moraliſts commonly hold, that with reſpect to the ſupreme good, man has a liberty of contradiction, inaſmuch as he may abſtain from the love or purſuit thereof; but he has not a liberty of contrariety, whereby to hate goodneſs.

Add, that though the human mind may have a freedom of contradiction with reſpect to all objects, even the ſupreme good itſelf; yet the freedom of contrariety is reſtrained to certain particulars, which either are, or appear to be good; the will having ſuch a natural propenſity to be good, that it cannot deſire evil, but under the notion and appearance of good.

FREEDOM *of Thinking*. See DEISM.

FREEHOLD, in *Geography*, a poſt town of America, in Monmouth county, New Jerſey; 15 miles W. of Shrewſbury, and 20 S. E. by S. of New Brunſwick. Freehold has an academy, and, in 1790, contained 3785 inhabitants.

FREEHOLD, *Upper*, a townſhip of New Jerſey, in Monmouth county, W. of Freehold. In 1790, it contained 3442 inhabitants.

FREEHOLD, a poſt town in Green county, New York, containing 3812 inhabitants.

FREEHOLD, *Frank Tenement, liberum tenementum*, in *Law*, is land, or tenement, which a man holds in fee-ſimple, fee-tail, or for term of life. (Bract. l. ii. c. 9.) An eſtate of freehold is defined by Britton (c. 32.) to be "the poſſeſſion of the ſoil by a freeman." And St. Germyn (Dr. and Stud. b. 2. d. 22.) tells us, that "the poſſeſſion of the land is called in the law of England the frank tenement or freehold." Such eſtate, therefore, and no other, as requires actual poſſeſſion of the land is, legally ſpeaking, *freehold*; which actual poſſeſſion can by the courſe of the common law be only given by the ceremony called "livery of ſeiſin," which is the ſame as the feodal inveſtiture. From theſe principles, ſays judge Blackſtone, we may extract this deſcription of a freehold: that it is ſuch an eſtate in lands as is conveyed by livery of ſeiſin, or, in tenements of an incorporeal nature, by what is equivalent thereto. Accordingly it is laid down by Littleton (ſ. 59.) that where a freehold ſhall paſs, it behoveth to have livery of ſeiſin. As therefore eſtates of inheritance, and eſtates for life, could not, by common law, be conveyed without livery of ſeiſin, theſe are properly eſtates of freehold; and as no other eſtates were conveyed with the ſame ſolemnity, therefore no others are properly freehold eſtates. See ESTATE.

Freehold is of two kinds, in *deed*, and in *law*. The firſt is the real poſſeſſion of land or tenement in fee, fee-tail, or for life: the other is the right a man has to ſuch land or tenement before his entry or ſeizure.

A freehold, by the common law, cannot commence *in futuro*, but it muſt take effect preſently, either in poſſeſſion, reverſion, or remainder. (5 Rep. 94.) Whatever is part of the freehold goes to the heir; and things fixed thereto, as glaſs windows, wainſcot, &c. cannot be removed by tenants, nor taken in diſtreſs for rent, or in execution, &c. No man ſhall be diſſeiſed of his freehold by ſtat. Magna Charta, cap. 29. but by judgment of his peers, or according to the laws of the land: nor ſhall any diſtrain freeholders to anſwer for their freehold, in any thing concerning the ſame, without the king's writ. (Stat. 52 Hen. III. c. 22.) Freehold eſtates of certain value are required by ſtatutes to qualify jurors, electors of the knights of the ſhire in parliament, &c.

For the method of finding the value of freehold eſtates, ſee ANNUITIES and LIFE-ANNUITIES.

FREEHOLD is likewiſe extended to ſuch offices as a man holds in fee, or for life.

FREEHOLD is alſo ſometimes taken in oppoſition to villenage.

Lambard obſerves, that land, in the Saxons' time, was diſtinguiſhed into bockland, *i. e.* holden by book, or writing; and folkland, held without writing.

The former, he ſays, was held on far better condition, and by the better ſort of tenants, as noblemen and gentlemen; and being ſuch as we now call freehold; the latter was moſtly in poſſeſſion of peaſants; being the ſame with what we now call "at the will of the lord."

In the ancient laws of Scotland, freeholders are called *milites*, knights. In Reg. Judicial, it is expreſſed, that he who holds land upon an execution of a ſtatute-merchant, until he hath ſatisfied the debt, "tenet ut liberum tenementum ſibi et aſſignatis ſuis;" and the ſame of a tenant per elegit; the meaning of which ſeems to be, not that ſuch tenants are freeholders, but as freeholders for the time, till they have received profits to the value of their debt.

FREEING *a* MINE, is paying the firſt diſh of ore obtained therefrom to the farmer of the king's dues in the king's field.

FREELS, CAPE, in *Geography*, a cape on the eaſt coaſt of Newfoundland. N. lat. 49° 35'. W. long. 53° 10'.

FREEMONT, a cape on the north coaſt of the iſland of Jerſey; 5 miles N. of St. Helier.

FREEPORT, a poſt-town of America, in Cumberland county, Maine, at the head of Caſco bay; adjoining to Durham on the N.E. and to North Yarmouth on the S.W.; 10 miles N.E. of Portland, and 140 N. by E. of Boſton: it was incorporated in 1789, and contains 1330 inhabitants. A mine of ſilver and lead, it is ſaid, has been diſcovered in this town.

FREETOWN, a thriving townſhip in Briſtol county, Maſſachuſets, incorporated in 1683, containing 2535 inhabitants, and lying 45 miles ſoutherly of Boſton. The ſouthern part of this town has been lately incorporated into a new town, by the name of Fall River.

FREEWILL's ISLANDS, three ſmall iſlands in the Eaſt Indian ſea, diſcovered by Capt. Carteret in the year 1767: called

called reſpectively, Pegan, Onata, and Onella. They are wholly ſurrounded by a reef of rocks, except towards the eaſt, where is a paſſage for a canoe. Pegan is ſituated about two miles north from the other two, which lie near each other in an eaſt and weſt direction. The inhabitants were friendly, and ready to exchange their cocoa nuts for ſmall pieces of iron, which they valued highly. They are of the Indian copper colour, with fine long black hair, and ſmall beards, which they were continually plucking by the roots from their chin and upper lip. Their features are pleaſing, and their teeth remarkably white and even; they are of the common ſtature, but ſingularly nimble, active, and vigorous. Their diſpoſition is free and open, and they aſſociated with the crew as familiarly as if they had been long acquainted. On their waiſt they had a ſlight covering, which conſiſted of fine matting. Their canoes are well conſtructed, having a hollow tree for the bottom, and planks for the ſides, with a ſail of fine matting, and an outrigger, and good ropes and netting. One of the inhabitants inſiſted on remaining with the ſhip's crew, who was named Joſeph Freewill, and from whom they learned that there were other iſlands towards the north, whoſe inhabitants had iron, and who always killed his countrymen when they met at ſea. The iſlands were ſmall and low, the larger not being more than five miles in compaſs, to which the captain gave the name of Freewill iſland. S. lat. 0° 50'. E. long. 137° 51'.

FREEZE, in *Architecture*, the middle ſubdiviſion of the entablature, ſeparating the cornice from the architrave.

The ancients called it *zoophorus*, ζωυφορος, becauſe it was uſually enriched with figures of animals; and our denomination freeze has a like origin, being formed of the Latin *phrygio*, an embroiderer, becauſe it is commonly adorned with ſculptures in baſſo relievo, imitating embroidery.

The freeze is ſuppoſed to be intended to repreſent the heads of the tranſverſe beams that ſuſtain the roof or covering.

In the Tuſcan order, the freeze is a plain flat member; in the Doric it is ornamented with tablets, which are cut into vertical, triangular grooves called triglyphs; and in the Ionic and Corinthian it is a plane ſurface; that of thoſe in the latter order is ſometimes enriched. The peculiarities reſpecting the freeze will be ſeen under the head of each individual order. See alſo COLUMN.

From the variety of enrichments practiſed on the freezes, they become variouſly denominated: as,

FREEZES, *Convex*, or *Pulvinated*, are thoſe whoſe profile is a curve; the beſt proportion whereof is, when drawn on the baſe of an equilateral triangle.

In ſome, the ſwelling is only at the top, as in a conſole; in others at bottom, as in a baluſter.

FREEZES, *Flouriſhed*, are thoſe enriched with rinds or imaginary foliages, as the Corinthian freeze of the frontiſpiece of Nero; or with natural leaves, either in cluſters or garlands, or continued, as in the Ionic of the gallery of Apollo in the Louvre.

FREEZES, *Hiſtorical*, are thoſe adorned with baſſ-relievos, repreſenting hiſtories, ſacrifices, &c. as that of the arch of Titus at Rome.

FREEZES, *Marine*, are thoſe repreſenting ſea-horſes, tritons, and other attributes of the ſea; or ſhells, baths, grottos, &c.

FREEZES, *Raſtic*, are thoſe whoſe courſes are ruſticated, or imboſſed; as the Tuſcan freeze of Palladio.

FREEZES, *Symbolical*, are thoſe adorned with the attributes of religion; as the Corinthian of the temple behind the Capitol at Rome, whereon are repreſented the inſtruments and apparatus of ſacrifice.

FREEZE *of the Capital*. See HYPOTRACHELION.

FREEZE, in *Commerce*, a kind of cloth or ſtuff. See FRIZE.

FREEZELAND PEAK, in *Geography*, a ſmall iſland in the South Atlantic ocean, near the coaſt of Sandwich land, ſo called from one of Capt. Cook's crew, who diſcovered it in the year 1775. S. lat. 59°. W. long. 27°.

FREEZELAND, *Friezeland*, or *Frizeland horſe*, in *War*, the ſame with *cheval de friſe*.

FREEZING, denotes that operation in nature, by which a liquid, as water, is converted into a ſolid form, as ice. It is effected by the abſtraction of heat from the liquid body, but how this ſhould produce a change in the form or conſtitution of the body, remains ſtill a ſubject for enquiry. It may be imagined that cold is ſomething poſitive, which inſinuates itſelf into the pores of the liquid, and obſtructs the free motion of its particles; but this would require the body to increaſe in weight; or, if we ſuppoſe cold to be void of gravity, ſtill it ſhould tend to increaſe the volume of the liquid; it however generally produces the contrary effect. Some have ſuppoſed that the heat of bodies being diminiſhed, their particles are brought more nearly into contact, and thus the attraction of aggregation or coheſion is increaſed; but in the caſe of water and ice, which is the moſt familiar inſtance we have, the very reverſe takes place; namely, the congealed body, ice, is of leſs denſity than the liquid; and what renders it ſtill more remarkable is, that before the tranſition from liquidity to ſolidity, a gradual expanſion is obſerved in the liquid itſelf during ſome degrees of deſcending temperature. More lately it has been ſuppoſed that a kind of polarity actuates the molecules of liquids, and brings them, in certain caſes, to cohere more forcibly; but this does not account for the phenomena obſerved in regard to change of volume.

Mr. Dalton, in his New Syſtem of Chemical Philoſophy, has given a ſection on the phenomena of the congelation of water, which contains ſome ingenious conjectures on the ſubject. He ſtates the principal facts of congelation as follows: "1ſt. The ſpecific gravity of ice is leſs than that of water, in the ratio of 92 to 100. 2d. When water is expoſed in a large ſuſpended jar to cool in ſtill air of 20° or 30°, it may be cooled 2° or 3° below freezing; but if any tremulous motion takes place, there appear inſtantly a multitude of ſhining hexangular ſpiculæ, floating, and ſlowly aſcending in the water. 3d. It is obſerved, that the ſhoots or ramifications of ice at the commencement, and in the early ſtage of congelation, are always at an angle of 60° or 120°. 4th. Heat is given out during congelation, as much as would raiſe the temperature of water 140° or 150°. The ſame quantity is again taken in when the ice is melted. This quantity may be $\frac{1}{2}$th of the whole heat which water of 32° contains. 5th. Water is denſeſt at 36° of the old ſcale, or 38° of the new: from that point it gradually *expands* by cooling or by heating alike, according to the law ſo often mentioned, that of the ſquare of the temperature. 6th. If water be expoſed to the air and to agitation, it cannot be cooled below 32°; the application of cold freezes a part of the water, and the mixture of ice and water acquires the temperature of 32°. 7th. If the water be kept ſtill, and the cold be not ſevere, it may be cooled in large quantities to 25° or below, without freezing; if the water be confined in the bulb of a thermometer it is very difficult to freeze it by any cold mixture above 15° of the old ſcale (Fahrenheit's); but it is equally difficult to cool the water much below that temperature without its freezing. I have obtained it

as low as 7° or 8°, and gradually heated it again without any part of it being frozen. 8th. In the laſt caſe of what may be called *forced* cooling, the law of expanſion is ſtill obſerved as given above. 9th. When water is cooled to 15° or below in a bulb, it retains the moſt perfect tranſparency; but if it accidentally freeze, the congelation is inſtantaneous, the bulb becoming in a moment opake, and white like ſnow, and the water is projected up the ſtem. 10. When water is cooled below freezing, and congelation ſuddenly takes place, the temperature riſes inſtantly to 32°." He then proceeds as follows: "In order to explain theſe phenomena, let it be conceived that the ultimate or ſmalleſt elements of water are all globular, and exactly of the ſame ſize; let the arrangement of theſe atoms be in ſquares, as exhibited in *Plate* XIV. *Pneumatics, fig.* 4, ſo that each particle touches four others in the ſame horizontal plane. Conceive a ſecond ſtratum of particles placed upon theſe in like order of ſquares, but ſo that each globule falls into the concavity of four others on the firſt ſtratum, and conſequently reſts upon four points, elevated 45° above the centres of the globules. A perpendicular ſection of ſuch globule, reſting upon two diagonal globules of the ſquare, is exhibited in *fig.* 5. Conceive a third ſtratum placed in like manner upon the ſecond, &c. the whole being ſimilar to a ſquare pile of ſhot.—The above conſtitution is conceived to repreſent that of water at the temperature of greateſt denſity.

"To find the number of globules in a cubic veſſel, the ſide of which is given; let n = the number of particles in one line or ſide of the cube, then n is the number in any horizontal ſtratum, and becauſe a line joining the centres of two contiguous particles in different ſtrata makes an angle of 45 with the horizontal plane, the number of ſtrata in the given height will be $n \div$ ſin. of $45° = n \div \frac{1}{2}\sqrt{2}$. Whence the number of particles in the cubic veſſel $= n \div \frac{1}{2}\sqrt{2} = n^3\sqrt{2}$.

"Now let it be ſuppoſed that the ſquare pile is inſtantly drawn into the ſhape of a rhombus, (*fig.* 6.) then each horizontal ſtratum will ſtill conſiſt of the ſame number of particles as before, only in a more condenſed form, each particle being now in contact with ſix others. But to counteract this condenſation, the ſeveral ſucceſſive ſtrata are more elevated than before, ſo that the pile is increaſed in height. A queſtion then ariſes, whether a veſſel of given capacity will hold a greater number of particles in this, or the former diſpoſition? It muſt be obſerved that in the laſt caſe, each particle of a ſuperior ſtratum reſts only on two particles of an inferior one, and is therefore elevated by the ſine of 60°, as repreſented in *fig.* 7. The baſis of the two piles are as $1 : \sqrt{\frac{3}{4}}$, and their heights as $\sqrt{\frac{1}{2}} : \sqrt{\frac{3}{4}}$; but the capacities are as the products of the baſe and height, or as $\sqrt{\frac{1}{2}} : \frac{3}{4}$; that is, as .707 to .750 nearly, or as 94 to 100. Thus it appears that the firſt arrangement contains more particles in a given ſpace than the ſecond, by 6 *per cent.*

"The laſt or rhomboidal arrangement is ſuppoſed to be that which the particles of water aſſume upon congelation. The ſpecific gravities of ice and water ſhould therefore be as 94 to 100. But it ſhould be remembered that water uſually contains 2 *per cent.* in bulk of atmoſpheric air; and that this air is liberated upon congelation, and is commonly entangled among the ice in ſuch ſort as to increaſe its bulk without materially increaſing its weight; this reduces the ſpecific gravity of ice 2 *per cent.*, or makes it .92, which agrees exactly with obſervation. Hence the 1ſt fact is explained.

"The angle of a rhombus is 60°, and its ſupplement 120°; if any particular angles are manifeſted in the act of congelation, therefore, we ought to expect theſe, agreeable to the 2d and 3d phenomena.

"Whenever any remarkable change in the internal conſtitution of any body takes place, whether by the acceſſion and junction of new particles, or by new arrangements of thoſe already exiſting in it, ſome modifications in the atmoſpheres of heat muſt evidently be required; though it may be difficult to eſtimate the quantity, and ſometimes even the kind of change ſo produced, as in the preſent caſe. So far therefore the theory propoſed agrees with the 4th phenomenon.

"In order to explain the other phenomena, it will be requiſite to conſider more particularly the mode by which bodies are expanded by heat. Is the expanſion occaſioned ſimply by the enlargement of the individual atmoſpheres of the component particles? This is the caſe with elaſtic fluids, and perhaps with ſolids, but certainly not with liquids. How is it poſſible that water ſhould be expanded a portion repreſented by 1 upon the addition of a certain quantity of heat at one temperature, and by 340 upon the addition of a like quantity at another temperature, when both temperatures are remote from the abſolute zero, the one perhaps 6000 and the other 6170? The fact cannot be accounted for on any other ſuppoſition than that of a change of arrangement in the component particles; and a *gradual* change from the ſquare to the rhomboidal arrangement, is in all probability effected both by the addition and abſtraction of heat. It is to be ſuppoſed then, that water of the greateſt poſſible denſity has its particles arranged in the ſquare form; but if a given quantity of heat be added to, or taken from it, the particles commence their approach to the rhomboidal form, and conſequently the whole is expanded, and that the ſame, by the ſame change of temperature, whether above or below that point.

"If heat be taken away from water of 38°, then expanſion is the conſequence, and a moderate inclination of the particles towards the rhomboidal form; but this only extends a ſmall way, whilſt the maſs is ſubject to a tremulous motion, ſo as to relieve the obſtructions occaſioned by friction; by the energy of certain affinities, the new form is completed in a moment, and a portion of ice formed; heat is then given out, which retards the ſubſequent formation, till at laſt the whole is congealed. This is the ordinary proceſs of congelation. But if the maſs of water cooled is kept in a ſtate of perfect tranquillity, the gradual approach to the rhomboidal form can be carried much farther; the expanſion goes on according to the uſual manner, and the ſlight friction or adheſion of the particles is ſufficient to counteract the balance of energies in favour of the new formation, till ſome accidental tremor contributes to adjuſt the equilibrium. A ſimilar operation is performed when we lay a piece of iron on a table, and hold a magnet gradually nearer; the proximity of the approach, without contact, is much aſſiſted by guarding againſt any tremulous motion of the table. Hence the reſt of the phenomena are accounted for."

It has been obſerved that freezing and cryſtallization are phenomena of the ſame kind. When ſalts cryſtallize, they uſually contain certain invariable proportions of water. The ſame remark applies to certain acids which congeal when diluted to a certain degree; thus, ſulphuric acid 1.78, ſpecific gravity, congeals about 32°, but does not melt under 45°; whereas an acid more or leſs diluted does not freeze without much greater cold, and when partially frozen, the ice is found to approximate to the ſtrength of 1.78, leaving the unfrozen liquid ſomewhat weaker or ſtronger, according to the circumſtances of the caſe. Nitric acid of 1.30 ſpecific gravity freezes at —2°, according to Mr. Cavendiſh, and no

other ſtrength will freeze at ſo high a temperature. From this concluſion however, we muſt be underſtood to except very dilute acid, ſuch as to be almoſt entirely water. This acidulous water freezes with a leſs degree of cold, and is ſeparated into two portions, the moſt watery part freezing firſt, and afterwards the moſt acid part. This has been called the *aqueous* congelation of the acids. The temperatures at which very dilute acids freeze have been aſcertained by ſir Charles Blagden as under. (Philoſ. Tranſact. 1788.) The ſulphuric acid was of the denſity 1.837, and the nitric acid 1.454. To 100 parts of water by weight were added certain weights of the above acids, and the temperatures at which the mixtures froze were obſerved.

Sulphuric acid.

Water.		Acid.	Freezing point.
100	+	10	24°.5
100	+	20	12°.5
100	+	25	7°.5

Nitric acid.

Water.		Acid.	Freezing point.
100	+	10	22°
100	+	20	10°.5
100	+	23.4	7°.

It appears alſo from ſir Charles Blagden's experiments, that various ſalts diſſolved in water contribute to lower the freezing point; and that the effect of the ſame ſalt is in proportion to its quantity. To 100 parts of water, by weight, were added parts of the different ſalts as under, and the freezing points of the ſolutions found.

Names of ſalts.	Proportion.	Freezing point.
Common ſalt	25	4°
Sal ammoniac	20	8°
Rochelle ſalt	50	21°
Sulphate of magneſia	41.6	25°.5
Nitre	12.5	26°.
Sulphate of iron	41.6	28°.
Sulphate of zinc	33.3	28°.6

Theſe ſolutions may be cooled below their reſpective freezing points, the ſame as water; and the contact of ice in ſuch caſe ſets the congelation a going. It is remarkable alſo, that the expanſion of theſe ſolutions by heat is very different from that of pure waters, eſpecially in the lower temperatures. For other particulars ſee CONGELATION, &c.

FREEZING *Mixtures*. In proſecuting chemical and other inquiries, it is ſometimes requiſite to ſubject bodies to a greater degree of cold than the ordinary changes of temperature in the atmoſphere allow. A reduction of temperature is effected by the chemical union of certain bodies; or, to ſpeak more properly, by the ſolution of one body in another. Salts diſſolved in water, ice or ſnow diſſolved in nitric and muriatic acids, reduce the temperature of the mixtures a great number of degrees. The cauſe is, the mixture has a larger capacity for heat than would be derived from blending the two capacities of the ingredients, and taking a mean; but this ſubject will be diſcuſſed more properly under the heads of CALORIC, HEAT, &c.

Fahrenheit ſeems to have been the firſt who made any number of experiments directed to this point. The zero of his thermometrical ſcale is derived from the cold which a mixture of equal parts of ſnow and common ſalt produces; and his 32°, or freezing point, is the temperature of a mixture of ice or ſnow and water. Mr. Walker of Oxford has proſecuted this inveſtigation farther than any other perſon. The reſults of his experience are given in two papers in the Philoſophical Tranſactions for 1795 and 1801. One principal object he had in view, was to exhibit the congelation of quickſilver without great natural cold. He ſucceeded ſo far as to freeze it even in the ſummer, though it requires the temperature of — 39° at leaſt to congeal that metal. Profeſſor Lowitz of Peterſburgh, in 1796, publiſhed ſome intereſting experiments on the ſubject of frigorific mixtures, which may be ſeen in the Annales de Chimie, tome 22, for 1797. Fourcroy, Vauquelin, and Guyton, gave memoirs on the effects of frigorific mixtures in the 29th volume of the ſame work, which contains many facts deſerving attention. Lowitz's great improvement was in the introduction of muriate of lime, an article which unites almoſt all the deſirable properties of an ingredient in ſuch mixtures. It produces the greateſt degree of cold, is cheap in the firſt inſtance, and eaſily recovered for further uſe, and is not coroſive. By means of this article and ſnow, or pounded ice, very large quantities of mercury have been frozen. In 1793 Lowitz froze 12lbs. of mercury at Peterſburgh; and in 1799 Mr. W. H. Pepys of London, aſſiſted by ſome philoſophical acquaintance, froze 56lbs. of mercury; an account of which may be ſeen in the 3d vol. of the Philoſophical Magazine. Mercury in freezing aſſumes the cryſtalline form, and contracts in its dimenſions, according to Mr. Cavendiſh, $\frac{1}{23}$d of its volume, but according to Mr. Biddle, it amounts to $\frac{1}{7}$th of the volume.

The following table gives the moſt complete and accurate liſt of freezing mixtures and their effects, that we yet have. They are the reſults of Mr. Walker's experience.

Table of Freezing Mixtures.

Mixtures.			Thermometer ſinks
Muriate of ammonia	5 parts		From 50° to 10°.
Nitre	5		
Water	16		
Muriate of ammonia	5 parts		From 50° to 4°.
Nitre	5		
Sulphate of ſoda	8		
Water	16		
Nitrate of ammonia	1 part		From 50° to 4°.
Water	1		
Nitrate of ammonia	1 part		From 50° to — 7°.
Carbonate of ſoda	1		
Water	1		
Sulphate of ſoda	3 parts		From 50° to — 3°.
Diluted nitric acid	2		
Sulphate of ſoda	6 parts		From 50° to — 10°.
Muriate of ammonia	4		
Nitre	2		
Diluted nitric acid	4		
Sulphate of ſoda	6 parts		From 50° to — 14°.
Nitrate of ammonia	5		
Diluted nitric acid	4		
Phoſphate of ſoda	9 parts		From 50° to — 12°.
Diluted nitric acid	4		
Phoſphate of ſoda	9 parts		From 50° to — 21°.
Nitrate of ammonia	6		
Diluted nitric acid	4		
Sulphate of ſoda	8 parts		From 50° to — 0°.
Muriatic acid	5		

Sulphate

Mixtures.		Thermometer ſinks
Sulphate of ſoda -	5 parts	From 50° to 3°.
Diluted ſulphuric acid	4	
Snow - - -	1 part	From 32° to 0°.
Common ſalt - -	1	
Muriate of lime -	3 parts	From 32° to — 50°.
Snow - - -	2	
Potaſh - - -	4 parts	From 32° to — 51°.
Snow - - -	3	
Snow - - - -	1 part	From — 20° to — 60°.
Dilated ſulphuric acid	1	
Snow or pounded ice -	2 parts	From 0° to — 5°.
Common ſalt - -	1	
Snow - - -	3 parts	From 0° to — 46°.
Diluted nitric acid -	2	
Muriate of lime -	2 parts	From 0° to — 66°.
Snow - - -	1	
Snow or pounded ice -	1 part	From — 5° to — 18°.
Common ſalt - -	5	
Muriate of ammonia and nitre - - -	5	
Snow - - -	2 parts	From — 10° to — 56°.
Diluted ſulphuric acid	1	
Diluted nitric acid -	1	
Snow or pounded ice -	12 parts	From — 18° to — 25°.
Common ſalt - -	5	
Nitrate of ammonia -	5	
Muriate of lime -	3 parts	From — 40° to — 73°.
Snow - - -	1	
Diluted ſulphuric acid	10 parts	From — 68° to — 91°.
Snow - - -	8	

For more particulars in regard to the hiſtory of the congelation of mercury, ſee MERCURY.

A little experience will ſuggeſt ſome of the precautions neceſſary to enſure ſucceſs in theſe mixtures. The ſalts ſhould be cryſtallized, but reduced to a fine powder. The water of cryſtallization, probably exiſting in a ſtate reſembling ice, ſeems to perform an important part of the cooling effect. It is therefore needful that ſalts liable to effervescence, ſuch as the ſulphate and phoſphate of ſoda, ſhould be freſh cryſtallized, or kept from the action of the air; the muriate of lime, and other deliqueſcent ſalts, ſhould be cryſtallized, then pulverized, paſſed through a ſieve, and bottled cloſe, to prevent the acceſs of air. Mr. Walker informs us that muriate of lime of 1.45 ſpecific gravity will cryſtallize at the temperature of 32°, and is therefore beſt to uſe for that temperature; but for uſe in warm weather, he recommends boiling the liquid down to 1.49 ſpecific gravity at the temperature of 80°, cryſtallizing, pounding, and bottling, &c. The veſſels containing the frigorific mixtures ſhould be thin, and juſt large enough to hold them. Tinned iron will do well where no acids are employed. The ingredients ſhould be mixed as quickly as poſſible. When great cold is to be produced, the ingredients are to be ſeparately cooled in other freezing mixtures; thus they may be reduced to 0° by a mixture of ſnow and common ſalt. The thermometers uſed on theſe occaſions are made of ſpirit of wine or alcohol. The potaſh in the above table is cauſtic potaſh cryſtallized; and the diluted acids are the common acids of the ſhops diluted with equal weights of water. It is to be regretted that Mr. Walker has not rather given us the ſpecific gravities of the ſeveral acids uſed, as their ſtrengths as articles of commerce are known to be variable.

The beſt and moſt convenient of the above mixtures, when great frigorific effects are to be produced, is muriate of lime and ſnow. But when a reduction of 15° or 20° of temperature is only wanted, equal parts of nitre and ſal ammoniac, in the proper proportion of water, are found moſt advantageous, as the ſalts are eaſily recovered by evaporation.

It is remarkable that none of the above mixtures reduces the temperature of the ingredients above 83°. But in mixtures producing heat or increaſe of temperature, we have an elevation of 200° by ſulphuric acid and water mixed in due proportion; and a ſtill greater elevation is obſerved in mixing lime and water. This would ſeem to indicate that our preſent method of reckoning degrees of temperature is probably wrong; that the lower degrees are much too large, and conſequently too few in number. If the idea of Mr. Dalton be confirmed, that the freezing point of mercury at — 39° or — 40° of our thermometer, that is, at 72 below the freezing point of water, be really 200° below the ſaid point, when the degrees are duly appreciated, this remarkable circumſtance, of leſs cold than heat being obtained from chemical mixtures, will vaniſh.

FREEZING *Apparatus*, is a very ſmall apparatus contrived by Mr. Cavallo for freezing a ſmall quantity of water, *viz.* about 10 grains, in every climate. The whole apparatus is contained in a box 4½ inches long, 2 inches broad, and 1½ deep. The apparatus, and method of uſing it, are repreſented in *Plate* XIV. *Pneumatics*, *fig.* 8. E F G is a common phial with a glaſs ſtopple, filled with ether; E D is a glaſs tube with a capillary aperture at D, and having ſome thread wound round the other extremity for the purpoſe of fitting the neck of the bottle when the experiment is to be performed. A B is a glaſs tube about four inches long, and about ⅕th of an inch in diameter, hermetically cloſed at B. Into this tube a ſlender wire H is introduced, the lower extremity of which is ſhaped into a ſpiral, and ſerves to draw out the ice when formed. When a little water, C B, is put into the tube, the operator holds the tube by its upper part, with the fingers of the left hand, and keeps it continually, but gently, turning round its axis, firſt one way, and then the other; whilſt with the right hand he holds the phial in ſuch a manner as to direct the ſtream of ether, which comes out of the capillary aperture D, towards the outſide of the tube, a little above the ſurface of the water within. The ſtream of ether ſhould be ſuch as that a drop of it may, now and then, (*e. g.* every ten ſeconds) fall from the under part of the thermometer. By continuing this operation during two or three minutes, the water C B will be frozen, and may be drawn out of the tube in one hard lump of ice. When this is done, the phial is turned with its aperture upwards, the ſhort tube E D is removed, the ſtopple is placed in its ſtead, and the remaining ether is preſerved for other trials.

FREEZING *Rain*, or *Raining Ice*, is a very uncommon kind of ſhower, which fell in the weſt of England, in December, anno 1672. See Phil. Tranſ. N° 90.

This rain, as ſoon as it touched any thing above ground, as a bough, or the like, immediately ſettled into ice; and, by multiplying and enlarging the icicles, it broke all down with its weight. The rain that fell on the ſnow immediately froze into ice, without ſinking in the ſnow at all.

It made an incredible deſtruction of trees, beyond any thing

in

in all hiſtory. "Had it concluded with ſome guſt of wind," ſays a gentleman on the ſpot, "it might have been of terrible conſequence."

"The ſprig of an aſh-tree, of juſt three quarters of a pound, being weighed, the ice thereon weighed ſixteen pounds. Some were frighted with the noiſe in the air; till they diſcerned it was the clatter of boughs daſhed againſt each other." Dr. Beale obſerves, that there was no conſiderable froſt obſerved on the ground during the whole; whence he concludes, that a froſt may be very fierce and dangerous on the tops of ſome hills; while, in other places, it keeps at two, three, or four feet diſtance above the ground, rivers, lakes, &c. and may wander about, very furiouſly in ſome places, and be remiſs in others, not far off. This froſt was followed by glowing heats, and a wonderful forwardneſs of vegetation.

FREEZING *of Wines*. See *Condenſing of* WINES.

FREEZING, in *Commerce* and *Manufactures*. See FRIZING.

FREEZING, in *Sea Language*, is a ſort of ornamental painting on the upper part of a ſhip's quarter, ſtern, or bow. It generally conſiſts of armour, inſtruments of war, marine emblems, &c.

FREGAROLA, in *Ichthyology*, a name given by many to a ſmall river-fiſh, well known in England by the name of the minow.

FREGATA, in *Ornithology*, a ſpecies of *procellaria*, which ſee.

FREGATA, or *Frigata*, a name given to the PELECANUS *aquilus*, which ſee.

FREGELLANUM, or FREGELLA, in *Ancient Geography*, a town of Italy, in Latium, S.E. of Anagnia, on the Latin way. D'Anville places it to the right of the Liris; but the abbé Chauppy thinks the ſituation was that of Opio, a corruption, as he conceives, of the name Opimius, a Roman conſul, who deſtroyed Fregella; Fregellanum having been built on its ruins.

FREGENA, a town and colony of Italy, in Etruria, ſituated on the ſea-coaſt.

FREGGIA, in *Ichthyology*, the name of a long anguilliform fiſh of the tænia kind, more commonly called *cavagiro*. It is the CEPOLA *tænia*.

FREGIT CLAUSUM. See CLAUSUM.

FREHEL, CAPE, in *Geography*, a cape on the W. coaſt of France; 12 miles W. of St. Malo. N. lat. 48° 38'. W. long. 2° 13'.

FREHER, MARQUARD, in *Biography*, an eminent juriſt and man of letters, was born at Augſburg in the year 1565. He was educated for the profeſſion of the law, firſt at Altdorff and then at Bourges. His firſt office was that of counſellor to the elector-palatine, John Caſimir, and in 1596 he obtained the profeſſorſhip of the law in the univerſity of Heidelberg. By the elector Frederic IV. he was employed in various important concerns, and created vice-preſident of the ſenate. He was a very diſtinguiſhed negociator, but did not, by engaging in diplomatic concerns, neglect his literary purſuits, which were particularly directed to hiſtory and antiquities. He was author of many learned works: of theſe the principal is, "De re monetaria veterum Romanorum, et hodierni apud Germanos Imperii Liber." He was a collector of ancient paintings, and poſſeſſed a well choſen cabinet of medals, many of which he elucidated in his writings. He died at Heidelberg in the year 1614. Moreri.

FREIBURG, in *Geography*, a town of the duchy of Bremen; 16 miles N. of Stade.

FREIDDEG, a town of Auſtria; 7 miles S.S.W. of Ips.

FREIDNAU, a town of the duchy of Stiria; 6 miles W. of Rakelſpurg.

FREJENAL, or FREXENEL, a town of Spain, in the country of Seville; 47 miles N. of Seville.

FREIENHAGEN, a town of Germany, in the principality of Waldeck, on the Watter; 18 miles W. of Caſſel. —Alſo, a town of Brandenburg, in the Mark of Prignitz; 69 miles N.W. of Berlin. N. lat. 53° 17'. E. long. 12° 27'.

FREIENSTEIN, a town of Germany, in the county of Erbach; 10 miles S. of Erbach.

FREIENWELDE, a town of Germany, in the duchy of Pomerania; 15 miles N.E. of Stargard. N. lat. 53° 36'. E. long. 15° 23'.

FREIGHT. See FRAIGHT.

FREIMERSHEIM, in *Geography*, a town of France, in the department of Mont Tonnerre, taken by the French in 1794; 4 miles N.N.E. of Landau, and 12 S.W. of Spire.

FREIN, or WRANOW, a town of Moravia, in the circle of Znaym; 8 miles W. of Znaym.

FREIND, JOHN, in *Biography*, a celebrated phyſician, was born in 1675, at Croton, in Northamptonſhire, of which place his father was rector. He was educated at Weſtminſter ſchool, under Dr. Buſby, and was thence elected, in 1690, into Chriſt-church college, Oxford. Here he was conſiderably diſtinguiſhed by his claſſical attainments, to which Dr. Aldrich gave teſtimony, by ſelecting him, together with Mr. Foulkes, for the taſk of publiſhing a Latin tranſlation of the oration of Æſchines againſt Cteſiphon, and of Demoſthenes de Corona. Having for ſome time purſued the ſtudy of phyſic, he communicated to the Royal Society, in 1699, an account of a remarkable hydrocephalus, and in 1701 a relation of a ſingular convulſive diſeaſe affecting two poor families in Oxfordſhire. In 1703 he publiſhed a work, which immediately brought him into notice as a phyſiologiſt and phyſician, entitled, "Emmenologia, in qua fluxus muliebris menſtrui phænomena, periodi, vitia, cum medendi methodo, ad rationes mechanicas exiguntur," Oxford, in 4to. In this work, which was favourably received, and went through ſeveral editions, in tranſlations, on the continent, Freind adopted the principles of the mechanical ſect of phyſicians, which then flouriſhed under the auſpices of Baglivi, and other learned men. He conſidered local plethora as the cauſe of the evacuation, and attributed its diminution or deficiency to a lentor of the blood, and a rigidity of the veſſels, and its exceſs to the oppoſite condition of tenuity of the blood, and laxity of the veſſels; whence his plan of cure was derived. In the year 1704 he was appointed profeſſor of chemiſtry at Oxford; and in his lectures he attempted, after the example of Keil, to explain the operations of this art, alſo upon mechanical principles. In the enſuing year, however, he accompanied the earl of Peterborough, in his expedition to Spain, in the quality of phyſician to the Engliſh forces. He was abroad two years, and returned through Italy, viſiting Baglivi and Lanciſi at Rome, by whom he was received with diſtinction, his reputation having already reached that capital. On his return, in 1707, he was created doctor by diploma, and publiſhed his chemical lectures in Latin, under the title of "Prælectiones Chymicæ in quibus omnes fere Operationes Chymicæ ad vera principia et ipſius naturæ leges rediguntur." Theſe lectures were nine in number, and were dedicated to ſir Iſaac Newton. He was elected a fellow of the Royal Society in 1712; but in the ſame year quitted London in order to accompany the

troops

troops under the command of the duke of Ormond, into Flanders. On the concluſion of peace in the following year he returned to London, where he chiefly reſided afterwards, and roſe to high profeſſional reputation. In 1716 he was received as fellow of the College of Phyſicians, and in that year publiſhed the firſt and third books of Hippocrates on epidemics, with the addition of a commentary on fevers, in nine parts, under the title of "Hippocratis de morbis popularibus liber primus et tertius: his accommodavit novem de Febribus Commentarios I. Freind M. D." This is a performance of great erudition, affording a perſpicuous view of the practice of the Greek phyſicians, of which he was for the moſt part a zealous defender. He was attacked with unbecoming acrimony, on account of ſome obſervations made in theſe commentaries, relative to the advantages of purgative medicines in the ſecondary fever of confluent ſmall pox, by Dr. Woodward, in a treatiſe entitled "The State of Phyſic and Diſeaſes." To this Dr. Freind firſt oppoſed a ludicrous reply, in the name of a noted empiric, one Byfield. At length he thought proper to anſwer it ſeriouſly, in a letter addreſſed in Latin to Dr. Mead, with the title of "De Purgantibus in ſecundo Variolarum Confluentium febre adhibendis," 1719, 8vo.—This letter contains many valuable obſervations, deduced both from theory and practice, elegantly expreſſed, which contributed to eſtabliſh the practice for which he contended. He paſſed through the offices of the college, and in 1720 delivered an Harveian oration, which was much applauded.

Hitherto Dr. Freind had confined himſelf to medical and philoſophical purſuits with great reputation and ſucceſs; but in 1722, for what reaſons we know not, he was induced to engage in political life, and entered into parliament as burgeſs for Launceſton. His connections were with the party at this time in oppoſition to the court; and as the times were critical, and his attachments warm, his conduct ſoon expoſed him to ſuſpicion. Biſhop Atterbury's plot for the reſtoration of the Stuart family was the leading topic of this period; and when a motion was made againſt the prelate in the houſe of commons, Dr. Freind was among the ſpeakers in his favour. As the circumſtances of the time had given the miniſtry a pretext for the ſuſpenſion of the habeas corpus act, ſeveral perſons of conſequence were committed to priſon, among whom was our phyſician, charged with ſuſpicion of high treaſon. The oppoſition ſuggeſted that the only ground for this was his parliamentary conduct; but Walpole declared privately to ſeveral perſons, that there was poſitive proof of the blackeſt treaſon againſt him. This, however, (as in many inſtances of a ſimilar kind,) was never brought forward; and, after a confinement in the Tower from March 15, 1723, to June 21ſt, of the ſame year, he was admitted to bail, his ſureties being Dr. Mead, and three others of his brethren. He appeared at the king's bench in November following, and was finally diſcharged. For the honour of Dr. Mead, however, the mode in which his liberation was procured muſt not be omitted to be noticed. Being called to attend ſir R. Walpole in ſickneſs, that phyſician refuſed to undertake the cure of the miniſter until Dr. Freind was ſet at liberty. He afterwards made over to Dr. Freind 5000 guineas which he had received in fees from his (Dr. F.'s) patients. His mind was tranquil enough on this occaſion to ſuffer him to employ his leiſure in the Tower in drawing up a ſecond Latin epiſtle to Dr. Mead, concerning the ſmall-pox, entitled, "De quibuſdam Variolarum generibus Epiſtola," 1723. During his confinement he alſo formed the plan of his great work, of which the firſt part appeared in 1725, and the ſecond in 1726. This was entitled "The Hiſtory of Phyſic from the Time of Galen to the beginning of the Sixteenth Century, chiefly with regard to Practice; in a Diſcourſe written to Dr. Mead," in two volumes 8vo. This work was ſuggeſted by the Hiſtoire de la Medecine of Daniel Le Clerc, which terminated with Galen, and to which Dr. Freind intended it as a kind of ſupplement. It is divided into three parts, in which the Greek phyſicians, the Arabians, and the moderns are reſpectively treated of. The author did not attempt a biography of the leading phyſicians, nor a minute analyſis of their works, but only notes the peculiarities of each in point of theory and practice, occaſionally interſperſing his own obſervations. This work was much read, both at home and abroad, in tranſlations, and continues to be a ſtandard work. It was attacked, however, from ſeveral quarters. Sir Clifton Winteringham publiſhed, anonymouſly, a tract, entitled, "Obſervations on Dr. Freind's Hiſtory of Phyſic, ſhewing ſome falſe repreſentations of Ancient and Modern Phyſicians, by C. W. D. M." 1726. And the celebrated John Le Clerc made ſome animadverſions upon it, in defence of his brother Daniel, in the "Bibliotheque Ancienne et Moderne," tome XXVI., chiefly in regard to ſome points of chronology. The controverſy was maintained by the interference of ſeveral writers on both ſides. The errors of Le Clerc, pointed out by Freind, are, however, acknowledged, as well as ſome miſtakes of his cenſurer.

Whatever political ſuſpicions might have fallen upon Dr. Freind in conſequence of his connections, the ſtain of diſaffection to the reigning family muſt be regarded as obliterated, by his appointment, on the acceſſion of George II., to the office of phyſician to queen Caroline. He did not long, however, enjoy this honourable truſt, for he died in July, 1728, in the fifty-ſecond year of his age, much regretted by all; and the care which his ſovereign afterwards extended to his widow and his ſon, evinced the eſteem in which he had been held by that prince.

The Latin works of Dr. Freind were publiſhed by Dr. Wigan in a folio volume, London, 1733, together with a Latin verſion of the Hiſtory of Phyſic, and a life of the author by that editor. Several foreign editions of the ſame collection have alſo been publiſhed. Eloy. Dict. Hiſt. Gen. Biog. Sprengel, Geſchichte der Artzn.

FREINDORF, in *Geography*, a town of Auſtria, four miles S.E. of Tulla.

FREINSHEIM, John, in *Biography*, was born at Ulm in 1608. He ſtudied at various German univerſities, and was patronized by Matthew Berneger. He improved every advantage of which he was poſſeſſed by inceſſant diligence, and carried his reſearches into every part of literature. His knowledge of the languages was very extenſive, and comprehended not only thoſe which are now dead, and which have acquired the title of learned, but likewiſe moſt of thoſe in modern uſe. In 1634 he was invited to Metz to occupy the poſt of interpreter to the king's ſecretaries; here he continued three years, and returned and married the daughter of his patron, with whom he took up his reſidence. In 1642 he was appointed profeſſor of politics and eloquence at Upſal, and after five years queen Chriſtina engaged him, with a liberal ſalary, to act as her librarian and hiſtoriographer. In 1652 he was invited to Heidelberg by the elector Charles Lewis, and created electoral counſellor, and honorary profeſſor of the univerſity. In this ſituation, to which his talents and manners were admirably adapted, he cultivated an extenſive correſpondence with the learned throughout Europe, and was honoured with the friendſhip and eſteem of many perſons of rank. He died in 1660, at the age of fifty-two. As a critic he illuſtrated with learned com-

commentaries, the Latin hiſtorians Florus, Q. Curtius, and Tacitus, and compoſed ſupplements for the loſt books of Livy. He was author of many Latin orations, poems, and diſſertations; and in his youth he wrote German poems, one of which introduced him to the notice of Berneger. Moreri.

FREINSHEIM, in *Geography*, a town of Germany, in the palatinate of the Rhine; 10 miles W.N.W. of Manheim.

FREIRE, DE ANDRADA, HYACINTH, in *Biography*, was born about the year 1597, at Beja in Portugal. He was educated at Coimbra, where he took the degree of doctor in canon law, and applied to the ſtudy of theology. He likewiſe engaged in a political queſtion of conſiderable intereſt at that time, and wrote a treatiſe, entitled "Portugal Reſtaurado," in which he zealouſly maintained the right of the houſe of Braganza to the crown. When he had taken prieſt's orders, he went to the court of Spain, and was patronized by the firſt miniſter of Philip IV. who conferred upon him a valuable abbacy in the province of Beira. The freedom with which he vindicated the rights of his country deſtroyed, in a ſhort time, all his proſpects of future advancement, and even brought him into ſome perſonal danger. He declared to his patron, without reſerve, when the queſtion was put to him, that the rights of the king of Spain to the crown of Portugal were thoſe only of force and uſurpation, and having compoſed a work in favour of the title of Catherine the ducheſs of Braganza, an order was iſſued for his arreſt, but he fortunately eſcaped to his abbey, and there continued a voluntary priſoner till the acceſſion of John IV. to the crown of Portugal in 1640, by whom he was received with the diſtinction and reſpect that his patriotiſm merited. He was offered the appointment of preceptor to the prince, which he declined, as he did the nomination to a biſhopric, foreſeeing that the pope would probably refuſe to confirm the election, ſaying that "he did not chooſe to be a biſhop as players were kings and emperors." Diſſatisfied with the manners and principles of the court, he retired in a few years to his abbey, with which he was equally diſguſted, and on the death of his father he returned to Liſbon to ſettle his family affairs, and continued there till his death in 1657. He was a frank, generous and upright character, liberal to the needy, and warmly attached to his friends, whom he defended and juſtified in their abſence, but whoſe faults he did not ſpare when they were together. He was an elegant author, publiſhed ſome poems, which may be found in a collection printed at Liſbon under the title of "Fenix Renacida;" but his moſt important work is "The life of Don John de Caſtro," which is eſteemed one of the beſt compoſed books in the Portugueſe language. Moreri.

FREISACH, in *Geography*, a town of Germany, in the duchy of Carinthia, belonging to the archbiſhopric of Salzburg, ſituated on the Metnitz; having a caſtle, college, convent of Dominicans, and commandery of the Teutonic order; taken by the French in 1797; eight miles N. of St. Veit.

FREISCHBACH, a town of France, in the department of Mont Tonnerre, lately belonging to the palatinate of the Rhine; taken by the French in 1794; ſix miles E.N.E. of Landau.

FREISHEIN, a town of Moravia, in the circle of Znaym; 20 miles W.N.W. of Znaym.

FREITAG, JOHN, in *Biography*, a phyſician, was born at Nieder Weſel, in the duchy of Cleves, on the 30th of October 1581. His relations were compelled, by the troubles of the times, to retire to Oſnaburg, and there young Freitag began his claſſical ſtudies. He was afterwards ſent to Cologne, but was ſoon recalled by his parents from the fear that he might acquire principles, in that univerſity, contrary to thoſe of the proteſtant religion which they profeſſed. After completing his claſſical purſuits at Weſel, he commenced the ſtudy of philoſophy at Helmſtadt; but his diſpoſition being early turned to medicine, as a profeſſion, he ſtudied at Roſtock, afterwards returned to Helmſtadt to attend the lectures of Duncan Liddell and of Francis Parcovius; he likewiſe derived much advantage from the lectures of the celebrated Meibomius, in whoſe houſe he reſided in the capacity of tutor to his ſon, and therefore had frequent opportunities of converſing on the ſubject of medicine with that able maſter. The progreſs of his improvement in this ſcience was ſo great, that permiſſion was given to him of giving private lectures to the younger ſtudents on the practice. He afterwards lectured in public as profeſſor extraordinary; and in 1604, that is, at the age of 23 years, he obtained the ordinary profeſſorſhip in the univerſity, which office he filled during four years. At the end of this time he obtained his degree of doctor, and went to the court of Philip Sigiſmund, duke of Brunſwick Lunenburg, and biſhop of Oſnaburg, who had appointed him his principal phyſician. About the year 1622, Erneſt, duke of Holſtein and earl of Schawenburg, offered him the ſame office, with the addition of the chief medical profeſſorſhip in the univerſity which he had lately founded at Rinteln; but his patron would not permit him to accept it. This prince-biſhop dying in 1623, his nephew, duke Frederic Ulric, gave Freitag the option of being his chief phyſician, or of reſuming his profeſſorſhip at Helmſtadt. He continued at Oſnaburg, where the new biſhop retained him as his phyſician, and alſo appointed him one of his chamberlains. He alſo ſerved his ſucceſſor in the ſame capacity, but was diſmiſſed in 1631, on account of his refuſal to become a catholic. He found protection and patronage, however, under Erneſt Caſſimir, count of Naſſau, and the counts of Bertheim, who procured for him the vacant profeſſorſhip in the univerſity of Groningen. He fulfilled this new appointment with great reputation, and continued to diſtinguiſh himſelf by the ſucceſs of his practice till the decline of his life, which was accelerated by a complication of maladies. Dropſy, gout, gravel, and fever terminated his exiſtence on the 8th of February, 1641, in the 60th year of his age.

Freitag was a follower of the chemical ſect, and alſo a partiſan of the philoſophy of the ancients, to which indeed he retained his attachment with ſo much bigotry, that no efforts of his friends could ever prevail upon him to change his opinion. He publiſhed ſeveral works. 1. "Noctes Medicæ, ſive de Abuſu Medicinæ Tractatus," Francfort, 1616.—2. "Aurora Medicorum Galeno-chemicorum, ſeu de rectâ purgandi methodo è priſcis ſapientiæ decretis poſtliminio in lucem redacta," Ibid. 1630.—3. "Diſputatio Medica de morbis ſubſtantiæ et cognatis quæſtionibus, contra hujus temporis Novatores et Paradoxologos," Groningen, 1632.—4. "Diſputatio Medica calidi innati eſſentiam juxta veteris Medicinæ & Philoſophiæ decreta explicans, oppoſita Neotericorum et Novatorum Paradoxis," Ibid. 1632.—5. "De Oſſis natura et medicamentis opiatis Liber ſingularis, &c." Groningen 1632.—6. "Diſputatio Medico-philoſophica de Formarum origine," Groningen, 1663.—7. "Oratio panegyrica de perſona et officio Pharmacopæi," &c. Ibid, 1633.—8. "Detectio et ſolida Refutatio novæ Sectæ Sennerto-Paracelſicæ," Amſterdam, 1636.

FREJUS, in *Geography*, a town of France, in the department of the Var, and chief place of a canton in the diſtrict of Draguignan. The place contains 2229, and the canton 7797 inhabitants, in a territory of 497½ kiliometres, in 6 communes. This was formerly a conſiderable place, called

"Forum

"Forum Julii," and the birth-place of Agricola, but it is now a ſmall fortified town, containing a cathedral, a pariſh church, and 4 convents. Its ſituation is marſhy and inſalubrious to the left of the Argens, about half a league from the ſea-coaſt, 16 leagues N.E. of Toulon, and 12 N.W. of Nice. Its port is choaked up. Among the remains of antiquity are a Roman amphitheatre and an aqueduct. N. lat. 43° 25′ 52″. E. long. 6° 45′ 54″.

FREIXEL, a town of Portugal, in the province of Tra los Montes; 15 miles S. of Mirandela.

FREIXIERA, a town of Portugal, in the province of Entre Duero e Minho; ſeven miles N.E. of Amarante.

FREMONA, a town of Abyſſinia, in the kingdom of Tígré, where the Portugueſe miſſionaries took up their firſt reſidence; 50 miles N.E. of Siré. N. lat. 14° 40′. E. long. 38° 18′.

FREMONT, D'ABLANCOURT, NICHOLAS DE, in *Biography*, flouriſhed towards the cloſe of the 17th century. He was nephew of Perrot d'Ablancourt, who undertook the charge of his education, to which the young man did much credit by an early diſplay of his knowledge and great talents. In 1663 he was appointed envoy from France to the court of Portugal, and in 1675 reſident at Straſburg. After this he returned to France, and ſpent his time in ſtudy and in the ſociety of the learned. At the revocation of the edict of Nantes he was obliged to quit his country on account of his ſteady attachment to the Proteſtant cauſe. From the prince and princeſs of Orange he obtained a penſion as hiſtoriographer. He died in 1693. As an author he added to his uncle's tranſlation of Lucian, the dialogue between the letters of the alphabet, and the ſupplement to the true hiſtory. He publiſhed ſome elegant dialogues, and a French catechiſm. After his death appeared his "Memoirs concerning the hiſtory of Portugal, from the treaty of the Pyrenees to 1668." Moreri. Bayle.

FREMUR, in *Geography*, a river of France, which runs into the Engliſh channel. N. lat. 48° 35′. W. long. 2° 12′.

FRENCH, FRANÇOIS, abſolutely uſed, ſignifies the language of the people of France.

The French, as it now ſtands, is no original, or mother-language, but a medley of ſeveral: there is ſcarcely any language from which it has not borrowed words, or perhaps phraſes.

The languages that prevail moſt, and that are, as it were, the baſes thereof, are, 1. The Celtic; whether that were a particular language itſelf, or whether it were only a dialect of the Gothic, as ſpoke in the Weſt and North. 2. The Latin, which the Romans carried with them into the Gauls, when they made the conqueſt thereof. And, 3. The Teutonic, or that dialect of the Teutonic ſpoken by the Franks, when they paſſed the Rhine and eſtabliſhed themſelves in Gaul.

Of theſe three languages, in the ſpace of about thirteen hundred years, was the preſent French formed, ſuch as it is now found. Its progreſs was very ſlow; and both the Italian and Spaniſh were regular languages long before the French.

Paſquier obſerves, it was under Philip de Valois that the French tongue firſt began to be poliſhed; and that, in the regiſter of the chamber of accounts of that time, there is a purity perceived almoſt equal to that of the preſent age.

However, the French was ſtill a very imperfect language till the reign of Franies I. The cuſtom of ſpeaking Latin at the bar, and of writing the public acts and inſtruments of the courts of juſtice in that language, had made them overlook the French, their own language. Beſides, the preceding ages had been remarkable for their ignorance, which was owing, in good meaſure, to the long and calamitous wars in which France had been engaged; whence the French nobleſſe deemed it a kind of merit not to know any thing; and the generals regarded little, whether or not they wrote and talked politely, provided they could but fight well.

But Francis I. who was the reſtorer of learning, and the father of the learned, changed the face of things; and, after his time, Henry Stephens printed his book, "De la Precellence du Langage François."

The change was become very conſpicuous at the end of the ſixteenth century; and under Henry IV. Amyot, Coeffeteau, and Malherbe, contributed towards bringing it to its perfection; which the cardinal de Richelieu completed, by the eſtabliſhment of the French academy; an aſſembly, wherein the moſt diſtinguiſhed perſons of the church, the ſword, and the gown, have been members.

Nor did the long reign of Louis XIV. contribute a little to the improvement of the language: the perſonal qualities of that prince, and his taſte for the polite arts, and that of the princes of the blood, rendered his court the politeſt in Europe. Wit and magnificence ſeemed to vie; and his generals might have diſputed with the Greeks, Romans, &c. the glory of writing well, if they could not that of fighting.

From court, the elegance and purity of the language ſoon ſpread itſelf into the provinces; and now there is ſcarcely any body there who does not write and ſpeak good French. One of the characters of the French language is, to be natural and eaſy. The words are ranged in it much in the ſame order as the ideas in our minds; in which it differs exceedingly from the Greek and Latin, where the inverſion of the natural order of words is reputed a beauty. Indeed the Hebrew ſurpaſſes even the French in this point; but then it comes ſhort of it in copiouſneſs and variety.

It muſt be added, however, that as to the analogy of grammar, and the ſimplicity with which the moods of verbs are formed, the Engliſh has the advantage, not only over the French, but over all the known languages in the world; but then the turns, the expreſſions, and the idioms, of the Engliſh, are ſometimes ſo quaint and extraordinary, that it loſes a good deal of the advantage which its grammatical ſimplicity gives it over the reſt.

The French has but few compound words: wherein it differs widely from the Greek, High Dutch, and Engliſh. This the French authors own a great diſadvantage in their language; the Greek and Dutch deriving a great part of their force and energy from the compoſition of words, and frequently expreſſing that in one ſounding word, which the French cannot expreſs but by a periphraſis. The diminutives in the French are as few as the compounds; the greateſt part of thoſe remaining in uſe having loſt their diminutive ſignification; but what diſtinguiſh the French moſt are its juſtneſs, purity, accuracy, and flexibility.

French is the moſt univerſal and extenſive language in Europe. The policy of ſtates and courts has rendered it neceſſary for the miniſters of princes, and their officers, &c. and the taſte of arts and ſciences has had the ſame effect with regard to the learned.

In Germany, and elſewhere, the princes and perſons of diſtinction value themſelves on underſtanding French; and in ſeveral courts of Europe, French is almoſt as much known as the language of the country; though the court of Vienna

is an exception from this rule. French is there very little uſed; the emperor Leopold could not bear to hear it ſpoken in his court; the Latin and Italian are there cultivated inſtead of it. This extenſiveneſs of the French language is no modern advantage; William the Conqueror gave laws to England in the French language; and the ancient cuſtoms of moſt of the provinces of the Netherlands are written in the ſame.

Laſtly, the French is the ſame language every where; not only in all the provinces of France, but in all places where it is ſpoken, out of France.

For a critical acquaintance with what regards the French tongue, ſee the Remarques of M. Vaugelas; and the obſervations M. Corneille has made on thoſe remarks; the Remarques of F. Bouhours; and the doubts of a Basbreton gentleman, by the ſame father; the converſations of Ariſte and Eugene; the obſervations of M. Menage, and his etymologies, with thoſe of M. Huet; F. Buffier's French grammar; and that of the abbé Regnier. Add, the two diſcourſes of the abbé de Dangeau; one on the vowels, and the other on the conſonants, and many later works.

French, in *Geography*, a conſiderable river of America, in the Maſſachuſetts, which iſſues from a ſmall pond on the borders of Leiceſter and Spencer, in Worceſter county, and which runs through Oxford, and joins Quinebauge river, in Thompſon townſhip, in Connecticut. It derives its name from the French proteſtants who obtained a ſettlement in the town of Oxford, after the revocation of the edict of Nantes in 1685.

French *Bay*, a bay in the ſtraits of Magellan, on the coaſt of Patagonia. S. lat. 53° 51'. W. long. 72° 24'.

French *Barley*, in *Agriculture*, a name given to a ſort of barley which has the grain naked like wheat, but the ear ſhaped in a ſimilar manner to that of common barley. It is a kind of barley which is ſaid to afford a large increaſe, and to make good malt and bread. It is ſometimes denominated *wheat-barley*.

French *Bean*, a ſort of bean moſtly grown in the garden; but which may be cultivated in the field where the ſoil is light and mellow, with great advantage. See Kidney-bean and Phaseolus.

French *Bole*. See Bole.

French *Bread*. See Bread.

French *Broad*, in *Geography*, a navigable river of America, in the Teneſſee, which riſes on the S. E. ſide of the great Iron and Bald mountains in North Carolina. It is formed by two principal branches, which receive ſeveral ſtreams in their courſe, and unite about 58 miles from the ſource of the Nolachucky, the eaſtern branch; thence it flows northerly about 25 miles, and joins the Holſton, 11 miles above Knoxville, and is four or 500 yards wide. The navigation of this branch is much impeded by rocks, and ſo likewiſe is the Teneſſee branch, which joins the main river 50 miles below this. A large, clear, medicinal ſpring, ſaid to be efficacious in the cure of many diſeaſes, has been lately diſcovered on the waters of this river, about 30 miles in a direct line from its mouth. The water is ſo hot that a perſon, upon firſt going into it, can ſcarcely endure it. Nearer the mouth of the river, a valuable lead mine has been diſcovered.

French *Character*, *Coins*, *Companies*. See the ſubſtantives.

French *Creek*, in *Geography*, a north-weſtern water of Alleghany river, into which it falls along the N. ſide of Fort Franklin, 80 miles N. by E. of Pittſburgh. This affords the neareſt paſſage to lake Erie. It is navigable with ſmall boats to Le Bœuf, by a very crooked channel; the portage thence to Preſque iſle, from an adjoining peninſula, is 15 miles. This is the uſual route from Quebec to Ohio.—Alſo, a river of Kentucky, which runs into the Ohio. N. lat. 37° 47'. W. long. 86° 40'.

French *Graſs*, in *Agriculture*, a name given by our farmers to a plant raiſed for the food of cattle, and more properly called ſaint-foin. It had its name French graſs, from its coming originally to us from France, and from its uſe in ſerving, both freſh and dried, for the food of cattle; the common clover is called graſs alſo by the farmers, though neither this nor the other are properly graſſes. Some of our farmers alſo call it everlaſting graſs, from its long continuance, a ſtrong crop often yielding a plentiful annual produce for forty years without any renewing.

French *Key*, in *Geography*, a ſmall iſland in the Spaniſh Main, near the Moſquito ſhore. N. lat. 11° 12'. W. long. 82° 50'.

French *Keys*, two ſmall iſlands among the Bahamas, S. of Mayaguana. N. lat. 22° 35'. W. long. 73° 36.

French *Meaſures*, *Money*. See the ſubſtantives.

French *Muſic*, muſic in the national ſtyle of France. The whole French nation ſeems at preſent pretty generally to have relinquiſhed their old ſtyle of muſic, for cenſuring which, fifty years ago, Rouſſeau was burnt in effigy at the door of the opera houſe at Paris. Lulli is given up; la baſſe fondamentale, and the operas of Rameau, which were thought to do ſo much honour to the nation, are fading faſt, yet they have ſtill a few adherents. But the muſical critics in France, particularly the Gluckiſts, ſo deciſively ſet up their muſic againſt every other, that they ſeem to expect all Europe not only to bow down to them, but to aſk pardon for ever having been pleaſed with any other ſpecies of muſic than that produced on the model of the operas of Gluck! Theſe gentlemen neither ſee nor hear any thing but defects in the fineſt compoſitions of Italy. The abbé Rouſſier is "un enragé" for "la troiſieme progreſſion," and M. Laborde, for that and the compoſitions of Rameau; while the abbé Feytou falls foul on whatever has been ſaid or done in the theory of muſic, except by himſelf; of the practice, or the merits of compoſition or performance, neither he nor the abbé Rouſſier ſeem to care one farthing. It is eaſy to diſcover in ſome articles of the Encycl. Methodique, and other writings, that there are ſome lovers of muſic in France, who really feel the elegance, grace, and expreſſion of Italian vocal muſic; and who are truly ſenſible of the defects and deficiencies of French ſinging. All nations are ambitious of having operas in their native language. The French, the Germans, the Engliſh, the Poles, and the Ruſſians have their national theatres; but all the courts in Europe have had ſerious operas in the Italian language, compoſed and performed by Italians, except the French. The French, the Engliſh, and the Germans, are very wiſe in aboliſhing recitative from their muſical dramas. No country, except Italy, has a genuine recitative; but muſt the Italians, who have one diſtinct from declamation and ſong, muſt they renounce the original characteriſtic of an opera to oblige, or rather to appeaſe their neighbours? The French certainly manifeſt good ſenſe and good taſte in excluding long airs either of bravura or cantabile, till ſingers can be found to execute them: but in countries like Italy, where good ſingers abound, and in other countries where Italian ſingers are tolerated and ſupported, are they to prohibit good ſinging in their theatres to humour French critics? See Opera and Recitative.

French ſinging at the ſerious opera of "Iphigenie en Tauride," has been very aptly compared, not to a female

in

in diſtreſs, but in labour during the throes of childbirth. The French, always partial to "la muſique criarde," have had their taſte flattered by Gluck, who knew that though they could not ſing, they could *ſcream* to ſome tune. His harſh modulations, and their "éclats de voix," augmented, "à force de l'Orcheſtre," he was ſure would be *well heard*, and fix his fame.

FRENCH *Nuts*, a term ſometimes provincially employed to ſignify bruſh-wood; and alſo wall-nuts.

FRENCH *Order*, *Padſaddle*. See the ſubſtantives.

FRENCH *Park*, in *Geography*, a ſmall poſt town or rather village in the county of Roſcommon, Ireland; 83 miles W. by N. from Dublin, and about eight miles from Tulſk.

FRENCH *Pox*. See Pox.

FRENCH *River*, in *Geography*, a river of Upper Canada, of irregular breadth and form, and crowded with iſlands, ſo that its real banks are ſeldom ſeen. It enters lake Huron from the N. E. in N. lat. 45° 53'.

FRENCH *School of Engraving*. The art of engraving, ſo as to deliver impreſſions on paper, was introduced into France from the neighbouring empire of Germany ſome time about the middle of the fifteenth century. The preciſe year of its introduction has not been recorded. The benefits it has ſince conferred, and is ſtill conferring on Europe, are on all hands acknowledged to be great, yet the art appears to have entered France, with all the unobſerved humility of an apoſtle of our holy religion; and that highly cultivated country, to which cultivation the art of engraving has contributed in no trifling degree, to be indebted for its *introduction*, not to the providence of the government, though the government hath ſince done much to accelerate its progreſs, but to the enterprize or neceſſity of ſome individual artiſt, whoſe name has not deſcended to us.

Engraving on wood, or that art which enabled the printer to deliver his work from the ſurface of the engraving, preceded the art of engraving on copper a few years: and both were at firſt employed in France, as in Germany and Italy, in the embelliſhment of books, in which it has been preſumed by Huber and Papillon, that the city of Paris took the lead, though Lyons is ſoon after mentioned.

The moſt ancient French book ornamented with letter-preſs engravings appeared in the year 1482, or ſoon after. It is a tranſlation of "Belial," in one ſmall folio volume, and is ſuppoſed by the French writers to have been printed at Paris, though the name of that city is not mentioned. Yet this book concludes in the following manner, "from which it is not clear whether the tranſlator or printer finiſhed his taſk at the time mentioned."

Here ends the book called "Conſolation for poor Sinners," lately tranſlated into French by the venerable and diſcreet brother Peter Ferget, doctor of theology, and of the order of the Auguſtines. In the year of Grace 1482, and on the 21ſt day of January, he finiſhed this book.

The moſt ancient prints from engravings on copper were alſo the embelliſhments of typographical works. The firſt French book ornamented with copper plates was printed at Lyons in 1488, in folio. This book, the author, or rather tranſlator of which was Nicholas le Huen, a monk of mount Carmel, and profeſſor of theology, is for the moſt part a compilation from the Itinerary of Bernard de Breydenbach, and the title is "A Peregrination beyond Sea in the Holy Land." It concludes with the following words, "Of the peregrinations in Jeruſalem, the environs, and places adjacent. Of mount Sinai, and the glorious Catharine. This work contains the whole deſcription, as far as God would permit it to be known, printed at Lyons by men of ability. Michael Topie of Pyrmont, and James Heremberg of Germany, living at the ſaid Lyon. In the year of our Lord 1488, and on the 28th of November."

In the French work are the views of the ſame cities that are found in the Latin and German editions of the Itinerary of Breydenbach, publiſhed at Mayence in 1486, by Erhard Rewich, with this difference, that the engravings are printed from copper plates in the tranſlation, and with the letter-preſs, and preſumptively from blocks of wood, in the original work. It is not known whether the engraver of theſe plates, (which are of very rude execution,) was a Frenchman or a German. Huber ſpeaks of it as very poſſible that James Herenberg, one of the printers, may have been alſo the engraver of the embelliſhments.

As theſe early works are publiſhed without any engravers' names, (notwithſtanding that in the latter thoſe of the printers are mentioned,) it may ſafely be inferred that thoſe who performed them were little thought of at the time, and that no idea was entertained in France of the future ſuſceptibilities or importance of that art of which theſe were the earlieſt productions. Other anonymous engravings, which have ſince fallen into neglect, were produced before the cloſe of the fifteenth century; but the earlieſt French prints to which the names or monograms of the artiſts appear, are thoſe of Wendel Reich, a foreigner, and preſumptively a German, who was reſident at Lyons in the year 1515, and Jean Duvet, ſometimes called Davet, who was born at Langres in 1510.

Reich engraved on wood, and, according to profeſſor Chriſt, publiſhed many of his works at Lyons, marking them with the cypher which will be found in our plate of the monograms, &c. of the French School of engravers; and, according to the ſame writer, Duvet was known by the name of the Maſter of the Unicorn, from his engravings of the triumphs of that animal. He worked at Paris during the reign of Henry the Second, and publiſhed there ſeveral plates from very Gothic deſigns, and which are engraved in a wretched ſtyle. The principal of them are "Le Dieu Mars," inſcribed I. D. 1530. "Adam and Eve," with the eternal father clothed in a ſacerdotal habit, folio ſize, inſcribed Johannes Duvet fecit. "Moïſe, avec les Patriarchs," folio, and a ſet of twenty-four plates, alſo in folio, of which the ſubjects are taken from the Apocalypſe. Duvet ſometimes placed his initials on a tablet, as appears in our plate of the marks and monograms of French engravers.

Solomon Bernard, frequently termed "le petite Bernard," from the ſmallneſs of his works, appeared ſoon after. He was born in the year 1512; and engraved chiefly for the bookſellers of Lyons, of which city he was a native; though between the years 1550 and 1580, he was alſo employed by thoſe of Tournay and Rouville. The French writers on art ſay, that he became the diſciple of Jean Couſſin; however this may have been, his engravings, which are both on copper and on wood, are executed (conſidering the early period at which they were done) in a clear, neat ſtyle, and diſplay in the deſigns conſiderable ſpirit and fertility of invention.

We have thought proper to give more copious liſts of the works of the engravers of the foreign ſchools than of thoſe of the Engliſh, becauſe ſuch liſts are not hitherto printed in any Engliſh book that has come to our knowledge.

The firſt edition of Bernard's bible, which Strutt ſpeaks of as being his moſt eſteemed production, was publiſhed at Lyons in 1550. Subſequent editions, containing impreſſions from the ſame engravings, have been publiſhed, but collectors eſteem the firſt as far more valuable; and it is now become

extremely rare. In the year 1553 he produced "Les Médailles pour l'Epitome des Antiquités de Jacques Strada. Mantouan, imprimé à Lyon."

Of the other engravings by this maſter, the firſt of the French ſchool that is worthy to be ſo termed, the following are the principal. "Les Metamorphoſes d'Ovide," imprimé à Lyon en 1557. The prints to "L'ane d'or d'Apulée," imprimé à Lyon en 1558. "The Hiſtorical Vignettes to a French Tranſlation of Virgil's Æneid," imprimé à Lyon 1560. "Un Livre de Thermes au nombre de dix-huit," imprimé à Lyon en 1572. "The Hiſtory of Pſyche in thirty-two figures," 12mo. Twenty-two prints of decorations of theatres, &c. Six ſmall emblematical ſubjects in ovals. Two hunting pieces. "A View of the City of Lyons;" (probably the firſt French landſcape that was ever engraven.) "A triumphal Chariot with Arms." "A Head, with a triple Face ſurrounded by Cherubims;" and the ornaments (in ovals) to a book of hymns, printed alſo at Lyons.

Stephanus de Laulne was born at Orleans in the year 1520, and travelled twice to Straſbourg, probably for improvement in his art. At what time he died is not mentioned, but he was at Straſbourg, for the ſecond time, in 1590, when he muſt have been in the ſeventieth year of his age. He made ſome ſucceſsful copies from the engravings of Mark Antonio, which were now in high and deſerved repute; but the far greater part of his prints are from his own deſigns, and being in general ſmall, he is claſſed by collectors among "the little maſters."

De Laulne was a man of conſiderable inventive powers, but though his compoſitions abound with figures which are not ill deſigned, his drawing is frequently defective, particularly in the long and ſlender proportions of his figures, which meagreneſs he probably imbibed from ſtudying too much the productions of the early German engravers. He worked entirely with the graver, and his chiaro-ſcuro is yet more defective than his drawing.

The abbé Marolles mentions three hundred and eighteen engravings by this maſter, of which the following will probably be found the beſt. He ſometimes placed his initials to his works, and at other times only Stephanus fecit. "David beheading Goliah," "The Maſſacre of the Innocents," "The Martyrdom of St. Felicité," "The Rape of Helena," "Alexander commanding the Books of Homer to be ſhut up in the Cheſt of Darius." The above are all copied from Mark Antonio. "The Serpent of Aaron," painted for the Cordeliers of Sens, after Jean Couſſin. This is in folio, and is probably the largeſt print from the hand of this maſter. "The Rape of Hippodamia," after Roſſo. The following are engraved from his own deſigns. A ſet of thirty ſmall ſubjects from the hiſtory of the Old Teſtament. A ſet of four plates of heathen gods, *viz.* Jupiter, Neptune, Mercury, and Ceres, in circles. A ſet of ſix plates, of ſtatues of gods and goddeſſes. A ſet of eighteen mythological ſubjects, ovals. A ſet of twelve, the months of the year circles. A ſet of the four monarchies, in ovals. A ſet of four from ancient hiſtory, in ovals. A ſet of four rural occupations, in ovals. The three Graces, inſcribed Sic Rome Carites niveo ex Marmore ſculp.

Contemporary with de Laulne, but inferior in merit, was Noel Garnier, to whom has been falſely attributed the credit of introducing the art of engraving on copper into France. The French writers on the fine arts ſay, that he was born ſome time about the year 1520, and that preſumptively, judging from his name; he was by birth a Frenchman. His real merit is ſo trifling that this matters but little. He was by education probably a goldſmith, and from the Gothogerman ſtyle of his engravings, it may reaſonably be conjectured that he learned, what he knew of the art, under ſome German goldſmith and engraver. After ſtating, that "his works are very rude and badly executed," Strutt mentions a ſmall plate of a combat between naked men, of whom there are ſeveral, in which he ſeems to have made a feeble attempt at copying the ſtyle of Sebald Beham. The only other engravings that are known to be from the hand of Noel Garnier, are forty-eight plates repreſenting the arts and trades, and an alphabet of capital letters ornamented with figures and foliage. His ſingular mark will be found in our plate of monograms, &c. of the French ſchool.

Pierre Voeiriot, or Woeiriot, engraved both on copper and on wood, and was alſo a goldſmith. He was born at Bar-le-duc, in Lorraine, in the year 1525, but eſtabliſhed himſelf as a goldſmith and engraver at Lyons. His prints, of which there are as many from wood as from copper, are chiefly after his own deſigns, and are tolerably well executed, conſidering the general ſtate of French art at the time.

There is ſtill extant a curious book adorned with engravings on copper by this artiſt, entitled "Pinax Iconicus Antiquorum ac Variorum in Sepulturis Rituum," to which is prefixed his own portrait, and which was printed at Lyons in the year 1556. He occaſionally uſed two monograms, which are ſomewhat complicated, and intended to ſignify Pierre Woeiriot of Bar-le-duc; and Papillon adds, that he marked his engravings on wood with the ſort of double croſs, which will be found in our plate of the monograms and marks uſed by the ancient engravers, and which is called "la petite Croix de Lorrain."

Strutt places the birth of this artiſt in 1510, but does not cite his authority. His principal engravings are as follow. "The Sacrifice of Abraham," in folio. "Moſes ſaved from the Waters," in folio. "Phalaris ſhut up in the brazen Bull," a ſmall upright. "A Woman with two Children in her Arms caſting herſelf on a funeral Pile." Two ſmall landſcapes, in which are introduced a great number of figures. In one is repreſented a funeral oration, in the other two naked men are fighting on the ſummit of a funeral pile. The three latter probably belong to the book which is mentioned above of ſepulchral rites. "The Battle of Conſtantine with Maxentius," after Raffaelle, in folio. The above are all engraven on copper. The medallion of Jacques Bornonius, dated in 1573, is probably one of the beſt of his engravings on wood: it is very delicately cut, its ornamented frame is ſupported by Mercury and Minerva, and it is inſcribed with Greek, Latin, and French verſes, terminating with the following couplet:

"Qui veiut pour ſon pais combattre á tous alarmes
Doit avoir de Mercure et de Pallas les armes."

Jacques Periſin, otherwiſe Periſim, otherwiſe Perſinus, was born in France ſome time about the year 1530. In concert with J. Tortorel, he deſigned and engraved a ſet of twenty-four large prints repreſenting the war of the Huguenots, and other remarkable events relative to the hiſtory of France between the years 1559 (which was marked by the death of Henry II.) and 1569, when the German troops were diſperſed. Some of theſe are executed on copper, and, according to Strutt, others on wood. He ſays, "thoſe on copper are ſlightly *etched*," which, it is worthy of remark, is the firſt time we met with this word in the hiſtory of French engraving, though etching had now been invented near half a century: "the etchings are in a coarſe, incorrect ſtyle, nor have the impreſſions from wood much to recommend them with regard to the compoſitions, but they

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are executed with a tolerable degree of attention; and the croſs ſtrokes, or hatchings, are well imitated."

The mark of this artiſt will be found in our plate of thoſe of the French ſchool; but he ſometimes inſcribes his name at length, and ſpells it not always alike. It is profeſſor Chriſt who reads it Perriſin, and perhaps juſtly.

René Boivin was born in the province of Anjou in the year 1530, or thereabout. "His plates, in general, are executed with the graver only, in a manner reſembling that of Cornelius Cort;" but in ſome few inſtances he practiſed the art of etching. His works, though not held in the higheſt eſtimation, are by no means devoid of mechanical merit; for he handled the graver with much facility, but his drawing is very defective, particularly in the extremities of his figures.

Boivin ſometimes ſigned his works with his baptiſmal name only, as Renatus fecit, but more frequently with a cypher compoſed of an R and a B, as ſeen in our plate.

He engraved the portraits of the philoſophers and poets of antiquity in twelve plates 4to.; and ſeverally thoſe of Clement Marot, (dated 1556,) Jean Sebaſtian Pfanſerus, George Vicellus, theologian, and himſelf; dated alſo in 1556.

His principal hiſtorical works are, an emblematical plate repreſenting "The Triumph of Virtue, and the Defeat of Vice," a folio plate. "Suſanna and the Elders," in 4to. The plates for a work entitled "Livre de la Conqueſte de la Toiſon d'or, par le Prince Jaſon de Teſſalie." Theſe were deſigned by Leonard Thiri, and are encloſed in ornamental borders.

"Hagar and Iſhmaël before the Houſe of Abraham," a ſpirited etching of a 4to. ſize. "Four Bandits pillaging a Peaſant's Cart," alſo an etching in 4to. "Françoés premier march ſuel au temple de l'Immortalité, et laiſſe loin derrière lui l'ignorance, la ſtupidité, &c."

Leonard Gaultier, or Galter, as he ſometimes deſignated himſelf, is preſumed by the French writers on art to have been a native of France; but profeſſor Chriſt, though without aſſigning his reaſon, ſuppoſes him to have been born in Germany in the year 1560, or thereabout. He worked entirely with the graver, imitating the ſtyles of Criſpin de Paſs and the Wierixes. But while we are ſurpriſed at the great number, preciſion, and neatneſs of his works, we cannot but lament the ſtiffneſs and incorrectneſs of deſign by which they are equally characterized. According to the abbé Marolles, the number of prints engraved by this maſter amount to eight hundred, and they are chiefly from his own deſigns, though he ſometimes worked after Raffaelle, Rubel, Caron, and Dumouſtier. His engraving of the Laſt Judgment of Michael Angelo was not done from the original picture, but copied from the plate by Martin Rota. His cypher, or monogram, will be found among thoſe of the French ſchool. The liſt of his principal engravings is as follows:

"The Loves of Cupid and Pſyche," after Raffaelle, in 8vo., not engraved from the original pictures, but through the medium of the prints of Auguſtino Veneziano. The "Proceſſion of the League," a ſatyrical piece, in folio. The "Family of Henry IV." folio. The "Aſſaſſination of Henry IV." folio. The "Coronation of Maria de Médicis," folio; inſcribed L. Gaultier, ſc. 1610. The "Cyclopes forging Thunder-bolts," folio.; after Jean Couſen, inſcribed Léonár Galte fecit, 1581. "A Sacrifice," in the antique ſtyle, folio; after Martin Freiment. A ſet from the Old and New Teſtament, in 4to. A ſet of the prophets, apoſtles, and evangeliſts, in 8vo., and the following portraits: Philippe de Mornay, lord of Pleſſis, in folio, 1611. Alexandre Bouchart, viſcount Bloſſeville, folio; after Dumouſtier, 1613. Meſſire Jacques Amyot, biſhop of Auxerre. Henry III., by the grace of God king of France and Poland; inſcribed L. Gaultier fecit. 4to. Stephan. Paſchinus Regiarum Rationum Patronus, 1617. 4to. Petrus Aerodius Quæſitor Andegavus, 1615. 4to. Charles de Gontaut de Biron, mareſchal of France, 4to. Henry, duke of Montpenſier, 4to.

Melchior Tavernier began to reſide at Paris, where he publiſhed his own engravings, ſome time about the year 1620. He was originally of Anvers, and is the firſt whom we find honoured in France with the title of engraver to the king. Yet nominal honours and real merit are not inſeparable. Tavernier's real ſtock of talent as an artiſt was inconſiderable. His productions are chiefly portraits and maps, with ſome few ornaments, and other ſubjects of minor importance, from his own deſigns, and from thoſe of Danier Rabel.

His principal plate is a large upright folio, of which the ſubject is an equeſtrian ſtatue of Henry IV. of France, ſuperſcribed "Melchior Taverneir, à Paris, graveur et imprimeur du Roi, pour le tailles douces, demeurant l'iſle du palais, ſur le quay de l'eſpy d'or, 1627."

Of his ſmaller works, a buſt of the duke d'Aleçon, crowned with laurel, with four French veres, in 8vo. is among the beſt.

Huber has choſen to conſider the boaſt of Melchior Tavernier, that his father Gabriel firſt brought to Paris the art of engraving on metal, as unfounded: but Huber's premiſes do not neceſſarily lead to this concluſion, and the preſent writer will readily pardon the court of France, if, on account of this merit of his anceſtor, Melchior was created engraver to the king; for if the ſins of the fathers may religiouſly be viſited on the children, ſurely their virtues may alſo be viſited.

Melchior ſays, "there was not till that time (the time that Gabriel Tavernier of Anvers introduced the art of engraving on metal,) any one in the kingdom of France who practiſed the art, nor any one who knew its excellence."

Now according to the ſame writer, (Huber,) Melchior was born in the year 1560, or thereabout; it therefore only requires that Gabriel ſhould have practiſed engraving on metal about thirty years before the birth of his ſon, (which is ſurely by no means incredible,) to ſubſtantiate the ſon's ſtatement: yet it muſt be confeſſed that none of Gabriel's engravings have been ſeen by the preſent writer, nor are any mentioned by Melchior or any other of the French writers on art.

The honours which poſterity have awarded to Jean Baptiſte Tavernier ſtand on a far leſs queſtionable foundation. From contemplating and admiring his father's maps, he imbibed an irreſiſtible deſire to travel, and by ſubſequent travellers his name has been juſtly celebrated. See JEAN BAPTISTE TAVERNIER.

Philippe Thomaſſin was born at Troyes, in Champagne, in the year 1536. He went to Rome at an early age, and began engraving, like Hogarth and Sharp of England, by ornamenting with the graver and ſcorper the furniture of the table, and buckles and other articles of dreſs. He afterward placed himſelf for improvement under Cornelius Cort, and perhaps for a time under Cherubino Alberti. Huber ſays he ſtudied under the former, (who was now in high repute at Rome,) and Strutt, that "it is very poſſible he might actually ſtudy under the direction of the latter. He worked with the graver only, in a ſlight, but clear and firm ſtyle. There is, however, a ſtiffneſs in his execution, which being rendered more viſible by the total

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want of effect in his prints, gives them a harſh unfiniſhed appearance. His drawing is rather mannered, than abſolutely incorrect."

Thomaſſin died at Rome at an advanced age, where he had the honour (for ſo it ſhould be eſteemed) of inſtructing Callot in the uſe of the graver; but a handſome lady whom Thomaſſin had married, and of whom he was jealous, was the means of preventing Callot from remaining long under his tutorage. His engravings conſiſt of more than two hundred plates, of which the ſubjects of fifty-two are the Italian antique ſtatues. Of the remainder, the principal are, "Philippe Emanuel de Lorraine, Duc de Mercœur," in folio, dated 1595. "Jeſus Chriſt and the Apoſtles," after Raffaelle, on fourteen folio plates. "Saint Margueritia, holding a Palm in her Hand, with her Foot on the Wing of a Dragon," from Raffaelle, in folio, 1589. "Saint Cecilia, and four other Saints," from Raffaelle, in folio, 1617. "The School of Athens," after Raffaelle, wherein he has changed the philoſophers Plato and Ariſtotle for St. Peter and St. Paul, large folio. "The Doctors diſputing reſpecting the Holy Sacrament," from the celebrated picture in the Vatican by Raffaelle; a large plate, dated 1617. "Saraſin landing at the port of Oſtia," from Raffaelle. "Holy Family," after F. Zucchero, in folio. "The Adoration of the Kings," after F. Zucchero; a large plate, upright in form, and arched at the top. "Miracle of Jeſus at Cana," from F. Zucchero, folio. "The Nativity," from Ventura Salembini. "The Purification of the Virgin," from Barroccio. "The Four Martyrs," after B. Paſſari, in folio. "The Laſt Judgment," from F. Vanoi, in folio. "Allegory of the Redemption." Here the virgin is ſeen in the clouds interceding for the patriarchs; from Vaſari, folio. "Apollo with the Muſes dancing around him," from Balthaſar Peruzzi; a large print, in the form of a frieze, engraved on two plates, and dated 1615. The works of this artiſt are moſt of them marked with his name at length.

Thomas de Leu was born at Paris ſome time about the year 1570. He worked entirely with the graver, which he handled with much care. His ſtyle is neat and mechanically clear, reſembling that of the Wierixes; and his works conſiſt chiefly of portraits of the celebrated characters of his time, of which ſeveral are engraved after his own drawings, and the reſt from the pictures of Bunel, Caron, Rubel, and Quenel.

Of his hiſtorical works, which amount but to very few, we are only able to enumerate an "Ecce Homo," attended by angels bearing the ſymbols of the paſſion; "The Twelve Sybils," deſigned by himſelf; "The Life of St. Francis," in twenty-five plates; and "Juſtice rewarding the Labours of the Huſbandman," from Frederic Zuccaro. His principal portraits are of the following perſonages:

Henry de Bourbon, prince of Condé, at the age of nine, dated 1595. Céſart Monſieur, aged five years. Henri III. king of France and Poland. Mary Stewart, queen of France and Scotland. Charles de Bourbon, count of Soiſſons. François de Bourbon, prince de Conty. Anne duke of Joyeuſe, admiral de France. François de Bone, lord of Leſdigueres. Charles de Goutant de Biron, mareſchal de France. Charles de Gonzague, duke of Nivernois. Charles de Lorraine, duke of Maine. Henri de Savoye, duke of Nemours and of Genevois. Henri de Montmorency, conſtable of France. Louiſe de Budos, the ſpouſe of the former. Louiſe de Lorraine, dowager of France. Louis Serven, advocate-general. Jean Paſſerat, a learned man and a poet, repreſented in profile. from having loſt an eye. Franciſcus Ranchinus, profeſſor medicus. Bonus de Broe, Turnonenſis, ſacerdos et abbax. 1588. Buſt of Henry IV. after Bunel, folio. Buſt of Henry III. and Marie de Medicis, after J. Quenel, in folio. Marie de Medicis, princeſs of Florence, and M. Nicholas de Neufoille; the laſt of which, in the opinion of Strutt, is a fine ſpecimen of his ability in portrait engraving.

The prints by this artiſt are commonly inſcribed either Thomas, or Th. de Leu fe. et exc.

Louis Buſinck was born in France toward the cloſe of the ſixteenth century, and practiſed that mode of engraving on wood which had been invented almoſt a century before by Mair, or by Hugo da Carpi, and was technically termed engraving in *chiaro-ſcuro*. Three blocks of wood are ſucceſſively impreſſed on every print produced in this manner. The firſt for the outline; the ſecond for the deeper ſhadows; and the third for the demi-tint. See WOOD ENGRAVING.

Buſinck practiſed this mode of art with conſiderable ſucceſs. He probably learned it in Germany, for we find him, according to Heinnekin, engraving at Minden, about the year 1630, in concert with George L'Allemand.

His ſtyle of engraving is broad, bold, maſterly, and in all reſpects ſuperior to that of his coadjutor. Heinnekin adds, that before he quitted Minden for Paris he had executed the following ſubjects from compoſitions of his own.

"Fidelity," an allegorical piece, dated 1630, in folio. A Man, half-length, 1630, folio. A Cavalier on foot, 1630. A Peaſant with a wallet. Another Peaſant carrying a pitcher.

The following, which are alſo in clare obſcure, (or chiaro-ſcuro,) are from the deſigns of L'Allemand.

"St. Peter holding the Keys," in 4to. "The Apoſtles, John and Matthew, in folio. "Judith with the Head of Holofernes," in folio. "Moſes ſitting with the Tables of the Law," in folio. "A young Man with a Plume in his Hat playing on aFlute," in folio. "Æneas reſcuing his Father Anchiſes and his Family from the burning of Troy," an upright, in folio.

L'Allemand, the coadjutor of Buſinck, was alſo a native of France, and, according to abbé Marolles, was born at Nancy. Papillon, from the information of his father, ſays that he reſided at Paris, where he expended ſuch conſiderable ſums in conſtructing preſſes and other machinery of his own invention, for printing chiaro-ſcuro engravings on wood, as much impaired his circumſtances. To which Strutt adds, that he made a great number of drawings to be engraved in that manner, many of which he engraved with his own hands; "and when one ſees how indifferently they are done, his want of ſucceſs is not ſurprizing."

Francois Perrier was born at Macon in Burgundy, in the year 1590, and died at Paris in 1660. He painted and engraved in chiaro-ſcuro, and alſo performed ſome etchings on copper. Under what maſter he learned the firſt rudiments of art is not known; but he went to Rome early in life, where, though he ſubſiſted with difficulty, he ſtudied hard. His drawings from the antique ſtatues and baſſo relievos recommended him to the notice of Giovanno Lanfranco; and under the direction of that admirable artiſt he purſued his ſtudies with better encouragement, and more ſucceſs.

After a long ſtay at Rome, he returned to his native country, and painted at Lyons the little cloiſter of the Chartreuſe; going from thence to Paris, he there engaged himſelf with Simon Vouet; and his reputation continued to increaſe.

In the year 1635 Perrier returned to Italy; and it was during his ſecond abode in that country that his beſt etchings were

were executed, particularly thoſe after the antique ſtatues and relievos.

The word genius, which is applicable to ſo few, has been perhaps too haſtily applied to the works of Perrier. Without denying him the merits of facility and ſpirit, we have ſtill to learn, in what reſpect he extended the former boundaries of his art. His etchings are coarſe and incorrect; the heads and extremities of his figures are neglected, and his facility is not the facility of feeling. In his works from the antique, he has left behind the exquiſite preciſion of thoſe great models; and has given us little more than the attitudes and compoſitions. But his chiaro-ſcuro engravings on wood are entitled to much higher praiſe, and are more juſtly eſteemed by connoiſſeurs.

Whilſt Perrier remained in Italy, he Italianized his name, and the etchings he performed there accordingly bear the ſignature of *Paria*. His cypher, compoſed of an F and a P, will be found in our plate of thoſe of the French ſchool, to which he ſometimes added the letter B, denoting that he was a native of Burgundy.

Of his numerous engravings, we ſhall begin with mentioning the beſt of thoſe which are after his own pictures and drawings.

"A Holy Family," or the infant Jeſus and St. John, in folio. "Flight into Egypt," in folio. The Holy Family are here repreſented as paſſing a river. "Chriſt with the Virgin in a Swoon at the Foot of the Croſs," in folio. "St. Roch curing the Plague," in folio. "The Body of St. Sebaſtiana," in folio; inſcribed at length Franciſcus Perrier Burgundus, inv. et ſ. 1633. It is a ſort of apotheoſis of the ſaint, in which are repreſented ſaints and angels with the palm and crown of martyrdom. "Venus with the Loves and the Graces," in folio; this is inſcribed Fr. Paria Borgog., and is of the proportions of a frieze. "Time clipping the Wings of Love," in folio. This is engraved in chiaro-ſcuro, and is a performance of great merit; certainly one of the very beſt works of the maſter. It is accompanied by the following Latin motto:

"Omnia vincit amor, vincit mox tempus amorem."

Of the plates which he has engraven from the antique ſculpture, and compoſitions of Italian and French painters, the following will probably be eſteemed among the beſt. A ſet of the antique ſtatues conſiſting of an hundred plates, in folio. Another ſet conſiſting of fifty plates of the bas reliefs of Italy, in folio. The Angles of the Farneſe gallery, ten plates. "The Aſſembly of the Gods, and the Nuptials of Cupid and Pſyche," a pair of the frieze form, after Raphael. "The laſt Communion of St. Jerome," a middle-ſized upright plate from A. Carracci. "The Nativity of Jeſus Chriſt," from S. Vouet, folio. Portrait of Simon Vouet, ſurrounded by an hiſtorical border, in folio; dated 1632.

Guillaume Perrier, (the younger,) who died in 1655, was alſo born at Macon, and is ſuppoſed to have been the younger brother of Francis, from whoſe deſigns he executed ſeveral plates, imitating his ſtyle of etching, but with no great ſucceſs.

Auguſtin Garnier, (whom Strutt miſtakenly calls by the name of Antoine,) was born at Paris in the year 1592, and was living in the time of the abbé Marolles, but the year of his death is not known. He etched his plates with a broad and bold line, and finiſhed them with the graver; there is conſequently a certain firmneſs and facility in his ſtyle, yet the heads and extremities of his figures are ſomewhat heavy, and his outlines hard and incorrect. His principal works are, twelve plates from thoſe pictures of Primaticcio, which are in the chapel of the palace de Fleury at Fontainbleau. "A Holy Family," "St. John the Baptiſt," and "Charity," all in folio, after J. Blanchard. "The fainting St. Sebaſtian, relieved by Women," from the ſame painter, and alſo in folio.

He moreover engraved ſome few plates from Pouſſin, M. A. Carravaggio and other maſters, on which his monogram appears, for which ſee our plate of the cyphers, &c. of the engravers of the French ſchool.

Jean de Courbes was alſo a native of France, and born about the ſame time with A. Garnier. He engraved chiefly for the bookſellers. His works are little known or noticed, and do not deſerve to be noticed more.

At one period of his life he was in England, and engraved here the portraits of ſir Philip Sydney, and the counteſs of Pembroke, which are inſcribed J. de Courbes fecit.

It is merely on the authority of Huber and Roſt, that this artiſt is here ſtated to have viſited England. The preſent writer is inclined to doubt the fact, and rather on account of the poetry which is engraved beneath theſe portraits, being in the French language.

The verſes under that of ſir Philip are as follow:

"Sidney, dont voicy le viſage,
Scent joindre également les armes et les arts,
Et mit tous les deux en uſage,
Sur le mont d'Apollon, et dans le champ de Mars."

and are ſcarcely leſs complimentary under the portrait of the counteſs:

"Pallas puruſt jadis en Grece,
Comme la beauté que tu vois,
Que ſeule euſt de cette Dieſſe
L'eſprit, le viſage, et la voix."

Claude Vignon practiſed both painting and etching. He was born at Tours in the year 1590, and died in 1670. He ſtudied a long time in Italy, imitating at firſt the ſtyle of Michel Angelo Carravaggio, and with ſome ſucceſs; but he afterwards fell into a manner of his own, more expeditious, but rough and unfiniſhed.

Of his etchings, which diſplay the hand and mind of a maſter, the abbé Marolles poſſeſſed two hundred and ſeventeen, of which the following may be numbered among the beſt.

A ſet of thirteen from the life of Chriſt, in ſmall quarto. "St. John in the Deſert." "St. Philip baptizing the Eunuch of Queen Candace." "The Martyrdom of St. Andrew." "The Aſſumption and Coronation of the Virgin," inſcribed Cl. Vignon inv. et fecit, Romæ.

Jaques Callot was born at Nancy, whilſt Lorraine was yet an independent dukedom. He is by ſome authors reckoned among the engravers of the French ſchool, but as he ſtudied at Rome and at Florence, and exercifed his art chiefly at the latter city, his biography and works will be found in our account of the Italian ſchool of engravers.

Claude Audran is the patriarch of that family who created an era in engraving, and is therefore entitled to reſpectful notice in our account of the French ſchool. He was the ſon of Louis Audran, an officer belonging to the Wolfgang hunters, in the reign of Henry IV. and was born at Paris A.D. 1692. He did not take up the graver till rather late in life, and produced but few prints, but he was the father of Germain and Gerard Audran. From Paris he retired to Lyons, and died there in the year 1677.

Carl or Karl Audran was alſo the ſon of Louis, and was born in Paris, A.D. 1594. He diſcovered ſome taſte for engraving, and learned the uſe of his tools in his native country,

country, but afterward travelled to Rome for improvement, when he produced ſeveral prints that obtained him deſerved reputation, and at his return adopted that ſpecies of engraving which is performed with the graver only, imitating the ſtyle of Cornelius Bloemart.

But though he imitated Bloemart, he aimed at ſuperior neatneſs, and perhaps the prints of Lucas Kilian, and thoſe of the Sadelers, may have been the real foundation of his ſtyle.

On his return from Italy he ſettled at Paris, where he died in the year 1674, without having ever been married. He at firſt was accuſtomed to mark his prints with the letter C. but his brother Claude producing ſome engravings of inferior merit, marked with the initial letter only of his baptiſmal name, he ever after made uſe of the letter K, and wrote his name Karle.

The abbé Marolles, who ſpeaks of this artiſt with great praiſe, attributes an hundred and thirty prints to him. The following will probably be found to include the beſt of his works.

The portrait of Henry de Bourbon attended by the cardinal virtues, an oval, in folio, marked K. Audran ſc. The portrait of André Laurent, phyſician to Henry IV., ſmall oval. The portrait of Pierre Légier, with ornaments, ſmall folio. An allegorical ſubject, including the portraits of Nicolai de Neufville, marquis of Villeroy, and Charles de Neufville. A genius is repreſented as painting a third portrait, and on the palette is written "Unus ex duobus." Marked C. Audran fecit.

Hiſtorical and Emblematical Subjects.—A frontiſpiece to the gallery of illuſtrious women, conſiſting of twenty plates of celebrated women, after Pietro da Cortona. The work is in folio, and with each portrait is a repreſentation of that event in the life of the original, on which her celebrity is principally founded. "The Annunciation," a folio plate, engraved from the picture of Louis Carracci in the cathedral at Bologna, but falſely attributed, upon the plate itſelf, to Annibal. Strutt, who ſpeaks of it as being one of the beſt works of this engraver, has fallen into this error. The "Baptiſm of our Lord," a ſmall oval, after Annibal Carracci, without the names of the artiſts. "St. Francois de Paulo, in folio, after Melini, marked Carl Audran ſc. "The Stoning of St. Stephen," in folio, after Palme be Jene. "The Miraculous Conception," inſcribed "Amat hanc ſapientia matrem," after Jac Stella, in folio. "La Nativité de notre Seigneur," in folio, after the ſame maſter. King David is here introduced recording ſomething on a tablet. "St. Catherine devant la Sainte Famille," in folio, after the ſame, a beautiful piece, in which ſeveral angels are introduced. "The Holy Family," in folio, after Titian, an excellent work. It may be diſtinguiſhed from the numerous compoſitions on this inexhauſtible ſubject, by the following circumſtances. The Virgin Mary is receiving an apple from the infant St. John, St. Catherine is kneeling, and the back ground is a landſcape with ſhepherds and cattle. "La Vierge tenant l'enfant Jeſus," who is trampling on the ſerpent, in folio, after Giov. Lod. Valeſio, marked K. A. F. "Sujet de Theſe," in folio, after Cl. Vignon. This engraving repreſents religion as the true ſcience, and has a Latin inſcription. "St. Francois," in folio, after S. Vouet. The ſaint is repreſented as in an holy extacy before the ſacrament, and the print is inſcribed, Tergeminus in terris vincis. A Frontiſpiece to the book of Joannes Franciſci Niceronis Pariſini. "Ord. Minor. Thaumaturgus," in folio, after the ſame maſter. The ſubject is a genius holding the portrait of Cardinal Mazarin. "L'Aſſomption de la Vierge," in folio, after Dominichino. It is in a circle or a ſhort oval, is inſcribed Reginæ Triumphanti, and eſteemed one of the beſt engravings of Carl Audran.

Michel Laſne was born at Caen in the year 1596, but reſided chiefly at Paris, where he died in 1667. He worked entirely with the graver, and handled that inſtrument in a bold, open ſtyle, ſomewhat reſembling that of Bloemart, though Mr. Strutt believes that he choſe Villamena for his model. His execution is dry, and his drawing, eſpecially of the extremities, ſomewhat heavy. Laſne was induſtrious in his profeſſion, and, according to the abbé Marolles, the number of his engravings amount to about ſix hundred. He ſometimes marked his prints with his name at length, and at others with the cypher, which will be found in our plate of the monograms, &c. of the French ſchool of engraving. The beſt of his works are enumerated below, beginning with thoſe *from his own compoſition.*

"Un Garcon Errant," inquarto. "Compagnie de Payſans en bonne humeur," in quarto. "La Vierge," with the infant Saviour ſleeping under a tree, in folio. "A dead Chriſt mourned by the Magdalen," in folio, dedicated to Lewis XIII. and dated 1641. "Bellerophon monté ſur Pegaſe combat le Cheymere," in folio.

Hiſtorical, after various Maſters—"Sainte Famille," after Rubens, in folio, and very rare. The infant Chriſt is repreſented as careſſing his mother, and St. John introduced by Joſeph, is followed by his lamb. "St. Frances d'Aſſiſe receiving the infant Chriſt from the Virgin Mary," an upright folio, after Rubens. This plate is executed in a much neater manner that his other engravings, but bears the name of De Laſne.

"St. Francis de Paul receiving the Infant Chriſt from the Hands of the Virgin," from the ſame painter. "La Viſitation de St. Elizabeth," in folio, after L. Carracci, but falſely attributed to Annnibal. "La Vierge, et l'Enfant qui dor," in folio, after a celebrated picture of Annibal Carracci. This is in England commonly called "The Silence." It repreſents the infant Saviour ſleeping, and the Virgin holding up her finger as St. John approaches, and has been ſubſequently engraved by Picart, by Hainzelman, and by Bartolozzi. "Ecce Homo," in folio, after Titian. "Jeſus Chriſt dans ſa Gloire," in folio, after Paul Veroneſe. The Saviour is here accompanied by St. Peter and St. Paul. "The Virgin ſeated on a Creſcent," an oval, in folio, after Albani.

Laſne alſo engraved the following portraits, chiefly after his own drawings

Michel Aſénus, Sculptor Regius, in folio. Louis XIII. on horſeback, proclaimed by Fame, and Bernard, duc de la Valette, alſo on horſeback, its companion. In the back-ground of the former is repreſented the battle of Veillance, and in that of the latter the town of Metz: both of which back-grounds are engraved by Callot. Anne of Auſtria, queen of France, a whole length figure, in royal robes, folio. Arnaud, cardinal duc de Richelieu; folio. Julius cardinal of Mazarin, folio. Charles father of Crequi, marſhal of France, folio. Francis de Baſſompierre, marſhal of France, folio. Pierre Seguier, chancellor of France, folio. Nicholas de Bailleur, preſident of the French parliament, folio. Francis Fernandez, a friar of the order of St. Francis. Le pere Joſeph de Paris, a famous capuchin, folio. Louis Petit, General of the order of Trinity, folio. Jean Francois Mieron, a monk and celebrated mathematician; in folio, very rare. Julio Strozzi, the Venetian poet, in quarto, after Simon Vouet, dated 1627. Jean Charles Doria, quarto. Francois Queſtrel, firſt painter to Henry III., from a picture by himſelf; quarto. Le pere Nicholas Couſſin, folio, 1651.

Nicholas

Nicholas Chaperon was born at Chateaudun about the year 1596; he was educated a painter, and ſtudied under Simon Vouet, but afterwards preferred etching, of which his works chiefly conſiſt. Travelling to Rome for improvement, he was induced to remain there a conſiderable time, during which he produced a ſet of prints from thoſe pictures by Raphael, in the Vatican, which are called his *bible*. They conſiſt of fifty-two plates, which the preſent writer has not ſeen, but of which Strutt ſays, with ſome degree of inconſiſtency, that they "are chiefly eſtimable as being, upon the whole, the beſt copies of that noble work; but, however, the ſweet ſimplicity of ſtyle, and correctneſs of drawing, ſo manifeſt in the works of that celebrated painter, are totally loſt in the affected manner of the engraver. The heads are very indifferent in general, and the other extremities very poorly marked."

At his return from Rome, Chaperon eſtabliſhed himſelf at Paris, where he etched ſeveral plates in a ſpirited ſtyle, generally marking them with the initials of his name, and the addition of the letter F for fecit. Among them the following will be found worthy of preference on account of their merits:

The portrait of himſelf at the foot of the buſt of Raphael, in folio. This is generally prefixed to the bible mentioned above, and ſerves as its title-page or frontiſpiece.

Portrait of Henry IV. of France, at the age of forty-two, in a frame of antique ſculpture, beneath which the king, wounded by Du Chatel, is repreſented in bas relief. It is in folio, after Freminet, and bears not even the initials of Chaperon, but is known to be from his hand. This is a very rare print.

Another portrait of the ſame monarch, at the age of forty-four, beneath which a battle is repreſented in the ſame manner as in the above.

"Une Vierge conſiderant l'Enfant Jeſus en lui preſentant le Sein," in folio, after his own compoſition, as is ſuppoſed by Roſt and Huber, though bearing the name of Titian. Yet it is difficult to believe that Chaperon, or any man would have expoſed himſelf to the unpleaſantneſs of ſuch frequent enquiries after the original as muſt be the neceſſary conſequence of a forgery of this nature.

"An Holy Family," in folio, where the virgin mother is ſuckling the infant Chriſt. "L'Alliance de Bacchus et Venus," in folio; dated 1659. "Bacchus a qui un Homme preſente a boire," folio. "Bacchus accompagne d'un Homme qui porte un Enfant," folio. "Famille de Satyres," a ſmall upright folio. This is a bold and ſpirited etching, and one of the beſt works of the maſter. "Bacchanale," where a child is pouring forth wine for a Bacchante, in folio. Another Bacchanalian ſubject, where Silenus is introduced, mounted on a he goat, in folio. Another, where a young Bacchante is mounted on a ſhe goat, in folio. Another, where a child is ſucking a ſhe goat, which a ſatyr is holding, dated 1639.

Pierre Brebiette was born at Mantes on the Seine. He was contemporary with Chaperon, and like him eſtabliſhed himſelf at Paris, after travelling to Italy for profeſſional improvement. He executed a conſiderable number of ſlight ſpirited etchings, which prove him to have been an artiſt of fertile and active fancy. In compoſition he is agreeable and profuſe; and his figures are well grouped, though not correctly drawn. Moſt of his prints are from his own pictures and deſigns, though he alſo etched ſeveral after Raphael and other maſters. He ſometimes marked his engravings with his name at length, and at others with his initials encloſed in a heart, and ſurmounted by a figure reſembling the numeral 4, as ſeen in our plate of the monograms uſed by the French engravers. The ſubjects of his principal etchings are:

His own portrait encloſed in a border, ſupported by two angels, in quarto; entitled "Peter Brebiette, Calcographus."

That of Francis Queſnel, the painter, ſupported by allegorical figures of Painting and Fame.

A ſet, or book of various prints, under the title of "Opera diverſa à Pierre Brebriette inventa," in quarto, dated 1658. "The Nativity," in quarto. "The Adoration of the Magi," in quarto. This is an unfiniſhed plate, and without the name of the artiſt. "The Virgin Mary with the Infant Chriſt aſleep," in quarto, dated 1638.

The Miraculous Conception itſelf ſeems ſcarcely more miraculous than that of the infinitely varied and numerous compoſitions to which theſe divine germs have given intellectual birth. When the vaſt number of engravings and pictures of the Holy Family and Virgin and Child are contemplated, it really appears as if by ſome divine preſcience, the ſubject itſelf were inexhauſtible, and as if the mental act of comparing their various beauties and merits were deſtined to baffle human ſuſceptibility and judgment. Brebiette has engraven three more plates of the Virgin and Child, in folio; in the firſt of which the infant Chriſt is crowned; in the ſecond, the virgin mother appears on her knees near the Saviour, and attended by two angels; and in the third, ſaints are adoring her.

"The Converſion of St. Paul," without the name or cypher of Brebiette, in folio. "The Martyrdom of St. Catherine," in quarto. "The Martyrdom of St. Sebaſtian," in quarto. "The Death of Niobe's Children," an upright. "Orpheus ſurrounded by the Brutes," in quarto. An Arcadian ſubject with ſatyrs, in quarto. "Les Quatrains du Sieur de Pibrac," dated Paris 1640. "The Four Seaſons," in ſmall ovals.

The following are in the elongated form of friezes.

"The Battle of the Lapithæ and Centaurs," "Thetis at her Toilette;" "A Sacrifice to Ceres." A ſet of twelve Bacchanalian ſubjects; and a ſet of four, repreſenting ſea-gods, in folio.

After other painters, Brebiette has engraved the following plates:

"An Holy Family," wherein the infant St. John has his foot upon a cradle, an upright in quarto, after Raphael. Another Holy Family, after Andrea del Sarto, in quarto. "The Martyrdom of St. George," after Paul Veroneſe, in quarto. "Paradiſe," after a grand compoſition of old Palma, engraved on two plates, and one of the very beſt of the works of Brebiette.

Jacques Stella was born at Lyons in the year 1594, and was the ſon of Francis Stella, a native of Flanders, but who had ſtudied the arts of portrait and landſcape painting in Italy. He loſt his father at the age of nine years, but was already inſtructed in the rudiments of drawing. At the age of twenty Jacques went to Italy, and entered the ſervice of that diſtinguiſhed patron of art, Coſmo de Medicis, from whom he enjoyed a penſion equal to that which had been granted to Callot, though far his inferior in merit. After remaining at Florence about ſeven years, he purſued his journey to Rome, which had been the prime object of his travels, where he ſpent eleven years in ſtudying Raphael, Pouſſin, and the bright exemplars of ancient and modern art which then abounded in that far-famed metropolis.

In the year 1634, he removed to Paris, where Louis XIII., hearing of his merits, aſſigned him a handſome penſion, and apartments in the Louvre, which induced him

to abandon a journey he had projected into Spain, and to ſettle at Paris, where he was ſoon after honoured with the order of St. Michael.

In the ſtyle of his art Stella is tame, and without energy, though he poſſeſſes ſome portion of grace, and details his forms with conſiderable academical knowledge. He was more of a painter than an engraver, and his beſt productions are his ſmaller pictures of paſtorals and children's ſports, though theſe are not free from the reproach of languor and inanimation. He generally marked his engravings, which are chiefly performed with the point and aquafortis, with a ſtar, a ſort of pun upon his own ſurname, as is exemplified in our plate of the marks, &c. of the engravers of the French ſchool.

Stella's etchings, which are not very numerous, are from his own compoſitions. The principal of them are, "The Deſcent from the Croſs," in folio, and "The Ceremony of doing Homage to the Grand Duke of Tuſcany, on St. John's day," a large plate, dedicated to the emperor Ferdinand II., and dated in the year 1621.

This artiſt died at Paris in the fifty-firſt year of his age, and his death is ſuppoſed to have been haſtened by too cloſe application to his ſtudies.

Etienne, or Stefan Baudet, was born at Blois, A.D. 1598, and died at Paris in the year 1691. He acquired the rudiments of engraving at Paris, but afterwards, as was the cuſtom of his age, travelled to Italy for improvement. He varied the ſtyle of his engravings at different periods of his life; and connoiſſeurs eaſily diſtinguiſh between thoſe prints which he engraved before, and thoſe which were produced after, his return from Italy. His earlier works were executed entirely with the graver, and though ſufficiently neat, are cold, mechanical; and as a French author ſays, "the manner accuſes the metal." In his ſubſequent ſtyle, he mingled etching with the work of the graver, and roſe decidedly ſuperior to his former ſelf. From a certain degree of reſemblance being traceable between this ſecond ſtyle and that of Jean Baptiſte de Poilly, ſome of his biographers have inferred that he imitated that celebrated engraver, without reflecting that Jean Baptiſte could have been but a youth when Baudet produced the engravings in queſtion.

This artiſt alſo occaſionally engraved in the taſte of Claude Mellan, who was his contemporary; and in the courſe of a long life he produced a conſiderable number of plates, from which the following are ſelected as the moſt favourable ſpecimens of his abilities. In his firſt ſtyle, according to Mr. Strutt, (who however appears to be miſtaken in ſome of his dates reſpecting this artiſt,) are

"The Tribute Money," a middling ſized plate, nearly ſquare, from Valentino, which (ſays this author) I think the moſt maſterly of thoſe which he executed in this manner. Four large landſcapes lengthways with figures, from Albano, publiſhed at Rome in 1672. The figures in theſe are from the hiſtory of Venus and Adonis. "The Four Elements," large circular prints, from the ſame maſter, dated 1675, (though according to Strutt they are not dated till twenty years after); and "The Martyrdom of St. Stephen," a large folio plate from Annibal Caracci's celebrated picture in the cabinet of the king of France; publiſhed in 1677.

In his ſecond ſtyle, according to the ſame writer, are, "Moſes trampling on the Crown of Pharaoh," a large folio, from Pouſſin's picture in the Louvre. "Moſes ſtriking the Rock," and "The Iſraelites worſhipping the Golden Calf," both in folio, and from the ſame maſter. "The Holy Family," from Pouſſin's original in the gallery of the Louvre, in folio; and "Venus repoſing after the Bath," in folio, and from the ſame painter, publiſhed 1666. The following large hiſtorical landſcapes, adorned with figures, are alſo from the Pouſſins. A ſet of four, dedicated to the prince of Condé, and publiſhed in 1684; and another ſet of four, dedicated to the king of France.

From the deſigns of other painters, according to the catalogue of Huber and Roſt, Baudet has engraven the following plates, *viz.*

"An Holy Family," from Sebaſtian Bourdon, in a circular form, and where angels and the infant St. John are adoring our Saviour. "The Adoration of the Shepherds," after Jac. Blanchart, in folio. "The Deſcent from the Croſs," after Annibal Caracci, in folio. "The Communion of the primitive Chriſtians," after Charles de la Foſſe. A ſquare plate after Valentino, entitled "Le dernier de Ceſar." A ſet of ſix grand folio landſcapes, after Sebaſtian Bourdon. A ſet of ſix, five only of which are by Baudet, of the grand ſtaircaſe at Verſailles, after Le Brun, the originals of which no longer exiſt; (N.B. the ſixth plate, which is of the cieling, is engraved by Ch. Simmonneau;) and "Adam and Eve diſmiſſed from Paradiſe," after Dominichino, from a picture in the king of France's cabinet; which engraving is eſteemed the chef d'œuvre of Baudet.

Beſide hiſtory and landſcape, this artiſt has diſtinguiſhed himſelf by engraving ſome of the ſtatues in the royal garden at Verſailles, in which he has imitated the ſingle-ſtroke ſtyle of Mellan; and the following portraits are alſo from his graver, and are all of the folio ſize. Pope Clement IX. Charles Perault, comptroller-general of the royal buildings, after Le Brun, dated in 1665, and inſcribed "Stef. Baudet ſc. Acad. Reg." Louiſa ducheſs of Portſmouth, as Venus, careſſing a dove, after H. Gaſcar. Antique buſt of a Roman lady of the reign of Adrian, from an original in the Thuilleries, and another antique buſt of the emperor Adrian himſelf, alſo from an original in the Thuilleries, dated in 1678, and executed in the ſtyle of Mellan.

Simon Guillain was a ſtatuary, and occaſionally an architect, but who having performed at leaſt an hundred etchings, is commonly reckoned among the French ſchool of engravers. He was born at Paris A.D. 1599, and died in the ſame city, according to the French authorities, in 1679; though, according to Strutt, he died in the year 1658. His father was a ſculptor of Cambray, under whom he made conſiderable progreſs in art before he travelled to Italy. On his return to Paris, he executed, among other works, the baſſo relievos and bronze figures to the memory of Louis XIII. in the angles of the "Pont au Change" at Paris: the figures in the niches of the portal of the Sorbonne, and thoſe which ornament the Maitre Autel des Minimes de la Place Royal, are alſo from his chiſel.

The following ſlight, but maſterly etchings, are not leſs creditable than his ſculpture, to the general ſtock of his talents as an artiſt.

A ſet of twenty plates from the life of St. Diego, from the originals of Annibal Caracci and Albano, in the church of the Spaniards at Rome; and a ſet of eighty ſmall uprights, entitled the Cries of Bologna, alſo after Annibal Caracci, with his life and portrait appended.

Charles David was born ſome time about the commencement of the ſeventeenth century. He was a native of Paris, but under what maſter he ſtudied engraving his biographers have not mentioned. Strutt ſays of him, with much truth, that "his ſtyle of mechanical execution ſeems to have been founded on an examination of the works of ſeveral artiſts, rather than a direct imitation of any one. He worked entirely

with the graver, in a clear, neat manner, but with great freedom of hand; he often rendered the effect of his prints leſs pleaſing than it otherwiſe would have been, by croſſing his ſecond ſtrokes too ſquarely upon the firſt. He certainly drew the human figure with a conſiderable degree of correctneſs; but he was apt to overcharge his forms, and mark the outlines of his muſcles too powerfully. His extremities eſpecially are, in general, rather heavy and defective. His lights, a fault uſual with the engravers of that age, are too much ſcattered, and too equally powerful: yet his beſt prints are deſervedly held in great eſtimation. He engraved "The Labours of Hercules," a ſet of twelve ſmall folio plates from F. Floris. "The Cries of Rome," a ſet of ſixteen ſmall upright folios, copied ſo faithfully from Villamena, that it is not eaſy to know the difference apart from the originals. "The Virgin and Child ſurrounded by Angels," an upright 4to. after Champagne. "La Vierge nouriſſant St. Bernard de ſon lait," and another 4to. frontiſpiece from the ſame painter. A ſet of landſcapes after Paul and Matthew Brill. An Ecce Homo. "The Gay Nurſe and Companion," from his own deſigns; and a ſingular print of a man with a ſnail upon his finger, accompanied by a he goat with a crown of ſnails upon his head, while a diſh full of them is ſeen on a table, after Callot. This latter is a very rare print.

Jerome David was brother to Charles, and worked in the ſame ſtyle, though with talents ſomewhat inferior: he went to Italy, and followed there the profeſſion of engraving till toward the middle of the ſeventeenth century, but the dates of his birth and death have not been recorded.

He uſually ſigned his engravings "H. David." The letter H ſtanding for Hieronymus, which is the Latin for Jerome. The author of the "Series of Engravers," publiſhed at Cambridge, not attending to this circumſtance, has ſpoken of his works as if they were executed by two artiſts, Jerome, and H. David. In ſome inſtances, however, his engravings are marked only with his monogram, for which ſee our plate of cyphers, &c. of the French engravers.

The following liſt, which begins with his portraits, will be found to include the beſt engravings from the hand of this artiſt, the number of whoſe plates, added to thoſe of his brother Charles, amount to about two hundred and twenty.

Charles I. of England; Henrietta Maria, his queen; Anne, queen of France; Gaſton, duke of Orleans; and Cardinal Richelieu; are all whole length equeſtrian portraits, in folio, and the laſt a very rare print.

A ſet of forty-two plates repreſenting the churches, tombs, and altars of Rome: theſe are etchings, and are after the drawings of Jean Baptiſte Montano, a celebrated chaſer of Milan, who died in 1621, and whoſe portrait (in folio) Jerome alſo engraved.

A ſet of thirty-ſix heads of ancient philoſophers, from deſigns of his own, engraved in a coarſe, dark ſtyle, in 4to. "A Landſcape, with Adam tilling the Earth after his Expulſion from Paradiſe." "An Ecce Homo," a ſmall upright folio, from Guercino. "The Virgin of the Roſary," a ſmall upright folio, after Guido, dated 1633. "The Virgin and Child," a ſmall circle, after Guido. "The Aſſumption of the Virgin," after Camillio Procaccini. "St. Francis de Paul walking on the Sea," an etching after Robert Picou.

Contemporary with the Davids was Jean Ganieres, an engraver of very ſlender abilities, who was a native of France, and reſided at Paris. His beſt works are portraits, and the beſt of his portraits are thoſe of Louis XIII. of France, a ſmall oval, ſurrounded with ornaments, and dated 1640. Cardinal Flavio Chigi, a ſmall upright; and M. de la Melleraye, in 4to. dated 1679. He alſo engraved "A Boy ſleeping, with a Skull lying near him," a ſmall plate, dated 1640. "A Magdalen," in folio, after Jacques Blanchard, beſides ſome other plates from the ſame painter.

Francis Tortebat, an artiſt of far ſuperior merit, was born at Paris in the beginning of the ſeventeenth century, and died in the ſame city in the year 1690. He was the ſon-in-law and pupil of Simon Vouet, from whoſe pictures and deſigns he etched ſeveral of his plates.

His etchings are ſomewhat rough, but are performed with great ſpirit; and he frequently produces a good chiaroſcuro.

In the year 1663 he became a member of the French Royal Academy, and from his etching-needle may be enumerated the following ſubjects.

The anatomical figures of Jean de Calcar, from the wood engravings which accompany the treatiſe of Veſalius. An emblematical figure in folio, after Vouet, in which an angel is repreſented piercing with an arrow a flaming heart, from the ſame painter, and of the ſame (folio) ſize: he has alſo engraven as follow: "Peace deſcending on the Earth;" the "Aſcent of Elijah;" "Sampſon recovering his Strength, and deſtroying the Philiſtines;" and "The Apotheoſis, or Beatification of St. Louis."

The French writers reckon Jacques Blanchard and Claude Gelee, who both lived at this period, among their ſchool of engravers, though with no very ſtrict propriety, as neither of them contributed to the advancement of that art, and both were very diſtinguiſhed painters.

Blanchard, as well as Claude, performed a few etchings from his own compoſitions; of which thoſe which are moſt deſerving of notice are, "An Holy Family," in 4to. publiſhed by Huart. Another "Holy Family," publiſhed by Cartres. The "Nativity of the Virgin;" and "St. Agnes worſhipping the infant Chriſt," after Caracci.

For an account of Claude ſee our biography of him as a painter. Yet the curious may not be diſpleaſed to be informed that the following etchings are from the needle of this very diſtinguiſhed artiſt. They are after his own pictures, and of courſe are not without merit, though they bear the marks of a hand unpractiſed in the art of etching. Two folio landſcapes with ruins and cattle. Two 4to. landſcapes; one a ſea-port with mariners; the other a paſtoral ſcene with figures dancing. A ſet of twenty-eight landſcapes, which are highly eſteemed among connoiſſeurs, and the "Via ſacra detto Campo Vaccino di Roma," in folio, dated 1636.

Claude Mellan was born at Abbeville, in Picardy, A.D. 1601; of which city his father was receiver of the cuſtoms, and paid great attention to the education of young Claude. His genius for drawing diſcovering itſelf at a very early period of his life, it was thought proper to ſend him to Paris, where he became the pupil of Simon Vouet, a painter who was highly celebrated at a time when falſe criteria of excellence obtained, having had the honour of inſtructing the king of France, the grand monarque himſelf! in the arts of deſign.

Thus ſays Strutt; but the French writers, with more probability, and indeed with better opportunities of aſcertaining facts of this kind, ſay that from Paris young Mellan was ſent to Rome, and *there* attended the lectures of the celebrated Vouet. Now at the time Mellan was ſixteen years of age, which is the period at which he is ſaid to have travelled to Italy, Vouet was preſident of the Roman Academy of St. Luke, and did not return to Paris till the year 1627, when he was ſummoned home by Louis XIII.

for the decoration of his metropolis. After performing, with tolerable ſucceſs, a few imitations of the pictures of Vouet, Mellan relinquiſhed the art of his preceptor, and dedicated his attention ſolely to engraving, in which he ſoon made conſiderable proficiency. He worked chiefly from his own deſigns, and manifeſted great power over the inſtruments of his new art.

Of the ſtyle of his engraving, as it varied at different periods of his life, we ſhall preſently ſpeak: that of his deſign is marked by a certain aſſumed briſkneſs in ſome figures, contraſted by the uneaſy languor of others; and his expreſſion partakes, in moſt inſtances, of that ſophiſticated confidence which properly belongs to the French hiſtorical art of the ſchool of Vouet.

Moſt of the plates which Mellan engraved in Italy, (where he appears to have remained upwards of thirty years, and where, among numerous other works, he produced his prints from the Juſtinian gallery, the portrait of pope Urban VIII. and that of the marquis Juſtinian,) are executed with the graver alone, and in a manner not materially differing from that in which the graver had been employed by other artiſts: that is, with parallel or converging courſes of curved lines, croſſed with ſecond, and occaſionally with third courſes of lines, as the degree of ſhade, and texture of the ſurface to be expreſſed, might require; but after his return to Paris he invented a new mode of working with ſingle ſtrokes only; working out his chiaro-ſcuro by re-entering his original courſe of lines until they became of the breadth and depth which he deemed neceſſary to his effect. Our countryman, Strutt, in commenting on this novel and ſingular ſtyle, ſays, "In ſingle figures and ſmall ſubjects he ſucceeded very happily; but in large compoſitions, where great depth of ſhadow was required, he has failed, and that in proportion as the force of colour (depth of ſhade) was wanted. Beſides, in ſubjects where ſeveral figures occur, the ſameneſs of ſtyle, which neceſſarily appears in every part of the plate, fatigues the eye, prevents objects from relieving each other, and adds greatly to the flatneſs of effect." The truth is, that he has not failed from the cauſes which Mr. Strutt has aſſigned; for it would have been very eaſy to have produced much deeper tones than we ſee in the engravings of Mellan, by means of ſingle courſes of lines, which is proved by their having been ſo produced by other artiſts; but he has failed in the opinion of the judicious, becauſe this ſingle-ſtroke ſtyle was founded on novelty, and not on principle. The example of Mellan does but go to prove, among many others, that it is one thing to ſecure the approbation of poſterity, and another to obtain a little breathing-ſpace for the ſhort-lived monſters which faſhion has been known to engender upon fine art, in the purlieus of a French palace.

One of the moſt celebrated, and I will add, moſt juſtly celebrated, of the engravings of this artiſt, is his "Sudarium of Santa Veronica." The reader, if he be not "ſkilled in legendary lore," ſhould ſtop to be informed that Saint Veronica was canonized in conſequence of offering our Saviour, as he proceeded to Golgotha, ſweating under the burthen of the croſs, her handkerchief or napkin, and that the impreſſion of the divine countenance remaining on the drapery, was religiouſly preſerved, and well it might, as the moſt highly and juſtly valued relic belonging to the order of St. Face, or St. Veronica.

The engraving of Mellan, accordingly, repreſents the front face of Jeſus Chriſt, as large as life, and as if depicted or impreſſed on drapery. It is an upright folio plate, and is executed entirely by means of a ſingle ſpiral line, beginning at the extremity of the noſe, which is, as nearly as was practicable, the center of the engraving, and continuing, without intermiſſion, over the whole face and back-ground of drapery.

The ſuperceſſion of the ſcience which ſhould preſide over fine art, by the unprincipled novelties of faſhion, has been often and juſtly regretted. Before an artiſt prides himſelf on doing what no other man can do, he ſhould at leaſt be ſure that what he attempts is worthy of being accompliſhed. Yet perhaps Mellan did not himſelf ſo much miſtake means for end, as lead others into this error, from their inadvertently following his example. The ſingular ſtyle of his art, as exemplified in the Sudarium of St. Veronica, may find juſtification, or at leaſt excuſe, in the opinion of its admirers, from the reflection that a work, ſo novel and ſurpriſing, ſavours of the miraculous, and is ſo far analogous to its ſubject, and perhaps is, not without ſome plauſibility, addreſſed to the prejudices, if not to the underſtandings, of thoſe who have faith in the holy myſteries of the legend of St. Veronica. Moreover the feebleneſs of effect, which Strutt endeavours to account for, is here a merit, or at leaſt capable of being ſo conſtrued; for the impreſſion of the holy face thus left on the Sudarium of the Saint, might naturally be expected to be leſs vivid, than if St. Luke himſelf had painted it at his eaſel. Something, in theſe caſes, ſhould be left for the imagination.

The year of Mellan's return to Paris is not mentioned by his biographers. He married in that metropolis in 1654; and the king being made acquainted, and being pleaſed with his talents, beſtowed on him a penſion, and aſſigned him apartments in the Louvre, where he continued to reſide till the advanced age of eighty-ſeven, ſurrounded with honours and bleſſed with an excellent conſtitution, which exempted him from the diſeaſes uſually attendant on this late period of life; he enjoyed a competent fortune, and was greatly eſteemed by all who knew him. Florent le Comte ſays, that, "Charles the ſecond of England was ſo much pleaſed with his performances that he invited him to reſide in London, making him at the ſame time very advantageous offers; but the love of his country prevented his accepting them." He does not appear to have had any children; for his plates, at the death of his wife, became the property of his nephew. The ſubjects of the principal of them are as follow, beginning with ſuch of the allegorical and mythological as were invented by himſelf; "Phœbus paſſing the Zodiac," in folio. "Perſeus and Andromeda," 4to. "Venus ſeated on a Couch with her Doves," 8vo. "Hercules and Atlas," folio. A ſea-port whence is ſeen a rock, on which lies a book where are engraved the papal arms ſubſcribed, "Ibi confringes tamentes fluctus tuos," in folio. "The Reſignation of the Regency of France by the Queen-Mother, through the Hands of the Queen of Peace and Mother of God," in folio. "France ſeated at the Tomb of the Queen-Mother, and holding her Portrait," in folio. "Religion in a ſitting Poſture, pointing to a Man, kneeling before her." "St. Stephen diſtributing his Wealth to the Poor," in folio. "The Church Militant." In this piece, an angel is repreſented diſplaying the croſs to ſeveral perſons kneeling, in 12mo. A rural piece, in which are introduced a peaſant with a winnowing-fan, and a cow licking her calf, in 4to. An allegorical ſubject, in which is repreſented a naked female lying on a bed, having behind her a mouſe-trap, and before her ſeveral infantile genii, one of whom raiſes her leg, while another preſents her with a bunch of grapes, in folio. This print, which does not diſplay much ſpirit, is very ſcarce, and only half finiſhed. A frontiſpiece, for a collection of bon mots, repreſenting ſeveral ſatyrs, one of which is ſeated on a globe,

globe, having this inſcription: "ſic ſe ridendum dat deriſoribus orbis," 4to.

A political allegory from Antoine Talon, dedicated to cardinal Mazarin. This piece contains a figure repreſenting the adminiſtration, lying in an attitude of deſolation, and diſplaying in the diſtance ſcenes of horror which devaſtate the kingdom. Below, are two Hercules' preparing to bring ſuccour, and ſtill lower, are two figures writing, beneath which reclines a ſleeping Pallas, enchained by two youthful genii, with bands forming the initials of the cardinal's name. This ſcarce print is large, and is engraved on three plates.

Another allegory of the ſame ſilly kind, from Guill. de Longueil, dedicated to the ſame patron. Here Apollo is repreſented ſurrounded by the nine Muſes, who are occupied in pourtraying the arms, the initials, and the devices of the cardinal; and beneath are ſeen two rivers iſſuing from their urns, ornamented with feſtoons. This piece occupies two plates; and, like the former, is extremely ſcarce.

The following ſubjects are engraved from various maſters.

"Judith holding the Head of Holofernes," after Virginia de Vezlo, the wife of Vouet, in 4to. "Salomea carrying the Head of John the Baptiſt in a Charger," from S. Vouet, in 4to. "A Roman Charity," from the ſame, in 4to. "Lucretia," a folio plate publiſhed at Rome. "Pſyche and the ſleeping Cupid," Rome, in 4to. This piece is engraven with croſs lines, and in a very maſterly ſtyle. "The Virgin holding a Roſe, and the Infant Jeſus on her knee," from the ſame, dated 1633, in 4to. "St. Luke taking the Portrait of the Virgin," from the ſame, 1627, 8vo. "St. Francis de Paule contemplating the Heavens," from the ſame, Rome, in folio. "St. Catherine on her Knees, receiving from an Angel the Crown of Martyrdom," from the ſame, Rome, 8vo. "Genius, Memory, and Will," from Vouet, in folio. "The Eternal, in his Glory," with two figures repreſenting the old and new law. This is the frontiſpiece to the Louvre bible, from Pouſſin, in folio, without ſignature. "Horace crowned by Genius, while one of the Muſes preſents him with the Maſk of Satire," from the ſame, in folio. The frontiſpiece to the Louvre edition of Horace. "Virgil crowned by Apollo," from the ſame, in folio, without a ſignature. The frontiſpiece to the Louvre edition of Virgil. "The Courteſy of Rebecca, in her firſt Interview with Abraham's Steward," a folio engraving from Tintoret, eſteemed one of the fineſt hiſtorical prints of Mellan. "A View of a Palace in a Garden," a folio print after Pietro da Cortona, publiſhed at Rome.

His works from the Old and New Teſtaments are as follow: "Lot and his Daughters," in 4to. dated Rome 1629. "Sampſon betrayed by Delilah, who is cutting off his Hair," in 4to. The "Burning Buſh and Moſes," in 4to. dated 1663. The "Miraculous Fall of Manna," in 8vo. The "Annunciation," inſcribed "Ecce Virgo concipiet," a folio print, dated 1666. "The Madonna," in 8vo. in which the virgin is repreſented ſeated beneath a tree, with the infant Jeſus on her knees. Another of the ſame ſubject and ſize, dated 1659. Here Mary is ſeated at the baſe of a pillar, and, as in the preceding, ſhe holds the infant Jeſus on her knees. Another, in which ſhe is repreſented ſeated on a bank, with the infant Saviour ſtanding near her, and in the back ground St. Joſeph binding up faggots, while in the four angles are figures from the Old Teſtament. "A Holy Family," Rome, 1635, in folio. In this piece the virgin is ſeated near the ruins of an edifice, with the infant ſtanding on her knee. "A Group," conſiſting of St. Anne, St. Joachim, St. Joſeph, St. John the Evangeliſt, and St. Bernard. A buſt of the infant Chriſt. A buſt of the Virgin in her youth. A buſt of the Virgin, at a more advanced period of life, with her hands croſſed over her breaſt, 1650, in folio. "Chriſt in the Garden of Olives, and his Diſciples aſleep," in folio. This is a night-piece, and in ſome eſtimation among connoiſſeurs. "Chriſt led by the Soldiers," with this inſcription, "Pater ignoſce illis, quid faciant," in folio. "St. John, and Mary Magdalen, embracing the Croſs," Rome, in folio. "The Crucifixion," dated 1665, in 4to. "Chriſt expiring on the Croſs, with the Virgin, St. John, and Mary Magdalen embracing the Foot of the Croſs," in folio. "Jeſus Chriſt carried to the Sepulchre," during which the graves give up their dead. In one corner is ſeen written on a tomb, "Terra Mota eſt," 1678, in folio. "The Reſurrection of Jeſus Chriſt," inſcribed, "Per ſe refurgens," 1683, in folio. "The Fathers of the Church aſſembled in council," 1665, in folio. In this piece is ſeen a table, with an open book, in which the word "Evangelia" is inſcribed.

The number of ſubjects which this artiſt has ſelected from the rubrics of martyrology, as well as from the reigning whims of the minions of the French court, lead us to ſuſpect that he followed the taſte of the times in which he lived, and, careleſs or ignorant of the immutability of principle, merely and meanly rendered his art ſubſervient to the religion and politics of the hour. Thoſe which follow are from his own compoſition, as well as ſeveral of thoſe which we have juſt paſſed. "The Sudarium of St. Veronica," a large folio, of which we have already ſpoken. "St. Peter Nolaſque," in folio. The ſaint is borne through the air by two angels. This is the rareſt, and one of the beſt of Mellan's engravings. "St. Stephen in the Habit of a Deacon," in 4to. The ſaint is kneeling, and the following inſcription mingles with a radiance of light; "Ecce video Cœlos apertos." "Alexis in his latter Moments," in folio, dated 1649. "St. Bruno in the Deſert," an upright folio; four other folio plates lengthways, from the life of this ſaint; in the firſt of which he inveſts a brother of the order, in the ſecond, exhorts the holy brotherhood, in the third, enters the council, and in the fourth ſhews the hoſt to the military. "St. Ambroſe interdicting the Entrance of the Emperor Theodoſius into his Church," a folio plate dated 1681.

"St. Auguſtin converted in the Garden of Aleppo," 1660, in folio. "St. Bernard proſtrate before a Crucifix," in folio. "St. Cajetan kneeling before a Crucifix," 1664, in folio. "St. Dominic in a Trance," in folio. Beſides the principal perſonage in this landſcape, ſeveral monks are ſeen in the back ground. "St. Francis in the Deſert, kneeling before a Crucifix," 1638, in folio. "St. Francis de Paule," 1627, in quarto. "Pope Gregory writing to King Childebert," 1681, in folio. "St. John meditating in the Deſert," 1629, in folio. "St. Ignatius in a Trance," in folio. "St. Joſeph, (Joſeph Chriſti nutritie,)" in folio. "St. Peter at Prayers near a rock, a crucifix in the back ground," in folio. "St. Paul carried up into Heaven," with this inſcription: "Sive in corpore neſcio," 1674, in folio. "A Penitent Magdalen lying on a Mat, her Body lacerated by Thorns." "Mary Magdalen expiring, ſupported by Angels," Rome, 1687, in folio. "St. Genevieve, a young Shepherdeſs, ſeated in an Attitude of Contemplation, at the Foot of a Tree," 1680, in folio. "St. Claire kneeling before the Body of Chriſt," 1667, in folio. "A Nun at Prayers," 1647, in folio. "St. Thereſa kneeling in her Cell before a Crucifix," 1661, in folio.

The following portraits are chiefly engraved from the artiſt's own pictures and drawings.

Claude

Claude Mellan, painter and engraver, 1635, in folio. Pope Urban VIII., from Bernini, 1631, in quarto. Anne of Auſtria, queen of France, in weeds, in folio. Louiſa-Maria de Gonzague, queen of Poland, 1645, quarto. Cardinal Guido Bentivoglio, in quarto. Charles de Crequies-Leſdiguercy, Mareſchal of France, Rome, 1633, in quarto. Jean de Saint Bonnet, lord of Toiras, Maréſchal of France, in quarto. Claude Marolles, 1613, in quarto. This is the portrait of a Tourangeau gentleman, and one of the braveſt men of his age. Michel de Marolles, abbé of Villeloin, in quarto. This is the ſon of the former, and a great connoiſſeur in prints, whom we have ſometimes quoted. Francis de la Motte le Vayer, 1648, in quarto. Peter Gaſſendi, profeſſor royal of mathematics at Paris, in quarto. Henry duke of Montmorency, in quarto. Cardinal de Bouillon, 1613, in folio. This is a buſt of the cardinal on a pedeſtal. The illuſtrious Armand, cardinal duke of Richelieu, in folio. Cardinal Mazarin, gr. folio. Francis Villemonte, biſhop of St. Maloes, 1661, in folio. Pierre Seguier, chancellor of France, gr. in folio. This portrait is executed with much ſpirit. Nicholas Coćſſeteau, biſhop of Marſeilles, Du Mouſtier pinx. gr. folio. The celebrated cardinal de Perron, Herbin pinx. gr. folio. Victor le Bouthillier, archbiſhop of Tours, 1658. gr. folio. Joann Haberti Eq. T. D. de Montmor, Monument. D.D. Claude Mellan, &c. 1640, gr. folio. Henri-Louis Habert de Montmor, the ſon of Jean, 1640, gr. folio. Henrietta Maria de Baude Frontenac, the wife of H. L. Habert de Montmor, 1641, gr. folio. Henri de Meſmes, preſident of the parliament, &c. gr. folio. Pierre Molé, keeper of the ſeals, gr. folio. Abel Servien, treaſurer to the French Academy, gr. folio. Nicholas Claude Fabri de Peireſe, counſellor at Aix in Provence, gr. folio. This is one of the moſt beautiful portraits of Mellan.

Beſides the works above enumerated, Mellan executed ſtatues, antique buſts, and baſſo relievos, from the Juſtinian gallery, to the amount of 322; as well as the antique ſtatues and buſts of the royal palaces of France; but the latter, as has already been mentioned, were performed in concert with Baudet; they form altogether ſixty-one pieces.

Michel Corneille, the father, was born at Orleans in 1633, and died at Paris in 1664. He was a pupil of Simon Vouet, whoſe method he invariably followed in the pictures which he painted for different churches and palaces. He etched a few plates after Raphael, the Caracci, and Vouet, of which the following are moſt worthy of remark.

A Holy Family from Raphael, in quarto. In this piece, which has been often engraved, the Virgin is ſeated by the ſide of St. Elizabeth, while the infant Jeſus is taken out of the cradle, to be placed on the knees of his mother, and St. John is repreſented bringing ſome fruit.

"The Maſſacre of the Innocents," from the tapeſtries of the Vatican, by Raphael, in folio. "Jeſus appearing to Mary Magdalen, as a Gardener," or the "noli me tangere," from the ſame, in folio. "The Virgin ſuckling the Infant Jeſus," from L. Caracci, in folio.

Michel Corneille, the eldeſt ſon of the former, was born at Paris in 1642, and died in the ſame city in 1708. He was educated by his father, and became one of the moſt celebrated members of the Royal Academy. In order to diſtinguiſh his works from thoſe of his father, he ſometimes added an A to his baptiſmal name, on which account he has received the appellation of Michel-Ange Corneille, though he is ſometimes called Corneille of the Gobelins. Having learned the rudiments of art from his father, he went to Italy to complete his ſtudies in the ſchool of the Caraccii, the ſtyle of whoſe deſign he occaſionally imitated with ſome ſucceſs. He underſtood perſpective, and the management of light and ſhade, better than the majority of contemporary French artiſts; and though he chiefly excelled in hiſtory, was not without a conſiderable ſhare of merit in landſcape. Strutt ſays of his four engravings from the life of the patriarch Abraham, which are after his own deſigns, that "they are etched in a fine, bold, free ſtyle; the compoſitions are full of grandeur; the heads are peculiarly characteriſtic; the extremities, like thoſe of Raphael, are finely drawn, and the draperies diſpoſed with great taſte. One may ſee how cloſely he has ſtudied the celebrated Italian painters, and admire the good uſe he has made of thoſe ſtudies. The figure of Abraham in the laſt, has much of the ſtyle of Polidoro Caravaggio in it, and all the naked figures in the third are drawn in the manner of Caracci."

A printſeller of Rome having obtained theſe four plates, and having heard of the fame of Raphael, had the crafty ignorance to inſcribe beneath them the name of that great painter, and there were perſons at that time, as at preſent, the ready dupes of deception, and who conſulted no other oracles for the truths of art.

The ſubjects of theſe four prints, which are now become very ſcarce, are, 1ſt. The Deity appearing to Abraham. 2d. Abraham journeying with Lot. 3d. Abraham putting to flight the Army of the Confederate Kings. 4th. Iſaac taking leave of his mother before his departure for the ſacrifice. The remainder of the principal works of this artiſt are as follow:

"Delilah cutting off Sampſon's Hair." "The miraculous Conception." In this piece St. Ann and St. Joachim are repreſented in attitudes of admiration, and above is ſeen the Holy Ghoſt. "The Annunciation," occupying two plates. The angel is engraved on one, and the Virgin Mary on the other. Another "Annunciation" on a ſingle plate. "The Nativity, with the Shepherds worſhipping Chriſt." The infant Jeſus is lying in the manger amid oxen and aſſes. "The Flight," from a picture in the White Penitents, at Lyons, in which St. Mary is repreſented as about to enter a boat. "The calling of Peter and Andrew," a picture in Notre Dame, at Paris. "The Virgin embracing the Infant Jeſus, worſhipped by St. John the Baptiſt," from a painting in the Feuillans, at Paris. "St. John the Baptiſt in the Deſert." "Jeſus Chriſt, the Way, the Truth, and the Life." "St. Andrew adoring the Croſs," finiſhed by Jean Mariette. This is a beautiful ſmall upright, from a deſign by Corneille himſelf. "Jeſus Chriſt and the Virgin appearing to St. Francis," from a painting in the Capuchins, at Paris. "St. Francis of Aſſiſe," at full length. "St. Francis liſtening to celeſtial Muſic." "St. Anthony of Padua carrying the Infant Jeſus in his Arms." "The Apotheoſis of Æneas." "Hercules ſupporting the Globe of France." "The Genius of Painting." This is a frontiſpiece to M. de Piles' Lectures on Painting. "The Inhabitants of Madagaſcar ſwearing Fealty to the King of France." "The betrothing of St. Catherine," from a deſign of L. Caracci, in folio. "The Virgin," from Caracci, in folio. This is a landſcape in which the Virgin is repreſented ſitting at the foot of a rock, with the infant Jeſus. "A Landſcape," in which Jacob is ſeen ſtruggling with the Angel, after Ann. Caracci. "St. John the Baptiſt preaching in the Deſert," from the ſame. "St. John the Baptiſt interrogated by Two Diſciplies," a landſcape from the ſame. "St. Francis diſgraced," a landſcape from the ſame. "Mercury preſenting the Lyre to Apollo," a landſcape from the ſame. "Silenus, a Satyr, and a Faun," a landſcape from the ſame. "Pan ſeated with Apollo," a land-

landſcape from the ſame. "An indigent Family, followed by a lame Beggar on Crutches," from the ſame. "Hagar baniſhed by Abraham," after P. da Cortona, falſely aſcribed to Ann. Caracci, in folio.

Beſides the above, he etched from the works of his father, "The Sacrifice of Abraham," "King Phineas delivered from Harpies," and "Cleopatra taking the Aſp from the Baſket of Fruit."

Jean Baptiſte Corneille was born at Paris in the year 1646, and died in the ſame city in 1695. Strutt has dated his birth ten years earlier, and has ſpoken of him as the elder brother of Michael, when he was really the younger. Without uniformly evincing the ſame excellence as his brother, he is ranked among the celebrated artiſts of the French ſchool. After reſiding ſome time at Rome, he returned to Paris, and was ſoon after nominated a profeſſor of the French academy. He painted, at Notre Dame, "St. Peter delivered from Priſon;" and for the church of the Carmelites, "The Appearance of our Saviour to St. Thereſa and St. John, after his Crucifixion."

Like his brother, he etched ſeveral pieces of his own compoſition, as well as from thoſe of the Caraccii.

It is to Jean Baptiſte Corneille that we owe the publication of the fineſt ſtatues of Florence and Rome, reduced from actual meaſurement, of which himſelf engraved the greater number; the others were executed by F. Mariette, and C. Simoneau.

Among the pieces engraven by himſelf, may be mentioned "The Buſt of Michael Angelo." "Suſanna ſurpriſed in the Bath." "St. Auguſtin, ſeated in a Garden, in the Midſt of his Diſciples." "A half length Figure of St. Bernard." "Jeſus Chriſt appearing to St. Thereſa and St. John, after the Crucifixion," from his own painting in the Carmelite church at Paris. "The Buſt of Monſieur, crowned by Victory, with the Trophies taken at the Battle of Caſſel." "A Medallion of Apollo contemning Love." "A Medallion of Daphne transformed into a Laurel." "Virtue preparing her Crowns," an octagon. "An oval Medallion of Apollo playing at Quoits with Hyacinthus." "The Moon mounted on her Chariot drawn by Stags," finiſhed by J. Mariette. "Mercury in an Orb," finiſhed by the ſame. "Diana diſcovering the Intrigues of Caliſto." A collection of fifty plates of deſigns for the uſe of architects. The plates for the elements of painting, by M. de Piles. "St. John the Baptiſt in the Deſert," a landſcape from Annibal Caracci. "The Samaritans," a landſcape from the ſame. "St. Francis branded with Diſgrace," from the ſame.

Several artiſts have engraven from the originals of Jean Baptiſte. J. Mariette alone has himſelf engraven and cauſed to be executed fifty-five of his pieces.

Henry Mauperche was born at Paris A. D. 1606, and died in the ſame city in 1686. We are not informed whether he ever viſited Italy, though this ſeems highly probable, for his ſtyle of painting and engraving greatly reſembles that of Herman Swanevelt; after whom he has engraven ſeveral landſcapes.

He became a member of the royal academy, and though a landſcape painter, was nominated profeſſor in 1655. Fourteen hiſtorical landſcapes were painted by him on the walls of one of the royal apartments at Fontainebleau. He has alſo engraven ſeveral landſcapes, the greateſt number of which are of his own compoſition, of which the following claim reſpectful attention. A ſeries of ſix plates from the ſtory of Tobias, in folio. A ſeries of ſix plates illuſtrative of the life of the Virgin Mary, from the Annunciation to the flight into Egypt, in folio. A ſeries of twelve landſcapes from Swanevelt, in 4to. Two ſubjects from the Bible; 1ſt. "The Prodigal Son ruined by Courteſans." 2d. "The Prodigal Son received by his Father," inſcribed "H. Mauperché inv. pinx. et fec." in folio. Two landſcapes, with ruins and figures, id. fec. in folio. Two mountainous landſcapes, with buildings and figures, id. fec. in folio. A landſcape from the fable of Marſyas, id. fec. in folio.

Laurent de la Hire was born at Paris in 1606, and died in the ſame city in 1666. His father Stephen de la Hire, who had long exerciſed the profeſſion of a painter in Poland, obſerving the promiſing talents of his ſon, inſtructed him in the principles of his art. Young de la Hire afterwards ſtudied in the ſchool of Vouet, and was the firſt pupil of that maſter who ſtruck out for himſelf a new path. Notwithſtanding ſome imperfections, his paintings acquired him great reputation, and he was received into the academy in 1648.

But it is rather as an engraver, than as a painter, that we ought to regard de la Hire. He has engraven, in a light and elegant ſtyle, ſeveral pieces after his own compoſition. "A Holy Family, in which St. John is ſeen kiſſing the Feet of the Infant Jeſus." This piece is inſcribed L. de la Hire inv. et ſc. in folio. Another "Holy Family." This is a very fine landſcape, into which a great number of angels are introduced, id. fec. folio. "A landſcape." In this piece the Virgin Mary is ſeated on the ground, behind her St. Joſeph, and before her the Infant Jeſus, who bruiſes a ſerpent with a croſs brought by angels, id. fec. 1639 in folio, "A Repoſe during the Flight to Egypt;" a beautiful landſcape in folio, id. fec. "Chriſt with the Holy Women, and St. John, at the Foot of the Croſs;" inſcribed L. de la Hire, 1639. aq. fort. in folio. "The Converſion of St. Paul," id. fec. in folio. This piece is deſervedly admired. "The Judgment of Paris," in a beautiful landſcape, id. fec. in folio.

Iſrael Henriet was born at Nancy in the year 1607, and died at Paris in 1661. He was the ſon of Claude Henriet, a painter from Châlons, who had ſettled at Nancy. He went to Rome with the view of improving himſelf in the art of painting, under the direction of Antoine Tempeſta; but it ſhould ſeem that his progreſs was not conſiderable. On his return to his native country he ſettled as a printſeller at Paris, and Callot, de la Bella, and eſpecially Iſrael Silveſtre, his nephew and pupil, were employed by him. His ſtyle of engraving is ſimilar to that of Callot, with whom he was connected in the ſtricteſt bonds of friendſhip. At his death, Silveſtre inherited all his plates, which were extremely numerous. Iſrael Henriet has left behind him a vaſt variety of views and ſmall pieces from his own hand.

Remi Vuibert, or Wiburt, who was educated by Vouet, is ſuppoſed to have been a native of Paris, and to have been born about 1607. He reſided chiefly at Rome, where he executed ſeveral etchings from Raphael, Guido, Dominichino, and other Italian maſters, as well as from his own deſigns, among which the following are moſt remarkable. "The Cure of one poſſeſſed by the Devil," from a deſign of his own, dated 1639, in folio, nearly ſquare. A ſeries of arabeſque and groteſque figures, painted by Raphael for the Vatican, 13 pieces in folio; the ſame figures which were ſubſequently engraven by G. Audran. "Adam and Eve eating the forbidden Fruit," from a picture in the Vatican, by Raphael, 1635, 4to. "The Deciſion of Solomon," from the ſame, 1635, ſmall folio. "Marſyas conquered by Apollo," from the ſame, in 4to. "Providence governing the World," from the ſame, 4to. "The Deſcent from the Croſs," after Pouſſin, in folio; this piece has likewiſe been engraven by Stephen Gantrel.

Nicolas

Nicolas Mignard was born at Troyes, in Champagne, in the year 1608, and died at Paris in 1668. He acquired the udiments of art under Jean Boucher, of Bourges, and carefully ſtudied the antique ſtatues and pictures of Primaticcio and of M. Roux, preſerved in the palace of Fontainebleau. He afterwards took a journey to Italy, and, on his way thither, ſtopped at Avignon, where he became a huſband. During the period he remained with his father-in-law, he received the appellation of Mignard of Avignon. From this city, he departed for Rome, in order to improve himſelf in art. He painted ſeveral hiſtorical ſubjects for the palace of the Thuilleries; ſome portraits, by which he acquired great reputation; and he engraved the following eight plates from the pictures of Annibal and Agoſtino Caracci in one of the apartments of the Farneſe palace. 1ſt. "The Choice of Hercules." 2d. "Hercules repoſing after his Labours." 3d. "Hercules ſupporting the Globe." 4th. "Ulyſſes braving the Song of the Syrens." 5th. "Amphinome and Anape." 6th. "Perſeus ſtriking off the Head of Meduſa." 7th. "The Rape of Ganymede." 8th. "The Triumph of Bacchus."

Michel Dorigny was born at St. Quentin in 1617, and died at Paris in 1665, the diſciple and brother-in-law of Vouet, he conſtantly imitated the ſtyle of his maſter. Some pictures were executed by him for the chateau of Vincennes. Dorigny engraved more than a hundred pieces from deſigns by his father-in-law, in which he has faithfully preſerved the character of the originals. His execution is bold and deciſive; he well knew how to economiſe his light, and to impart to his draperies an eaſy and natural caſt. But he was not equally ſucceſsful in drawing, eſpecially of the hands and feet of his different perſonages. He executed, from his own invention, a ſeries of ſix plates, repreſenting the feſtivals of fauns, ſatyrs, bacchantes, &c. in folio; and from Vouet he etched the following:

"The Nativity of our Saviour," in folio. "Apollo aſſuming the Guidance of the Chariot of the Sun," in folio. "Apollo killing with his Arrows the Serpent Python," in folio. "Peace deſcending on Earth," in folio. A landſcape, in which the Holy Family is introduced, a ſmall folio, dated 1649. "The Harpies driven from the Palace of Phineas by the Children of Boreas," in folio. "Venus at her Toilet," ſmall folio. "Venus and Hope plucking the Wings of Love," ſmall folio. "Mercury and the Graces," from the ſame. "The Rape of Europa." "Iris tearing the fatal Hair from Dido on the funeral Pile," in folio. "The Kings of Arabia and Saba, with their Attendants bringing preſents to the Infant Jeſus." This ſubject was executed for the cieling of the hotel de Fermes, and is engraved in the manner of a frieze, on four plates.

Nicholas Robert was born, according to ſome accounts, at Langres, and from others at Orleans, in 1610, and died at Paris in 1684. Beſides his productions as a painter, Robert engraved the moſt rare flowers, birds, and the animals of the royal menagerie. He alſo etched, in conjunction with Gerard Audran, ſix cielings, and ſix plates of vaſes from George Charmeton.

Gregoire Huret was born at Lyons in the year 1610, and died at Paris in 1670. His engravings are numerous, and many of them from his own deſigns. "His compoſitions are neither learned nor judicious, and his drawing by no means correct. He worked with the graver only, in a coarſe, heavy ſtyle, apparently a diſtant imitation of that of Poilly." Such is the account which Strutt gives of this artiſt; Watelet ſpeaks much more favourably, but our countryman will probably be found nearer the truth.

We begin our liſt of his principal works, with the portraits which he has engraven, and which are of the folio ſize.

Jaques Bouceau equerry, lord of Baranderée, from A. de Vries. Francis de Bonne, duke of Leſdiguerres, conſtable of France, from Dumouſtier. This piece has a border with emblematical figures. Pierre Seguier, chancellor of France, in an ornamented frame, ſigned Greg. Huret fecit. An allegorical portrait of the author of the work entitled "De la Souveraineté de Roy." A ſeries of thirty-two plates illuſtrative of the paſſion of love. The liſts of his hiſtorical and allegorical engravings, which are alſo of the folio ſize, are,

"The Condemnation of St. Stephen." "St. Peter preaching to the Chriſtians, who receive the holy Spirit." "A Holy Family, with St. Catherine and another Saint." "The miraculous Image of our Lady of Lieſſe," inſcribed to the ducheſs de Nemours, 1655, a large folio. "Chriſt with the Crown of Thorns." "Louis XIII. and Queen Anne preſenting the Dauphin to the holy Virgin," dated 1638. "Wiſdom, Peace, and Eloquence ſupporting the Arms of Richelieu," 1638. "Frontiſpiece to the Hiſtory of the civil Wars of France."

The date of the birth and that of the death of Jaques Bellange have not been recorded. Strutt ſays that he flouriſhed towards the cloſe of the laſt century, and Huber that he was born ſome time about 1610, but both agree that he was a native of Chalons. He learned the rudiments of drawing under Claude Henriet, and afterwards ſtudied at Paris in the ſchool of Vouet. Baſan ſays of him that "he was a bad painter and a worſe engraver," and that, "in his etchings, which are from his own compoſitions, we find much fire, more caprice than judgment, little correctneſs, and very bad taſte;" but Mr. Strutt thinks this ſentence too harſh, and, commenting on Bellange's plate of the Virgin Mary and infant Chriſt, ſays that the ſtyle of engraving in which it is executed, "however ſingular, is by no means deſtitute of merit: his drawing appears to me to be incorrect rather from affectation than want of knowledge; the whole figure of the child is well executed; there is indeed an awkwardneſs in the turn of the figure of the Virgin, and the character of her head is childiſh." His etchings in general are ſlight, but free, and often maſterly; and he ſometimes, in the nudities of his figures, introduced ſtippling with the graver, by way of harmonizing and ſoftening the roughneſs of his etching.

Bellange left behind him fifty engraved plates, of which the principal, of a folio ſize, are as follows:

"The Holy Family, with St. John and St Catherine," a large upright. "The Annunciation," of a ſquare form. "The Reſurrection of Lazarus," an upright. "The Adoration of the Magi." A ſet of three ſingle figures of Eaſtern Kings, *viz.* Caſpar of Tarſus, Melchior of Nubia, and Balthaſar of Sheba. "Chriſt bearing the Croſs," large. "A dead Chriſt, ſupported on the Knees of the Virgin," ſmall folio. "The Three Marys viſiting the Sepulchre." "St John the Baptiſt in the Deſert." "The Martyrdom of St. Lucia." "The Death of Virginia." "Adonis bearing Diana on his Shoulders." "A back View of a Warrior ſtanding, and a Female leaning on a Drum, with a City in the diſtance." A ſeries of five female figures ſtanding in different attitudes. A ſmall oval of "St. Mary Magdalen, with her Hand on her Boſom."

Pierre Daret was born at Paris in the year 1610: after acquiring the rudimental principles of engraving in France, he went to Italy to complete his ſtudies, and remained there a conſiderable time; but finally returned to his native city, and

and died there at a very advanced period of life. He was not only a deſigner and engraver, but had ſome pretenſions to literature. Florent le Comte informs us that he compoſed a life of Raphael, which was printed in the year 1656, but it is little more than a free tranſlation of that from the pen of Vaſari. A portrait of Raphael is prefixed to the volume.

Strutt's ſummary of the talents of this artiſt is as follows: "his works are chiefly performed with the graver, without any other aſſiſtance. The mechanical part of his engraving is cold and ſilvery, the effect flat and unharmonized, and the drawing of the naked parts of his figures is frequently incorrect and heavy, more eſpecially the extremities. His works are in number very conſiderable, amounting to upward of two hundred and ninety-ſix prints." According to Huber they are much more numerous; and many of them are marked with his cypher, for which the reader is referred to our plate of the monograms, &c. of the French ſchool of engravers.

The following are ſome of the hiſtorical pieces executed by Daret from different maſters, and are all of the folio ſize.

"St. John ſeated in the Deſert, with a Lamb on his Knees," from Guido. "The Madonna ſuckling the Infant Jeſus," from Annibal Caracci. "St Peter delivered from Priſon," after Dominichino, a large upright. "Jeſus laid in the Sepulchre," from Baroccio. This piece appears under the name of P. Mariette. "A Holy Family, in which is introduced an Angel preſenting Fruit to the Infant Jeſus," from S. Vouet. "A dead Chriſt mourned over by holy Women," from the ſame. "St. Jerome ſeated in the Deſert, writing," from Blanchart, a half-length figure. "Thetis requeſting Arms for Achilles," from the ſame. "Charity, with Five Infants," from the ſame. "The Viſitation, or meeting of the Virgin Mary and St. Elizabeth," from M. Corneille the father. "The Virgin ſeated with the Infant Jeſus," from the group of Jac Sarazin. Upwards of a hundred ſmall plates for a work entitled "La Doctrine des Mœurs," publiſhed by M. Le Roy, of Gomberville, in 1646, from the deſigns of Otho Vænius.

Among the portraits of P. Daret, we find, of the quarto ſize, a buſt of Alexander the Great, with illuſtrations from Plutarch. Pope Alexander VIII. Charles I., king of Great Britain. Henry of Bourbon, prince of Condé, firſt prince of the blood. Charlotte Marguerite de Montmorency, princeſs of Condé. Donna Olympia Maldalchini. Bernard de Saxe, duke of Weimar. Henry de la Tour d'Auvergne, viſcount de Turenne.

And in folio, queen Anne, with the two princes on the throne, for the Hiſtory of Mezeray. Marguerite Gaſton, ducheſs of Orleans, 1652. Louis le Fevre de Caumartin, chancellor of France. Ladiſlaus IV., king of Poland, engraven in 1645.

Louis Boullongne, the father, was a native of Picardy, and born in 1610. After paſſing ſome years in Italy, he returned to France, and ſettled in Paris, where he died in the year 1674, having for ſome time enjoyed the reputation of being an excellent artiſt, and the honour of being profeſſor to the French Academy.

He engraved from his own pictures the Miracle of St. Paul at Epheſus, and the Decollation of that Apoſtle at Rome. He alſo, during his reſidence at Rome, executed a plate from Guido of the Rape of Helen.

Boullongne left behind him two ſons, of whom Bon, who was born at Paris in the year 1649, and died in that city in 1717, was the elder. While under the tuition of his father, he diſplayed conſiderable talent, he however paſſed five years at Rome, after which he proceeded to Lombardy, where he ſtudied the works of Correggio, and the Caraccii. An able deſigner, and good colouriſt, his manner partook of the perfections of both theſe great maſters; he likewiſe excelled in compoſition; and all his productions, but particularly his Reſurrection of Lazarus, are ſtamped with a grand character.

Bon Boullongne engraved ſeveral pieces of his own compoſition, among which are, "a Holy Family," in folio. "St. John preaching in the Deſert," a large upright. "St. Bruno ſeated in a Landſcape," and its companion, both in folio. The frontiſpiece to an almanack, engraven in 1694; and, a ſatire againſt the author of Mercure-galant, who amuſed himſelf at the expence of painters: beneath are the following words: "Ah ha, galant vous raiſonnez en ignorant."

Louis Boullongne, the younger brother of Bon, was born at Paris A.D. 1654, and died in the ſame city in 1734. Having received the ſame inſtruction as his brother, he ſet out for Italy. During his ſtay in Rome he copied ſeveral of Raphael's pictures; and it was from his copies that thoſe celebrated works were executed in the tapeſtries of the Gobelins. On his return from Italy he was admitted into the Royal Academy, in conſequence of his pictures of "Auguſtus ſhutting the Temple of Janus," the "Flight into Eygpt," painted for the church of Notre Dame, and the "Preſentation in the Temple." After the death of Ant. Coypel he was nominated firſt painter to the king, and chevalier of the order of St. Michael.

He etched the following plates, which, though ſpirited and free, are not correctly drawn. "A Holy Family," in 4to. in which the infant Jeſus is holding a bird in his hand. Another "Holy Family." "A dead Chriſt, ſurrounded by Saints, Women, and his Diſciples," in folio. "The Martyrdom of St. Peter," an upright, in folio. "The Martyrdom of St. Paul," in folio, its companion. "The Flagellation of St. Andrew," from Paul Veroneſe, in folio. "St. Bruno," in folio. "A Roman Charity," in folio.

Abraham Boſſe was born at Tours A.D. 1610, and died at Paris in 1678. Beſide his engravings, which amount (according to Huber) to eight hundred in number, and the greater part of which are from his own deſigns, he is the author of certain eſſays on perſpective and architecture, which have been printed; and he has the honour of being the firſt Frenchman who produced a treatiſe on the art of engraving; a work of which M. Cochin has given a new and improved edition, and of which there is an Engliſh tranſlation.

Under what maſter he ſtudied, his biographers have not mentioned. In the ſtyle of his engraving, he was the evident imitator of the coarſer manner of Callot, and for the moſt part employed the hard varniſh, (for which ſee the article ETCHING,) which that artiſt invented. The execution of his plates is accordingly clear and pleaſing, poſſeſſing much of that peculiar brilliancy of line which the graver produces; yet his lights are in general too much ſcattered.

Boſſe drew with a certain degree of ſpirit, but rather with ſpirit than with truth, and finiſhed his etchings by partially re-entering the corroded lines with the graver: but his practice, as well as his theory, was fettered by a ſuperſtitious preference, which appears to have originated in Germany, for the clear and clean cut lines which the latter inſtrument produces. Hence he imitated, whilſt etching, the work of the graver, and hence, in his treatiſe, he erroneouſly taught others to eſtimate the value of etching, by its degree

of reſemblance to the lines produced by the graving tool; a very falſe criterion of merit, and upon which Watelet juſtly remarks, that it is better to impart to each ſpecies of engraving the character peculiar to it; to leave to etching its freedom and playfulneſs, and to the graver its wiſdom and ſeverity.

Boſſe was a member of the Royal Academy of Paris, but the independence of his character led him to reſiſt the real or imaginary deſpotiſm of Le Brun, who at that time (ſays Huber) reigned over the arts with imperious ſway, and he was expelled in conſequence. Of his numerous engravings, the following will probably be found moſt worthy of notice:

Portraits of the queen dowager ſitting, with the young king of France and his brother ſtanding by, in folio, and without the ſignature of the artiſt. The portraits of cardinal Richelieu, and of Callot the engraver, with his epitaph, are alſo of the folio ſize. The king and queen of France addreſſing their prayers to the holy Virgin, of the proportions of a frieze. "Judith with the Head of Holofernes." "A Figure wrapt in a Mantle, leaning againſt a Tree," engraved by Boſſe and Mellan. "The preparation of a Chriſtian Soldier for ſpiritual Warfare." "The French Army." "The Siege of la Motte." "The Reduction of Mantua." All of the folio ſize. "The Adoration of the eaſtern Kings," in 12mo. "The Virgin ſitting, with the infant Jeſus on a Pedeſtal, behind her St. Joſeph," 12mo. "The Hiſtory of Dives and Lazarus," ſix pieces in folio. "The Hiſtory of the Prodigal Son," in folio. "The Parable of the wiſe and fooliſh Virgins," ſeven pieces in folio. "The ſeven Works of Miſericordia," in folio. "The Miraculous Image of St. Anne," folio. "The magnificent Proceſſion of the Hunt of St. Genevieve," folio. "Ceremony obſerved at the contract of marriage between Ladiſlaus IV. king of Poland, and Maria de Gonzague, which took place at Fontainbleau in 1645," folio. "Marriage ceremony of Louis XIV.," folio. "The hall of Charity," folio. "The Gallery du Palais Marchand," folio. The painter, ſculptor, engraver, and printer, engaged in their reſpective employments, a ſet of four plates, folio. A ſchool-maſter and ſchool-miſtreſs, two plates, folio. The four elements in the coſtume of the times, demi-figures, four ſmall pieces in 4to. The four quarters of the globe, in medallions, four plates in 4to. The four ſeaſons, repreſented by ſubjects of converſation, a ſet of four plates, in folio. The five ſenſes, repreſented in the ſame manner, on five folio plates.

Boſſe alſo engraved a few plates from Bourdon, Bellange, Deleſtain, Paul Farinati and others, and has been cenſured for devoting (either from choice or neceſſity) a portion of his time to trifling and temporary ſubjects, ſuch as fans, and affairs of French gallantry, which we forbear to enumerate.

Claude Dervet was born at Nancy in the year 1611, and died in 1642. He was the pupil of Iſrael Henriet, and the friend and fellow-citizen of Callot, whoſe ſtyle of engraving he ſucceſsfully imitated.

Of all his engravings, the two following are only known to us; they are both of the folio ſize.

Charles IV., duke of Lorraine on horſeback, ſurrounded with military inſignia, with the following inſcription on a cannon, C. Dervet fec. 1628. This piece was engraven for a book entitled "Triumpho de S.A. Charles III. Duc de Lorraine à ſon Retour dans ſes Etats," Nancy, 1604. The invention of this piece is attributed to Callot, and the little view, which accompanies the portrait, of the city of Nancy, is engraven by F. Clere. "A Pallas on horſeback, holding, in her right Hand, a Club." The invention of this piece has alſo been attributed to Callot.

Pierre Lombart was born at Paris in the year 1612, and is ſuppoſed to have frequented the then popular ſchool of Vouet; but it is not known where, or under whoſe inſtruction, he acquired the rudiments of the art of engraving. After exerciſing his profeſſion for ſome time in Paris, he repaired to London, and the reader will find his principal works, and the ſtyle of his engraving ſpoken of in our account of the origin and progreſs of Engliſh engraving; and his cypher, or mark, among thoſe of the French ſchool of engravers.

Of ſuch of his works as were executed in France (in addition to thoſe which we have already mentioned) we are enabled to ſupply the following liſt:

"St. Michael's Victory over Satan, or the Commencement of the Millennium," after Raphael, from the celebrated picture which was formerly at Verſailles. "The Virgin and Child ſeated on a Throne," from Annibal Caracci. "The Adoration of the Shepherds," from Pouſſin. An "Holy Family," in which the infant Jeſus is careſſing St. Joſeph; all which are of the folio ſize.—The following portraits are alſo from the graver of Lombart. The painter Walker, from a picture by himſelf, in folio, an oval. Sir Samuel Moreland, after ſir Peter Lely, in 4to. an oval. Anne Hyde, ducheſs of York, from the ſame painter, in 8vo, an oval. Jeremy Taylor, with a Latin inſcription, folio. Thomas Morant, marquis du Meſnil, maſter of requeſts, folio, an oval. Gabriel Chaſſebras, de la grand maiſon, maſter of the mint, folio. Jean Dallaens, miniſter of the goſpel, from W. Vaillant, folio. Anthony, duke de Grammont, from the ſame, folio. Pierre de Maſſart, counſellor to the king, from Cl. le Febure, folio. Chriſtianus Ludovicus, Dei gratia, dux Megapolitanus, princeps Vandalorum; inſcribed Richart de la Mane pinx. P. Lombart ſc. Pariſiis, 1670, folio. Vincentius Nevelet, in ſuprema regia curia ſenator, folio. William Daviſon, firſt phyſician to the king of Poland, after Schulz, folio. Brianus Waltonus, S.T.D. Cantab. coll. folio. This is a ſcarce print, but the following is among the ſcarceſt and beſt of the engravings of Lombart, *viz.* "In effigiem Domini de la Fond," a print perhaps better known under the title of "Gazzetier a Hollande," after H. Gaſcard.

Jean Morin was born at Paris in the year 1612, or thereabout, and died in the ſame city in 1666. According to Strutt's account of him, "he was a man of great ability; he ſtudied painting under Philip Champagne, but relinquiſhed that art in order to follow engraving. His plates are executed in a ſingular ſtyle; a mixture of lines and dots, harmonized with each other ſo as to produce a very agreeable effect. They are chiefly etchings; for he does not appear to have underſtood the management of the graver, by any means equal to that of the point. His portraits, which form the more numerous part of his works, are many of them executed in a maſterly manner, and though not finiſhed with all the preciſion and delicacy which the graver is capable of producing, manifeſt at leaſt the good taſte, freedom of hand, and knowledge, of the artiſt." Among the more eſtimable of his works, are the following:

"Head of St. Vincent, in the chapel of St. Germain of Auxerre." This is really the portrait of Morin himſelf painted by his friend Champagne. From the ſame painter he has engraved, of the folio ſize, "The Adoration of the Shepherds." "The Virgin Mary careſſing the infant Jeſus." "The grand Crucifix," a capital piece engraved

on three plates. "Jeſus Chriſt dead on the Croſs." "The Virgin carried up to Heaven by Angels," from a ceiling. Two plates, companions, of which the ſubjects are, "St. Peter, and St. Paul," half-lengths. Another pair, of "St. Jerome and St. Bernard." Two pieces, repreſenting "Groups of Angels in the Air," in quarto. A frontiſpiece to the pſalms of David, in 8vo. "The Virgin holding a Bunch of Flowers, with the Infant Jeſus on her Knees, who is placing a Roſe in the Boſom of his Mother," Raphael pinx. with the motto "Dilectus meus mihi," folio. "The Virgin adoring the infant Jeſus ſleeping on Straw," from Titian, folio; a beautiful ſpecimen of the engraver's ability. "The Virgin contemplating the Body of Jeſus extended on the Earth," from Caracci. "A Landſcape with Ruins, under which Goats are ſeen browſing," from Claude Lorrain, in 4to. In this, as in moſt of the following, Morin has attempted to finiſh the diſtances with dots, but with no great ſucceſs. A landſcape with a ruſtic houſe, and in the fore ground a man driving cows, from Fouquier, in folio. A mountainous landſcape, in the fore ground is ſeen a traveller on horſeback, preceded by a man on foot, from the ſame; large folio. Four landſcapes, with ruins and figures, from Corn. Polenbourg, in folio. A landſcape, on one ſide of which is an antique fountain, and on the other ruins, from L. B. Corneille, in folio.

The following twenty-four of the moſt beautiful portraits of Morin, are from Champagne, and are of the folio ſize. Louis XIII. king of France, an octagon. Anne of Auſtria, Regent, bare-headed. Anne of Auſtria, in weeds, and a black mob-cap. Jean Baptiſte Amador, abbe of Richelieu. Armand, cardinal de Richelieu, an octagon. Jules, cardinal de Mazarin. Corneille Janſenius, biſhop of Ypres. Jean Paul de Gondy, archbiſhop, and afterwards cardinal of Rez. Pierre Bertier, without letters, his hair curled, ſmall muſtachios, and the biſhop's croſs. Francis de Sales, biſhop of Geneva, without the painter's name, an octagon. S. Charles Borromee, cardinal and archbiſhop of Milan, an oval. Jean Pierre le Camus, biſhop of Bellay, an octagon. Jean du Verger of Haurane, abbe of Saint Sarin. Michael de Morillac, keeper of the ſeals. Michael Tellier, ſecretary of ſtate. Jaques Tubœuf, preſident of the chamber of accounts. Rene de Longuevil, ſeigneur de maiſon, preſident a mortier. Henri de Lorraine, count d'Harcourt. Nicolas de Neuiville, marquis of Villeroy. Charles de Valois, duc d'Angouleme. Robert Arnauld, lord of Audilly. Vincent Voiture, of the French academy. Jaques le Mercier, firſt architect to the king. Antoine Vitré, a celebrated printer at Paris, an octagon.

The following portraits by Morin, are from various other maſters:

Jaques-Auguſte de Thou, preſident of the parliament; Ferdinand pinx. in folio. Francis Auguſtin de Thou, preſident of the Parliament; Ib. pinx. in folio. Guido, cardinal de Bentivoglio; A. Van Dyke pinx. in folio. An anonymous portrait of a lady. Ib. pinx. in folio. This is the portrait of the counteſs de Boſſu. An anonymous portrait of a man with a ſhort beard, and the head bare. Ib. pinx. This is the portrait of Charles de Mallery, engraver and print-ſeller at Antwerp. Dom Gregoire Tarriſſe, ſuperintendant general of the congregation of St. Maur. Dunſtan pinx. Hieronyme Franeque, painter to the king. Se ipſe pinx. an octagon, in folio.

Jean Boulanger, was born at Troyes about 1613, and died at an advanced age, in Paris, where he publiſhed a great number of prints, both of his own compoſition, and from other maſters.

Boulanger is preſumed by Strutt to have formed his firſt manner of engraving on that of Francis de Poilly; he was the contemporary of Morin, and like him endeavoured to impart a ſoftneſs and mellowneſs to his fleſh by dotting or ſtippling. But Morin produced his dots by aqua-fortis, while Boulanger employed the graver; and as the draperies and back grounds of his prints are engraved in lines, with little or no intermixture of ſtippling, an effect of more or leſs of diſſonance is generally produced, and the back grounds of his portraits and his Madonnas are more eſpecially coarſe and harſh; but notwithſtanding this defect, and that he did not draw the naked parts of his figures either with correctneſs or fine taſte, the peculiarity of his manual execution, and the care which he has manifeſted, have obtained him many admirers. In ſubſcribing his name to his engravings, he has frequently joined the J of his baptiſmal name to a ſmall b, in ſuch a manner as greatly to reſemble an H, and hence it is ſometimes erroneouſly read Houlanger, and has ſometimes been ſo inſerted in printſellers' catalogues.

Of the following ſubjects, thoſe which are mentioned firſt are of his own invention.

Two buſts, the one of our Saviour, the other of the holy Virgin, with her eyes caſt down, in folio. An oval buſt of the Virgin, with a border of laurel leaves, in folio. "The Virgin, with the Infant Jeſus," a half-length figure, in folio. Another of "The Virgin with the Infant Jeſus on her Knees, who is taking a Croſs from the Hands of St. John," and alſo a half-length figure, without a name, in folio. "The Virgin ſitting with the Infant Jeſus on her Knees, preſenting Pinks to him," a print known under the name of "La Vierge à l'oeillet," from Raphael, folio. A buſt of the Virgin with her eyes caſt down, having the following inſcription: "Mater amabilis," from the ſame; in folio, in a circle. "The Virgin holding the Infant Jeſus, to whom St. Joſeph is giving ſome Cherries," from Caracci, large folio. "The Virgin of Paſſau," from Salario, folio. "The Virgin ſitting with the Infant Jeſus aſleep in her Arms," from Guido, in folio. "The Virgin, with the Infant Jeſus and the little St. John who kiſſes her Feet," from the ſame, formerly in the cabinet of the French king, folio. This print has a very ſtriking effect. "Holy Family," from Noel Coypel, the father, folio. "A Holy Family," here the Virgin is repreſented kiſſing the Infant Jeſus," half-length figures, without the name of the painter, which is Nic. Loir, in 4to. "An Infant Chriſt," inſcribed "Salvator Mundi, miſerere nobis," from the ſame, 1651, in 4to. "Chriſt bearing his Croſs," by Nic. Mignard, in folio, large. "A Virgin holding the Infant Jeſus ſtanding, St. John embracing his Knees," from P. Mignard, in 4to. "The Deſcent from the Croſs," from a painting in the church of St. Benedict, painted by S. Bourdon, a large folio. "Jeſus Chriſt carried to the Sepulchre," from the ſame maſter, a large folio. "A large Crucifix," with a back ground, from Ch. le Brun, a large folio. A piece of ſuperſtitious folly, entitled "The Interior of the Virgin, with the Holy Ghoſt next her Heart," from the ſame. Buſt in folio. "The venerable Père Michael le Nolle, to whom the Virgin preſents a Crown," from the ſame, in 4to. "St. Francis de Paule, Founder of the Minimes," from S. Vouet, in folio. "The Body of Jeſus Chriſt borne away by Joſeph of Arimathea," from a picture by Claude le Febure, a large folio. "The magnificent Proceſſion which took place at Paris on the day that Louis XIV. attained to his Majority," from F. Chauveau.

Boulanger alſo engraved a conſiderable number of portraits, among which is that of Charles II. of England.

Simon Renard de St. André was born at Paris in the

year 1614, and died in the ſame city in 1677. He was educated a painter, and ſtudied under Louis Bobrum, but the following etchings, which are held in ſome eſtimation by the collectors of French art, are from his hand. "An Infant Chriſt contemplating the Croſs, which he holds on his Knees." A ſet of forty-ſix folio plates from the paintings and ſculpture in the gallery of the Louvre, conſiſting chiefly of bloated allegory, and fulſome compliment to Louis XIV. after Le Brun. "The Crucifixion," alſo in large folio, and from the ſame painter. This appears without the name of André, but is known to be from his hand. F. de Poilly has engraven from the ſame original.

Giles, or Egidius Rouſſelet, was born at Paris A.D. 1614, and died in the ſame city in 1686. He appears to have ſtudied in the ſchool of De Poilly and from the works of Bloemart, for his ſtyle partakes occaſionally of the merits and peculiarities of both thoſe artiſts. Rouſſelet drew with tolerable correctneſs, and diſcriminated the textures of the various ſubſtances repreſented in his engravings with more ſucceſs than moſt of his predeceſſors.

More than three hundred and thirty of his prints have been enumerated, of which number the following will probably be found moſt worthy of the notice of the connoiſſeur.

"A Holy Family," from Raphael, dated 1650, in folio. In this piece is repreſented the Virgin ſitting before the Infant Saviour, while St. John is preſenting him with a bird. "A Holy Family," from a painting of Raphael, formerly in the poſſeſſion of the duke of Orleans, engraven in 1656, folio. Here St. Joſeph is kneeling and preſenting flowers to the Infant Jeſus, who is ſeated on the knees of his mother. Another "Holy Family," from a painting of Raphael, formerly in the poſſeſſion of the king of France, known under the name of "The Virgin of Fontainbleau, or the fair Gardener." In this piece the Virgin is ſeated, with the Infant Jeſus by her ſide, and the little St. John kneeling before him. "A Holy Family," from a painting of Raphael, formerly at Verſailles, and which Louis XIV. cauſed to be engraven by G. Edelinck, folio. "St. Michael overcoming the Devil," from a picture by the ſame maſter, formerly in the cabinet of the French king, a piece frequently engraven, folio. "The Virgin with the Infant Jeſus, to whom St. John is preſenting a Croſs," from Guido, a piece falſely marked with the name of Caracci, folio. "The Annunciation," from Guido, folio. "St. Francis in Meditation," from the ſame, folio. "David with the Head of Goliah," from the ſame, folio. A ſet of four plates of the "Labours of Hercules," from the ſame maſter, formerly in the cabinet of the French king, in folio; *viz.* 1. "Hercules ſlaying the Hydra of Lerna;" 2. "Hercules ſtruggling with Archelaus;" 3. "Hercules ſlaying the Centaur Neſſus, the Raviſher of Dejanira;" 4. "Hercules on the Funeral Pile." Theſe are very diſtinguiſhed prints, and of the upright form. "David playing on the Harp," from Dominichino, folio. "St. Catherine preſenting a Lily to the Infant Chriſt, lying on the Knees of his Mother," from P. de Cortona, folio. "Jeſus Chriſt carried to the Sepulchre," from a painting by Titian, in the cabinet of the French king, a large folio, finely executed. A ſet of four plates of the Evangeliſts, from pictures by Valentino, formerly in the cabinet of the French king, nearly ſquare. "The Virgin Mary," from Jacques Blanchard, in folio. "Eliazar preſenting a Bracelet to Rebecca," from a celebrated picture by Pouſſin, formerly in the cabinet of the French king, in folio. The "Holy Family," in which the Infant Jeſus is holding an apple, and ſitting above a fountain, from Bourdon, in folio, "St. John the Evangeliſt," from the ſame, in folio. A large "Crucifix," with a dark ſky, in which are ſeen two groups of little angels, and two heads of cherubims; in the back ground, the city of Jeruſalem, from le Brun. "The Body of Jeſus Chriſt placed before the Virgin at the Foot of the Croſs," from the ſame, both in large folio. "A Holy Family," from the ſame, in folio. Here the Infant Jeſus is repreſented as if expounding the ſacred ſcripture. "A Magdalen," inſcribed "Remittuntur ei peccata," from the ſame, a half-length figure in an oval, folio. "St. Bernard kneeling before the Virgin," from the ſame, in folio. "St. Thereſa in Contemplation," from the ſame, folio. "The Great Thèſe of count de St. Pol," in which Louis XIV. is ſeen on horſe-back, from the ſame.

Portraits.—Francis Hedelin, abbé of Aubignac. Egid. Rouſſelet ad vivum ſc. 1663, in 4to. Charles le Fevre, abbot of St. Geneviéve, inſcribed G. Rouſſelet del. et ſc. in folio. Francis Boulart, abbot of St. Geneviéve, in folio. Charles de Valois, duke of Angoulême, oval, in folio. Meſſire Pierre Seguier, chancellor of France, with ſupporters, from Le Brun, in folio. Richard de Belleval, chancellor of the univerſity, from the ſame, in folio. Frontiſpiece to the Polyglott bible, after Sebaſtian Bourdon, an engraving of conſiderable merit, wherein Fame is repreſented bearing the medallion of cardinal Mazarin, and Hiſtory preſenting the Holy Scriptures to France.

Samuel Bernard was born at Paris in the year 1615, and died there in 1687. He is ſaid to have been a pupil of Vouet, and to have painted in freſco and in miniature. As an engraver, his merit is inconſiderable: his drawing is incorrect, his draperies ſtiff and heavy, and his chiaro-ſcuro black and inharmonious: yet there is a certain degree of neatneſs in his execution. His plates conſiſt chiefly of etching, the lights being ſoftened by ſtippling with the graver.

Baſan has miſtakenly ſuppoſed that there were two artiſts of this name, from noticing two ſeveral admiſſions of Samuel Bernard to the French Academy; but the truth is, that our artiſt was originally admitted in the year 1655, was expelled on account of his adherence to the Proteſtant religion, (on the revocation of the edict of Nantes, in 1681,) and was afterwards re-admitted to a profeſſorſhip, on recanting his faith and becoming a member of the Catholic church. His moſt eſteemed engravings are as follow, beginning with his portraits, which are in folio.

Louis XIV. preſumptively from a picture by Bernard himſelf, an oval. Sebaſtian le Preſtre de Vauban, from F. de Troy; Charles Louis, count palatine, duke of Bavaria, from Vandyke, dated 1657. Louis Garnier, ſculptor and painter. Philippe, comte de Bethune. Anne Triſtan de la Beaume de Luze, archbiſhop of Paris, from F. de Troy.

Of his hiſtorical works, which are alſo of the folio ſize, the beſt are, "Attila, terrified by the Apparition of St. Peter and St. Paul in the Air, abandoning the Siege of Rome," from Raffaelle. "The Nativity of our Saviour," from Rembrandt. "Aſtyanax diſcovered by Ulyſſes in the Tomb of Hector," from S. Bourdon, a large plate. "A Repoſe during the Flight into Egypt," from Correggio. "The Crucifixion," from Ph. de Champagne. "The Body of Jeſus Chriſt before the Virgin," from the ſame. "The Aſcenſion of Jeſus Chriſt," from the ſame. "A Peaſant on horſeback, driving Cattle to Paſture," after Jean Foreſt. "The Image of Concord," an allegory from Le Brun. "A Shew of Cattle," from Caſtiglione. "Flight into Egypt," inſcribed "Dei, et matris, et filii, fugam in Egyptum," from Guido.

Jean Lanfant was born at Abbeville about the year 1615, and died at Paris, where he principally reſided, in 1674. He was the pupil of Claude Mellan, whoſe mode of engraving

graving he uſually imitated, but like all followers, was conſtantly behind his maſter. Many of his prints are performed with ſingle courſes of lines, like thoſe of Mellan; but he alſo imitated, with ſomewhat better ſucceſs, that artiſt's mode of engraving, wherein he employed croſs hatching. His plates are executed with the graver only, and though ſufficiently neat, are cold and taſteleſs.

The abbé Marolles collected an hundred and eighteen of this artiſt's productions, which are chiefly portraits, and of which the following are in moſt eſteem. They are all of folio dimenſions. Nicholas Blaſſet, architect and ſculptor to the king, inſcribed "Jo. Lenfant Abbavillacus ſc. Pariſiis, 1658. Franciſcus du Tillet, regis conſiliarus. Lenfant ad vivum faciebat, 1663. Franciſcus de Harlay, Rothomagenſis archiepiſcopus. Champagne pinx. Lenfant ſc. 1664. Ludovicus Boncherat, D. de Compana, &c. Id. fec. 1670. Ægidius la Maitre, dominus de Ferrieres, &c. Id. fec. 1662. Andreas de Pagot, ſupremi rei monetalis ſenatus. Id. fec. 1662. Henricus d'Argonges, abbas ſancti Quintini, Jo. Lenfant ad vivum faciebat, 1672. The buſt of our Saviour, after Raphael, an oval. "A Madonna with the Infant at her Breaſt," after Caracci. "The Virgin in the Act of Adoration," after Guido, oval. Joh. Lenfant del. et exc.

Louis Teſtelin was born at Paris in 1615, and died in the ſame city in 1655. He was the pupil of Vouet, and, according to the French writers, joined to a brilliant genius a correct taſte, and a love for ſtudy. So completely maſter was he of the theory of his art, that Le Brun himſelf was even not aſhamed to conſult him. In 1650 he was nominated profeſſor to the Royal Academy, and he continued his labours with indefatigable perſeverance.

His younger brother, Henry, equally diſtinguiſhed himſelf as a painter, and, like Louis, was nominated profeſſor to the Academy. He was the author of a work, entitled "Sentimens des plus habiles Peintres ſur la Pratique de la Peinture et Sculpture, mis en tables de preceptes, avec pluſiers diſcours Academiques, ou Conferences tenues en l'Academie Royale des dits Arts, &c." Par Henri Teſtelin, peintre du Roi, profeſſeur et ſecretaire en la dite Academie.

For this work Louis engraved ſeveral plates, and, among others, the following:

"The gathering of the Manna in the Deſert," after Pouſſin, in folio. "The Holy Family," from Pouſſin's celebrated picture at Verſailles, engraved in ſingle ſtrokes. "St. Michael's Victory over the Devil," which is alſo engraven without croſs hatchings. A ſet of fifty ſmall quarto plates, alſo executed for his brother's book, and from his own compoſitions, of which the ſubjects are children at play, and an expiring Chriſt, with the city of Jeruſalem in the back ground; an anonymous engraving, but one of the works of Teſtelin.

We are now arrived at the chronological ſtation of Sebaſtian Bourdon, of whoſe merits both as painter and engraver, we have already treated under the article BOURDON, SEBASTIAN: yet a more copious liſt of the engravings of ſo great a genius, than we were at that time enabled to give, may not prove unacceptable to the reader.

"The Return of Jacob," in folio. "Abraham's Servant accoſting Rebecca," in folio. "The Return of the Ark," in folio, a ſcarce and fine print, of which the compoſition is highly commended by ſir Joſ. Reynolds. "The Annunciation." "The Angel appearing to the Shepherds." "The Flight into Egypt," wherein the artiſt has introduced a mutilated ſtatue. Another of the ſame ſubject, in which Joſeph is watering his aſs. Another, in which the Holy Family are croſſing a wooden bridge, in order to reach a boat. Another, wherein the Holy Family are walking, and St. Joſeph leading the aſs. Another, in which the Virgin Mary is mounted on the aſs, which is led by St. Joſeph through ſome thickets. Another, in which St. Joſeph is ſeen leading the aſs by the bridle, in deſcending a hill. A Holy Family reſting, in which the infant Chriſt is feeding a lamb. Another, in which the infant St. John is ſeen holding the foot of the lamb. Another, here the Virgin is repreſented waſhing linen. This piece is beſt known under the title of "La Savonneuſe;" it is in quarto, and nearly ſquare. "The Baptiſm of the Eunuch," in folio. "Jeſus healing the Sick," in folio, nearly ſquare. "The Good Samaritan," in a landſcape, in folio. "A Peaſant giving Drink to one of his Children," in quarto. "Proſperity," in quarto. A ſet of five plates of the Senſes, in quarto. A ſeries of fourteen plates, repreſenting the liberal and the ſocial virtues, dedicated to M. de Colbert, in ovals and octagons. A ſeries of ſix grand landſcapes, in large folio, nearly ſquare. A ſeries of ſix beautiful landſcapes of a ſmaller ſize, in folio, and nearly ſquare. Two beautiful landſcapes, inſcribed S. Bourdon inv. ſculp. et exc. in folio. "The Seven Works of Mercy," with a dedication to M. de S. Bourdon.

Jean le Pautre, or le Potre, was born at Paris in the year 1617. In the early part of his life he was placed under a working goldſmith, where he acquired the firſt rudiments of ornamental drawing and engraving, and, in particular, acquired great facility in drawing with pen and ink, which probably led his mind to etching, while it helped to familiarize his hand to the uſe of the point. The authors of the "Manuel des Curieux et des Amateurs de l'Art," ſay that he alſo ſtudied under an architect, which ſeems highly probable, when we conſider the ſubjects of the greater part of his plates, which conſiſt of architectural decorations, vaſes, ceilings, and, in ſhort, ornaments of almoſt every kind, which are executed from his own deſigns, and abundantly prove the fecundity of his inventive powers. Florent le Comte juſtly ſays of him that "it is hardly poſſible to find an engraver who has produced more inventions than he," and that "every profeſſor of the liberal arts or mechanics, may find ſomething in his works which will at leaſt repay the trouble of examination."

Le Pautre was admitted a member of the French Royal Academy of Arts in the year 1677, and died at Paris in 1682. The ſtyle of his ornament, to ſay the beſt of it, is rather rich than elegant: it has been called ſolid; but it is too often cumberſome and heavy, when compared with the better taſte of the Greeks, or even that of the French in more recent times. The ſtyle of his engraving partakes of the ſame heavineſs, and his chiaro-ſcuro is deficient in harmony and tenderneſs. He muſt have both deſigned and engraved with great rapidity, for in the collection of Mariette were fourteen hundred and forty plates from compoſitions of his own; among the beſt of which, beſide his large volume of ornaments, the following may be mentioned: Portrait of himſelf, in a border of flowers, ſupported by genii, in folio, dated 1674. Louis XIV. ſeated in his cabinet in a Roman coſtume, dated 1634, a ſmall plate. The little good man, in folio: (this is the portrait of a mendicant friar). Portrait of Jean Robert, undertaker, in folio. Six plates of the hiſtory of Moſes, in folio. Twenty-two mythological plates, ſmall folio. Twelve landſcapes, with views of gardens and grottoes. Six plates containing fountains and jets d'eau, in the Italian ſtyle. Six plates in the manner of friezes, ornamented with various mythological ſubjects, in folio. Twelve plates of vaſes, adorned with children and mythological ſubjects, with figures in the antique ſtyle, in folio. Six plates of ſea-ports, in folio. Six plates of the viſions

viſions of Quevedo, each with its appropriate title, and eight French verſes, in quarto. Three large plates, each inſcribed with eight French verſes, relative to the coronation, conſecration, &c. of Louis XIV. Three large perſpective views of the canal of Fontainbleau, with the baptiſm of the Dauphin introduced, folio. Le Pautre alſo engraved a few plates after Paul Farinati, and he generally ſubſcribed his engravings with his initials, either J. P. or J. le P.

Pierre le Pautre was the ſon of John, whom we have juſt mentioned, and was born at Paris A.D. 1659, and died in 1744. He learned the principles of deſign, and probably of engraving, from his father, but his execution was more neat, and he worked principally with the graver. He has alſo been ſpoken of as a ſculptor with ſome approbation.

Pierre engraved ſeveral friezes; a figure of poetry for Perault's Cabinet des beaux Arts, publiſhed at Paris in 1690, and the pedeſtrian ſtatue of Louis le Grand, which was erected in the Hotel de Ville in the year 1639; an engraving which is rare and highly eſteemed, beſides other works of inferior note.

Euſtache le Sueur is not known to have etched more than a ſingle plate, which is of the quarto ſize, and the ſubject "An Holy Family." He was a painter of great celebrity, and of whom the French are juſtly proud; while his firm and upright character merits the reſpect of all men. For a detailed account of his life as a painter, ſee LE SUEUR.

François Chauveau was born at Paris in the year 1618, and died in the ſame city in 1676. He was the pupil of Laurent la Hyre, and painted ſmall pieces in a very pleaſing ſtyle; but he is better known by the vaſt number of his engravings. At the commencement of his career he employed the graver; but in a ſhort time he ſubſtituted the etching-needle in its ſtead, by which means he was enabled to finiſh, with greater celerity, the prodigious number of ſubjects which his fertile and lively genius engendered: for as the demand for his works was very great, and eſpecially by the bookſellers, he was obliged to finiſh them with great expedition. If his execution is not always pleaſing, we are at leaſt delighted with the ſpirit, ſtrength, truth, variety, and ingenuity of his compoſitions. In order juſtly to appreciate the merits of this artiſt, we ought not to form our deciſion from thoſe plates which were chiefly executed by the graver. In them he appears cold and diſagreeable, as may be ſeen in the prints of the Chartreux, which he engraved after le Sueur; whereas, in his etchings he is ſpirited and free.

Chauveau executed more than three thouſand plates, many of which were after other maſters, but the greater number from his own deſigns. It may ſuffice to mention the following, to ſome of which the name of Chauveau appears at length, and to others the cypher, which will be found in our plate.

Charles I. of England, in quarto. Jean Pierre Camus, biſhop of Bellay, in quarto. "The Pleaſures of Genius," in fifty figures, deſigned and engraven by Chauveau, in 1655, in quarto. "The principal Events of the Ancient Hiſtory of Greece," on nineteen plates including the frontiſpiece, in quarto. "Ovid's Metamorphoſes," by Benſerade, with an explanation of each ſubject, in quarto. "Philoſophical Fables of l'Eſclaches," by Chauveau and Richer, eleven pieces. Twenty-one plates for the poem of Clovis, by Chauveau and Nicolas Cochin. Twelve plates illuſtrative of the poem of la Pucelle d'Orleans, by Chapelain; and two hundred and forty-two for the medals of Fulvio Orſini, 1663. Chauveau alſo executed ſeveral prints in conjunction with Berain, la Moine, la Pautre, and Sylveſtre, for the collection of prints known under the title of the Cabinet of the King.

Subjoined are a few of the detached engravings of this artiſt, after his own deſigns, and thoſe of different maſters. "The Annunciation by the Angel," Chauveau inv. et fec. "A Repoſe during the Flight into Egypt." In this piece St. Joſeph is repreſented offering a flower to the infant Jeſus. "The Virgin Mary, her Son, the young St. John, and ſome Angels," inſcribed Chauveau pinx. et ſc. a ſmall plate, but finely etched, and finiſhed with taſte. "The Crucifixion." In this piece the Virgin, St. John, and Mary Magdalen, are repreſented at the foot of the croſs. Ib. inv. et ſc. in folio. "The Myſtery of the Holy Sacrament," 1678, on two plates. Two circular prints of "Meleager and Atalanta," and "Venus and Adonis," in folio. "Frontiſpiece to the Life of St. Bruno," in 4to. "Frontiſpiece for the Great St. Auguſtin," in 4to. "Frontiſpiece for the Poem of Charlemagne," in 4to. A "Theſis," with armorial bearings, and the four cardinal virtues. "Jeſus Chriſt at Table with the Diſciples at Emmaus," after Titian, in folio. This ſubject was alſo engraven by Maſſon. "A Concert," from Dominichino, in folio, a ſquare. This ſubject was likewiſe engraved for the cabinet of the king, by Picart. "The Life of St. Bruno," from le Sueur's pictures in the monaſtery of the Chartreux at Paris. A ſeries of twenty-two plates, in folio, engraved conjointly with le Clerc. "The Nativity of our Lord," after La Hire, in folio. "A Landſcape, with the Holy Family," from La Hire. "Meleager preſenting to Atalanta the Head of the wild Boar of Caledonia," after the ſame, in folio. "A triumphal Arch, a ſmall upright, for the Place Dauphine," after le Brun. "Apollo and Daphne," from Pouſſin, a middling ſized plate, dated 1667.

Nicolas Cochin was born at Troyes, in Champagne, in 1619, and died at Paris towards the end of the ſeventeenth century; he engraved a great number of prints, both of his own compoſition, and after other maſters. He imitated Callot in the ſtyle of his engravings; but he was more ſucceſsful in ſmall figures than when he attempted to execute large ones. The following are deemed ſome of his beſt performances:

A ſeries of ſubjects from the New Teſtament, eleven plates in 12mo. "The Martyrdom of the Apoſtles," a ſeries of ſixteen plates, in 12mo. A ſeries of battles in the ſtyle of Callot, ſix plates in 12mo. A ſeries of four plates, in which are repreſented the creation of the world; that of Adam and Eve; Adam eating the forbidden fruit, and Adam tilling the ground, in folio. "Melchiſedech and Abraham," in folio. "Abraham ſending away Hagar," in folio. "God promiſing the Land of Canaan," in folio. "The Children of Iſrael croſſing the Red Sea," dated 1645, in folio. "Pharaoh drowned in the Red Sea," in folio. "Moſes breaking the Tables of the Law," in folio. "The Adoration of the eaſtern Kings," in folio. "Repoſe in the Flight into Egypt," in folio. "Jeſus preaching in the Deſert," in folio. "Converſion of St. Paul," in folio "The Temptation of St. Anthony," in folio.

Beſides the above, Cochin engraved ſeveral plates after Rembrandt, Callot, Della Bella, and other maſters, ſome of which are contained in the works publiſhed by Beaulieu and Vulſon.

Noel, or Natales Cochin, was likewiſe a native of Troyes, and ſuppoſed to have been the brother of Nicolas. After exerciſing his profeſſion for ſome years at Paris, he retired to Venice, where he publiſhed ſeveral works.

It was this artiſt who engraved moſt of the plates for the work of Caroline Catherine Patin, daughter of the celebrated Charles Patin the phyſician, entitled, "Tabellæ ſelectæ

ſelectæ ac explicatæ a Carola Catherina Patina, Pariſiana Academica;" he alſo engraved a holy family from Titian, St. Anthony miraculouſly reſtoring a boy's foot, and a number of other coarſe etchings of little merit.

Charles le Brun, the great painter of the battles of Alexander, for the biography of whom, ſee the article LE BRUN, etched a few plates in a dark and bold, but maſterly ſtyle; among which, beſide the "Infant kneeling upon a Croſs," and "the four Parts of the Day," is a buſt of St. Charles Boromeo, an oval in folio, after his brother Gabriel's deſign.

Gabriel le Brun, the brother of Charles, was born at Paris in 1620. His talents were not of the moſt brilliant kind, either as a painter or engraver. It has been affirmed, though we ſhould hope without foundation, that ſo jealous was he of the fame of his brother, as thrice to attempt his life by poiſon. He engraved ſeveral pieces after Charles, as well as ſome from other maſters, among which we ſhall only mention the following.

Portrait of Charles Fevret de Saint Meſmin 1657, in folio, an oval. "An Allegory of the Peace concluded by Cardinal Mazarin," in folio. "Frontiſpiece to the Memoirs of Vittorio Siri," in folio. The "Twelve Apoſtles," after Charles le Brun, in folio. "The Redeemer," a large figure, from the ſame, in folio, on two plates. "Saint Martin," after the ſame, publiſhed by P. Mariette, in folio. "Saint Antony," after the ſame, in folio. A "Grand Theſe," dedicated to the parliament of Normandy; from the ſame, in folio. Another "Grand Theſe," dedicated to the parliament of Britanny, from the ſame. Gabriel alſo engraved ſeveral other pieces from Tintoret, Agoſtino Caracci, and other Italian maſters.

Bourguignon the battle painter, (for whoſe biography, ſee CORTESI,) performed about this time a few etchings on copper, which are juſtly admired and ſought after by collectors of French art. They are in a ſtyle of uncommon fire and freedom, and their chiaro-ſcuros broad and maſterly. The ſubjects of the principal of them are as follow:

A ſeries of eight plates of battles, ſubſcribed Giac. Corteſe fecit, ſmall. Another ſeries of four ſmall plates of battles ſubſcribed with his initials only.

The battles contained in the firſt edition of the hiſtory of the wars in Flanders, from Flam Strada, in 4to. are alſo attributed to this artiſt.

Guillaume Courtois, or Corteſi, the brother of Bourguignon, was born at St. Hippolito in Franche Compte in the year 1628, and died at Rome in 1679. He went to Italy at an early period of life, where he frequented the ſchool of Pietro da Cortona, and ſuch was his merit as a painter, that Carlo Maratte heſitated not to prefer his works to thoſe of his maſter. His deſigns may perhaps be more correct, but a certain coldneſs pervades his compoſition. His engravings are few in number, and the following will probably be found to be the beſt of them.

"The Plague, in which Tobias is ſeen burying the Dead," A. Weſterhout exc. in folio, nearly ſquare. "A glorified Virgin Mary," in folio. "The Adoration of the Kings," inſcribed Guil. Corteſe del. in folio. "The Preſentation of Chriſt in the Temple," after Paul Veroneſe, in folio. "The Reſurrection of Lazarus;" after Tintoret, in folio. "Chriſt healing the Sick," in folio.

The Courtois had another brother who was alſo named Guillaume, and who is ſaid to have been likewiſe a good painter. As he became however a capuchin friar in his youth, and only travelled reſpecting the concerns of his order, very little is known concerning him.

Iſrael Silveſtre was born at Nancy in the year 1621, and died in 1691 at Paris, where he had taken up his abode. The pupil and nephew of Iſrael Henriet, he diſplayed ſo much taſte and judgment in his views and other landſcapes, that Louis XIV. employed him to deſign and engrave the royal palaces, as well as the public feſtivals, and the principal places conquered by his arms. He afterwards was honoured with the title of maſter and deſigner to the Dauphin, accompanied with the grant of a penſion and apartments in the Louvre.

Silveſtre died in the month of October, at the age of ſeventy years, leaving behind a moſt reſpectable character and ſeveral children, of whom his ſon Louis was afterward diſtinguiſhed by being invited to the court of Dreſden, where he enjoyed the title of firſt painter to Auguſtus III. king of Poland and Elector of Saxony, and where he remained thirty years.

In the courſe of his life Silveſtre twice viſited Italy, whence he brought back a great number of ſketches and drawings, which he afterward engraved. The ſmall figures with which he peopled his landſcapes are executed with taſte and ſpirit. In the ſtyle of his landſcapes themſelves, his French biographers ſay, that he imitated Callot and Della Bella, and was in his turn imitated by le Clerc; but there is a certain freedom and felicitous feeling in the line of Silveſtre, that has very rarely been equalled, and perhaps, as applied to certain objects, has never been excelled. His winding roads, his various buildings, his broken ground, &c. are moſt taſtefully delineated, without being pranked into the French picturesqueneſs of the old ſchool; and his freedom and felicity of outline, being its ſureſt teſt, ſeems to proclaim *originality*. It ſhould further be obſerved, that the artiſt whoſe originality of ſtyle has merited and received the general approbation, deſerves always to have that circumſtance recorded to his honour, where it can be ſo recorded with certainty. Now though it be true that Della Bella, Callot, and Perelle, were the contemporaries of Silveſtre, yet the latter, (a ſomewhat younger man indeed,) is known to have etched the grounds and buildings in ſome of Callot's plates, which circumſtance, eſpecially when coupled with the internal evidence deducible from ſtrong and fine feeling, affords a ſtrong preſumption, that Silveſtre was the firſt French engraver who in his etchings delineated landſcape with taſte.

The whole number of engravings by this artiſt, amounting to more than a thouſand, we ſhall here reſtrict ourſelves to the mention of only the moſt diſtinguiſhed.

A ſet of four plates of the ſeaſons perſonified. A ſet of views in Italy and France, with French inſcriptions, twenty-one plates. Views of different edifices in Rome, and the environs, publiſhed by Iſrael Henriet, with explanations in French, thirteen plates including the title, in 8vo. Another ſet of twelve views in Italy and France, with buildings and ſmall figures. Another ſet of views, ornamented in the ſame manner, with explanations in Italian and French, twelve pieces in 8vo. Another ſet of twelve under the title of "Alcune Vedute de Giardini et Fontane di Roma e di Tivoli, deſignate et intagliate per Iſrael Silveſtre," with explanations in Italian. Four views, three of Rome, and one of the village of Flovelle, near Nancy, in 8vo. Another ſet of eleven plates, ſome of which appear to be by Della Bella, of views in Italy, with explanations in the Italian language, in 4to. Another ſet of eighteen topographical landſcapes, (views in France,) publiſhed by Iſrael, and dedicated to Louis de Crévant, marquis of Humieres, in 4to. Another topographical ſet of ſeven views in France, of the quarto ſize, "taken on the ſeveral ſpots by Iſrael

Silveſtre." Views in the kingdom of Naples, with explanations in French, four pieces in 4to. in the form of friezes. Different landſcapes in the duchy of Burgundy, "taken on the ſeveral ſpots by Iſrael Silveſtre," with explanations in French, twelve pieces 4to. In the form of friezes. A ſet of four plates of the environs of Nancy. A book containing views in France, Rome, and Florence, by Iſrael Silveſtre, with explanations in French, twelve beautiful plates, in 4to. The ſea-ports of Italy, on twelve quarto plates, in circles. Another ſet on ſix plates of ſea-ports in Naples, and its environs, by Iſrael Silveſtre, dated anno 1648, and alſo in circles. Views of the moſt remarkable places in Paris, and the environs, taken by Iſrael Silveſtre, with a dedication, and to each ſubject an explanation contained in four French verſes, twelve plates in 4to. Several of this beautiful ſeries were engraven by Della Bella. Views of the principal edifices in Rome, and other parts of Italy, four of which are of Venice, twelve pieces in 4to. A beautiful ſet. Another ſet, with deſcriptions in French, of Venetian topography, on twelve plates in 4to. Views of the caſtle and other buildings of Fontainbleau, by Iſrael Silveſtre, with explanations in French, ten plates, in 4to. Views of the chapel and houſe of the Sorbonne, founded by cardinal Richelieu; (the architect Jaques le Mercier,) together with ſeveral handſome chateaus in different parts of the kingdom, twelve plates in folio, with explanations. Views of the palace of Orleans, and of Luxembourg, with ſeveral other houſes and gardens in the environs of Paris, twelve pieces in 4to. Views in the environs of Paris, with explanations, twelve pieces, the frontiſpiece to which is engraven by Claude Gayrand, in folio. This ſet includes, by a ſtrange aſſimilation, a view of the church of St. Sophia at Conſtantinople. Another folio ſet of eighteen views of monuments, &c. in Rome, and other Italian cities, accompanied with explanations in French and Italian. Another folio ſet of ſeven plates, including the title, of Rome and its environs, taken by Iſrael Silveſtre. The ſubjects of this folio ſet are the church of St. Peter; the garden of Montalto, the palace and garden of Ludoviſe, the bridge of Limentane near Rome, St. Agnes without the gates of Rome, and the arch of Conſtantine. The churches named "the Stations of Rome," with a title and dedication on ten folio plates, comprehending views of the churches of St. Peter, St. Paul, St. Croix, St. John de Latren, Marie Maguere, St. Sebaſtian, St. Lawrence, St. Marié del Popolo, the Annonciade, and St. Paul of the three fountains, with Latin and French explanations. Topography of Nancy and its environs by Iſrael Silveſtre, a native of that city, twelve pieces with explanations; the two laſt of which views are engraven by Perelle, in folio. Perſpective views of the Cardinal palace, from the garden, the Louvre, and the Thuilleries, as well as of other celebrated places in the environs of Paris, by Iſrael Silveſtre, with deſcriptions in French, ten pieces in folio. A collection of views of chateaus and villas, drawn on the ſeveral ſpots by Iſrael Silveſtre, with deſcriptions, ten folio plates. Another collection of views, on ten plates, dedicated to his majeſty. Another collection of twelve folio perſpective views of chateaus and gardens, taken on the ſeveral ſpots, and publiſhed by Iſrael Silveſtre, in 1651. View of the Mazarin palace, with the gardens and edifices on mount Quirinal, inſcribed Iſrael Silveſtre incidit, a large piece in folio. Perſpective view of the city of Rome, with an explanation of the principal edifices and ſites dependent on it, very large, and engraved on four plates. View of Rome, with a part of the city in perſpective, and a ſide view of the church of St. Peter. Silveſtre fecit, excudit Pariſiis, a large folio plate. Beneath which are twenty verſes by Scudery. Another perſpective view of Rome, with its edifices and ruins, a large folio, in the form of a frieze. Perſpective view of Paris, taken from the bridge of the Thuilleries, with references to the principal edifices, in folio. Two large perſpective views of Charité and Nevers, with inſcriptions in Latin and French. De Lincler del. Is, Silveſtre ſculp. long friezes. An excellent large, and very rare print, a view of the Coliſeum at Rome, dated 1653. Perſpective views of Stenay, Sedan, Montmedi, Verdun, and Metz, a ſet of five large folio plates. "The grand Carouſal," or royal entertainment given at Paris in the year 1662, conſiſting of an hundred and eight prints, in the execution of which Silveſtre was aſſiſted by F. Chauveau. "The Pleaſures of the enchanted Iſland," dated in 1664, engraved on nine folio plates which were accompanied by a vignette, and publiſhed at Paris.

Jaques Prou was born at Paris A.D. 1639, or thereabout. He ſtudied under Seb. Bourdon and executed various etchings, ſome of which were from the works of his maſter and other painters, and the reſt from his own deſigns. The following are a few of his beſt pieces, all of which are of the folio ſize. A ſet of twelve landſcapes of his own compoſition. A ſeries of ſix grand landſcapes, of a wild and ſavage character, after Seb. Bourdon, large folio. "The Flight into Egypt;" after Aug. Caracci, and "St. John baptizing our Saviour in the River Jordan."

François Colignon was born at Nancy about the year 1621. He acquired the elements of engraving under Callot, whoſe ſtyle he adopted, ſtudying alſo the works of Della Bella and Silveſtre. In 1640, he viſited Rome, and, during his ſtay in that metropolis, executed ſeveral pieces both from his own deſigns, and after thoſe of other maſters. On his return to France, he engraved, for the grand collection of Beaulieu, ſeveral views of the cities conquered during the reign of Louis XIV.

The following are from his own compoſitions, a ſet of twelve landſcapes, in folio. A ſeries of pieces entitled, "The witty Inventions of Love." "The Buildings of Rome under the Pontificate of Pope Sixtus Quintus." "A Plan of the City of Malta, with the ancient Fortifications."

From the deſigns of other painters, he engraved, "The Flight of Attila," after the celebrated picture of Raphael in the Vatican. "The Canonization of the five Saints, St. Gaetan, St. Francis Borgia, St. Philippe Benizio, St. Bertrand, and St. Roſe," after J. B. Gaetano, in folio. "A View of Florence," drawn by Della Bella, in folio. "Plan of the Chateau de Moyen," formerly called Quinguengrogne, drawn by Callot, and a book containing nineteen prints in 4to. from the compoſitions of L. Valerio.

Dominique Barriere was born at Marſeilles in the year 1622. He viſited Rome about the middle of the 17th century, and during his ſtay in that city publiſhed a great number of prints engraven in a ſtyle, having ſome reſemblance to that of Della Bella. He either inſcribed his works with his name in the following manner, Dominicus Barriere Maſſilienſis, or with his cypher, which will be found among our monograms of the French ſchool. Among others, the following pieces are from the hand of this maſter:

Portrait of John de la Valette, grand Maſter of Malta, in profile, marked D. B. in folio. This is a very ſcarce piece. A ſet of ſix landſcapes, Roſſi ex cudit, in folio. A ſet of 12 landſcapes, dedicated to Lelio Orſini, and dated 1651, in folio. Series of ſeven views of the villa of Aldobrandini, engraved in 1649, and inſcribed Dominicus Barriere Maſſilienſis, in folio. Landſcape, in which is ſeen the zodiac, with this inſcription: "Vim profert ubi maximam,

ſmam, in folio. View of Freſcati, and its environs, in folio. "Pontana magiore nel Giardino di Tivoli, Vicino al organo," in folio, with the cypher of the engraver. "Statue e Vedute della villa Pamfili." Roſſi exc. in thirty-four middle ſized pieces. "Catafalco e aparato nella chieſa di S. Vincenzo e Anaſtaſio, pen. Effequie del cardinal Mazarino," four pieces in folio. "Sepulchral Monument of Nicolao Ludoviſi Plumbini, la Collegio ſac. Jeſu. Dominicus Barriere Gallus inventor, exegit, delineavit et ſculpſit," in folio. "Hercules ſitting, from a bas relief, in the Garden of the Palace of de Medicis," inſerted in the book of the Heſperides of P. Ferrari, in folio. "Circum Urbis Agonalibus ludis olim celebrem, dicata triumphali pompo Chriſto reſurgenti Hiſpana pietas celebriorem rediddit." Anno Jubilei 1650. Eques Rainal Archit. Dominicus Barriere maſſ. del. et ſc. This, ſay the French writers, is a ſuperb piece, enriched with a vaſt number of figures. "The Hiſtory of Apollo," engraved on ſeveral plates, after the paintings of Dominichino and Viola, in the Villa Aldobrandini.

Beſides the above, Barriere executed various other works, after Cortona, Bologneſe, Claude of Lorrain, Titian and other maſters.

Gabriel Perelle deſigned and engraved landſcape with conſiderable ſucceſs. He was a native of Paris, born ſome time about the year 1622; and, in conjunction with his ſons Adam and Nicholas, produced a very great number of plates, ſome of which are views, but the far greater part engraved from his own original compoſitions.—In point of drawing, his prints are far above mediocrity; but his chiaro-ſcuro wants breadth, his lights are too much ſcattered; and he ſeems to have endeavoured to compenſate for this want of breadth by the depth of his ſhadows, which has rendered his effects ſpotty; and in conſequence of his employing the point too little, and the graver too much, the ſtyle of his engraving is ſomewhat heavy and dry.

But notwithſtanding theſe defects, Perelle was a meritorious artiſt, and ſhould be ranked high among the landſcape engravers of France; though the foliage of his trees be defective in natural expreſſion, the ruined temples and other edifices which abound in his works are almoſt always taſteful and pictureſque. His imagination, ſtored by contemplating the works of Claude, the Pouſſins, Dominichino, and his great predeceſſors in landſcape, was lively and productive; he underſtood much of the principles of compoſition, and in conſequence, often attains elegance, and ſometimes conſiderable grandeur.

The engravings by this family, of whom the father appears to have been the ſuperior artiſt, are generally inſcribed "Perelle inv. et fecit." The whole have probably never been enumerated, but ſeven hundred and ſixty of their prints are known to have been in the poſſeſſion of the abbé Marolles in the year 1666, whilſt the artiſts were yet living. Of theſe a large proportion are from the compoſitions of the ſenior Perelle, and were publiſhed in ſets, generally conſiſting of four each, of the quarto ſize, and circular form, but without any titles beneath. As it would be endleſs to deſcribe theſe, we can only ſay in general that there are at leaſt a dozen of theſe ſets, conſiſting chiefly of mountain ſcenery with rocks, ruins, trees, and figures. Ruined edifices ſeen by moon-light conſtitute the ſubjects of one ſet; and at leaſt two ſets are of ſhipping and ſea ports. Of the remainder of Perelle's works, the following will probably be found moſt worthy of notice.

Four views in the gardens of Verſailles. A pair of do. The grotto of Rouel and the fountain of Tivoli, in folio. Five ſeveral pairs of folio landſcapes with appropriate figures. A pair of views, one of the gate of conference, the other in the gardens of St. Cloud, then the palace of the archbiſhop of Paris, in folio. A pair of views in the gardens at Fontainbleau. A ſet of four, alſo of the folio ſize, and from drawings by Silveſtre, *viz.* The church of St. Michael of Dijon; the palace of Dijon; the bridge of Grenoble, and the Point Reale of Marſeilles. Four views in Paris: *viz.* The arſenal and the mall, the Pont Neuf and the Ile du Palois; the Louvre, and the gate of Neſle; and the Mall with the adjoining fields. Silveſtre del. Perelle ſc. in folio. Four provincial views, namely, the baths of Bourbon d'Archambaut; the holy chapel of Bourbon d'Archambaut; the chateau of Bourbon Lancy, and its baths in the time of Julius Cæſar; and the Grand Chartreuſe near Grenoble; drawn by Silveſtre, in folio. Six views of the moſt beautiful ſcenes in the garden of Ruel. Iſrael Silveſtre del. Perelles ſculp., in large 4to. Two mountainous landſcapes, with buildings and ruins, in the one Abraham is repreſented diſmiſſing Hagar, and in the other the good Samaritan, from P. Bril, in folio. "The Adoration of the eaſtern Kings," the figures ſmall and ſurrounded by ruins, after C. Poelenburg, in folio. "The Defeat of the Spaniſh Cats by the French Rats," a ſatirical print, engraved on the occaſion of the ſurrender of Arras in 1642, with ſix explanatory verſes. L. Richer, inv. G. Perelle ſc. This piece, which is extremely ſcarce, was ſuggeſted by the following circumſtance. During the ſiege, the inhabitants of Arras affixed the following inſcription upon one of the gates: "Quand les François prendront Arras, les Souris mangeront les Chats." (When the French ſhall take Arras, the Mice will eat the Cats.) After the fall of the city, the inſcription was altered by the Frenchmen obliterating the p.

Jean Couvay was born at Arles A.D. 1622, and enjoyed the reputation of being one of the beſt French engravers of the ſecond claſs. His ſtyle poſſeſſed much eaſe, and reſembles that of Villamena. He executed both portraits and hiſtorical ſubjects, after his own deſigns, as well as from thoſe of other artiſts; and moſt of his prints are marked with his cypher, which will be found among our monograms of the engravers of the French ſchool. The following are a few of his beſt productions.

"The Virgin Mary preſenting ſome Pinks to her Son, whom ſhe holds on her Knees," after Raphael, inſcribed "Dilectus meus mihi et ego illi," in folio. "John the Baptiſt in the Deſert," after the ſame, in folio. "St. Benedict tempted by the Demon of the Fleſh, whom he puts to flight by preſenting a Crucifix." A night piece, after Guercino, in folio. "A Madonna," after Blanchard, in folio. A half-figure of an "Afflicted Magdalen, deſpoiling herſelf of her Raiment," after Le Brun, in folio. "The Aſcenſion," in which the portrait of the painter is ſeen among the apoſtles, after Jac. Stella, in folio. "Cleobulus, one of the ſeven wiſe Men of Greece," after Cl. Vignon, in folio. "The Martyrdom of St. Bartholomew," after Pouſſin, in folio, one of the beſt engravings of Couvay. A pair after G. Huret, which are entitled "The Reſidence of the Faculties of the Soul," and "The beautiful Abode of the five Senſes," in folio, engraved in imitation of the ſtyle of Ab. Boſſe.

Among the portraits of Couvay, the moſt eſteemed are, An effigy of brother Simon Diſſy, a lay capuchin, and Louis XIV. on horſe-back, preceded by Fame, after J. Bourdon, in 4to. the frontiſpiece to the poem of Clovis.

Sebaſtien Vouillement was born at Bar-ſur-Aube about the year 1622. He acquired the elements of deſign under Daniel Rabel, and engraved ſeveral plates both at Paris and Rome, where he reſided for a conſiderable time, but they

poſſeſs very little merit. He frequently uſed the cypher which is given in our plate of French monograms. The following are a few of the works of this artiſt :

"A Gypſey fore-telling good Fortune to a Youth," inſcribed with twelve French verſes, in folio. This is better than moſt other of the engravings of Vouillement. "Pope Urban VIII. pronouncing the Benediction," inſcribed S. Vouillement ſc. Romæ 1642, in 4to. "An Author writing," from Pouſſin, for the Documenti d'Amore, with the cypher of the engraver, in 4to. After Raphael he has engraved, in folio, "The Maſſacre of the Innocents," from two different compoſitions. "Mount Parnaſſus," from the picture in the Vatican, and "An Holy Family." "The betrothing of St. Catherine," with "St. Joſeph" and "St. Cecilia," are all from Albano, and in folio.

Jean Peſne (called Penna by the Italians) was born at Rouen in the year 1623, and died at Paris in 1700. It does not appear under whom he ſtudied, and Strutt, with great probability, conjectures that he was brought up under ſome painter, perhaps Nicholas Pouſſin, from whoſe pictures the greater part of his engravings are taken. He etched in a ſlight, coarſe, and irregular ſtyle, and finiſhed his plates with the graver, harmonizing and blending his work by means of ſtippling. Watelet ſays of him, ſomewhat ſeverely, that "his ſtyle of execution is neither agreeable, ſcientific, nor pictureſque;" but the ſuperior merit of fidelity to the effect of his original belonged certainly to Peſne; notwithſtanding the dryneſs and roughneſs of his ſtyle, his maſſes of light and ſhade are broad and clear; yet he did not detail his forms with ſufficient accuracy, and it has been juſtly aſſerted of him by Strutt, that had "the heads and other extremities of his figures been more carefully attended to, it might have been ſaid that the ſpirit of that admirable painter (Pouſſin) was never better expreſſed than by this artiſt;" but an exception very properly follows, in favour of Gerard Audran, and probably another ought to have followed in favour of Claudia Stella.

The beſt of his engravings are, two portraits of N. Pouſſin, from pictures by himſelf, middle-ſized upright folios, one dated in 1649. From the ſame maſter, and of the folio ſize, are "Eſther, before Ahaſuerus," in folio. "The Nativity, or Adoration of the Shepherds." "The Body of Chriſt extended near the Sepulchre, with Mary and St. John weeping." "Chriſt laid in the Sepulchre." "The Death of Sapphira." "A Madonna, with the Infant Chriſt, and the little St. John." "A Holy Family," dedicated to C. le Brun. "St. Paul taken up into the third Heaven." "The Teſtament of Eudamidas of the City of Corinth." "The Triumph of Galatea." "Summer, with the Story of Boaz and Ruth." "Autumn," the figures introduced into which are the two ſpies bearing a bunch of grapes from the promiſed land. N.B. The two other ſeaſons, which compleat the ſet, are engraven by J. Audran. A ſet of nineteen plates, including the frontiſpiece of the Labours of Hercules, from the paintings of Pouſſin, in the grand gallery of the Louvre. The manner in which the engraver has conducted his lines in theſe engravings is highly commended by Huber and Roſt. "The Seven Sacraments," from paintings formerly in the Palais Royal, and now in the collection of the moſt noble the marquis of Stafford, at Cleveland houſe, namely, "The Baptiſm," or John baptizing Jeſus in the waters of Jordan; "The Supper," or Jeſus at table in the houſe of Simon the Phariſee, with Mary Magdalen at his feet; "The Confirmation," given by the high prieſt; "The Euchariſt," or Jeſus holding the Paſſover with his Diſciples; "Extreme-Unction" adminiſtered to a dying man, ſurrounded by his weeping Family; "The Charge," or Jeſus delivering the keys to St. Peter; and "Marriage," or the affiancing of Joſeph and Mary, large folio plates.

The following pieces are after other painters of the Italian ſchool "A Holy Family," from Raphael's celebrated picture in the Orlean collection, in folio. In this piece Mary is repreſented holding the Infant Chriſt, whom St. John embraces, while St. Joſeph is ſeen at a little diſtance walking behind a thicket. A ſeries of landſcapes, with a frontiſpiece, by Jean Peſne, named here (at Rome) Gio. Penna, in fifteen plates, in folio, a production highly valued by connoiſſeurs.

Among his portraits, the two following are moſt eſteemed, Louis le Comte, ſculptor to the king, (inſcribed J. Penne pinx. et ſculpſit,) in folio, and Francis Langlois, called de Chartres, bookſeller, after Van Dyke, dated 1645, and alſo of the folio ſize.

Francois de Poilly was born at Abbeville A.D. 1622, and died at Paris in 1693. De Poilly was the ſon of a goldſmith, and the goldſmiths of the ſeventeenth century exerciſing alſo, in the ornamental parts of their work, conſiderable ingenuity in the arts of engraving and deſign, he acquired the rudiments of his future profeſſion under his paternal roof. He was afterward ſent to Paris, and placed under the tuition of P. Daret, (who had been the pupil of Bloemart,) with whom he remained three years; but being ſtill deſirous of acquiring more extenſive profeſſional knowledge, he went to Italy, and reſided ſeven years in the city of Rome, where he engraved ſeveral very capital ſubjects, from the great painters of that time, and their ſtill greater predeceſſors.

De Poilly worked with the graver only, and may juſtly be ſpoken of as one of the moſt ſkilful artiſts in the management of that inſtrument, that France ever produced, at leaſt till Europe was ſurprized by the tranſcendent manual powers of Wille and Bervic. His engravings are bold, firm, and clear, and are finiſhed with great accuracy; but from want of variety in the handling of his graver, the fleſh, draperies, and back grounds of his figures are not ſufficiently diſtinguiſhed from each other, and hence his works have much of the heavineſs and coldneſs of a leaden ſtatue. Rectangular croſſing was the prime element of his ſtyle; powerful ſecond courſes of lines were thrown over his firſt courſes, ſo as to form a ſmall ſquare between the interſections of every four lines. His outline however is drawn with great care and preciſion; in the characters of his heads he faithfully copied his originals, and his extremities, in general, are well rendered.

On his return from Italy de Poilly ſettled in Paris, where he not only purſued his profeſſional labours with his wonted aſſiduity, but likewiſe inſtructed a great number of pupils, both foreigners and of his own country; notwithſtanding whoſe aſſiſtance, it is not eaſily conceivable how he produced the very great number of plates which bear his name, when we reflect that many of them are large, and all the reſult of conſiderable care and patience. His engravings conſiſt of hiſtorical ſubjects and portraits, of which we ſhall proceed to mention ſome few of the moſt remarkable, beginning with the latter.

Louis XIV. when a youth, after J. Nocret; Henry d'Arnaud, biſhop of Angiers; Jerome Bignon, counſellor of ſtate, after Philip Champagne, dated 1664; Abraham Tabert, mareſchal of France, after L. Ferdinand; Cardinal Mazarin, after P. Mignard; Guillaume de Lamoignon, ſurrounded by allegorical figures of Virtue, Probity, and Candour, from the ſame painter; and a buſt of the ſame original, as large as life. The above are all of the folio ſize, and there

there is a portrait of de Poilly himſelf, engraven by his pupil J. L. Rouillet in the year 1699, from a drawing by his maſter, done in the year 1680, and inſcribed Francois de Poilly, engraver to the king.

The following hiſtorical works are alſo of the folio ſize: "The Holy Family," in a landſcape of a circular form, in which St. John is embracing the Infant Jeſus. "St. Ignatius de Loyola on his Knees." "St. Francis Xavier dying among the Indians." "The grand Triumph of Auguſtus." "The Viſion of Ezekiel," from a picture of Raphael, in the gallery of the Palais Royal. "A Holy Family," after Raphael, in which the Infant Chriſt is repreſented ſtanding on his cradle, an upright. "The Madonna raiſing a Veil to ſhew the ſleeping Saviour to St. John," from the ſame maſter, and of the upright form. (N.B. The firſt impreſſions of this plate are before the croſs lines were engraved on the veil.) The print is known among foreign connoiſſeurs by the appellation of "La Vierge au linge." "The Nativity," a large upright, in an octagonal border, from Guido, one of the beſt of de Poilly's engravings. The early impreſſions, which are now become ſcarce, were taken before the ſmall angels, which in the later impreſſions appear above, were inſerted. "The Flight into Egypt," from the ſame painter, in which Guido has introduced the poetic idea of an angel ſtrewing with flowers the path of the holy travellers. "Jeſus Chriſt at Prayers on the Mount of Olives," from the ſame. "A dead Chriſt," from a capital picture of Caracci. "Chriſt bearing his Croſs," from the ſame. "Nymphs bathing, in a Landſcape," after Julio Romano. "The overflowing of the Nile," after a deſign by Algarde. Views of two ſides of the grand obeliſk of the emperor Caracalla, erected at the fountain of Bernin, in the Place de Navonne, a pair of large uprights. "A Holy Family," after a picture of Pouſſin, in the Houghton gallery. "The Marriage of St. Catherine," after P. Mignard, a large upright. "The Baptiſm of Jeſus Chriſt," inſcribed "Hic eſt filius," after the ſame, a large upright. "St. Charles Boroméo adminiſtering the Sacrament to thoſe ill of the Plague at Milan," from the ſame. A capital piece both in reſpect to painting and engraving. "Mercury receiving the Order from Jupiter to convey the Infant Bacchus to the Nymphs," from Alexandre. "The Viſitation," from C. le Brun. "St. John in the Iſle of Patmos," from the ſame. "The Crucifixion," a large upright, from the ſame. "The Deſcent from the Croſs," after the ſame. "Grand Theſé of the abbé Tellier," in which Time holds up the portrait of Louis XIV., after the ſame, two plates, ovals. "Grand Theſé of Duke Albert, in which Louis XIV. clothed in a royal Mantle, appears ſeated, and ſupporting himſelf upon his Truncheon," dated 1663, in two plates. "Grand Theſé of M. de Segnelai, in which Louis XIV. clothed in a Roman Habit, is accompanied by Minerva and Power," after the ſame, in two plates. Grand Theſé, the ſubject of which is "The Diſpute between Minerva and Neptune, reſpecting the Name to be given to the City of Athens," after le Brun. "The Parable of the Gueſt, without a wedding Garment," after Ph. Champagne. "A grand Crucifixion," where the Saviour is on the point of expiring, uſually termed "Le Chriſt des Chartreux," from the ſame, in three plates. "The Aſcenſion," after the ſame. "Joſeph's bloody Coat preſented to Jacob," after Ant. Coypel.

Nicolas de Poilly, the brother, and in ſome ſort the pupil of the former, was alſo born at Abbeville in the year 1626, and died at Paris in 1696. He was an excellent deſigner and engraver, though ſomewhat inferior to his elder brother, whoſe ſtyle of engraving he ſucceſsfully imitated. He engraved a great number of portraits, as well as hiſtorical ſubjects, which are very much valued by connoiſſeurs for the neatneſs and preciſion of their execution. The following are a few of the ſubjects, which he engraved after different maſters:

"A Head of the Virgin Mary," without the painter's name, which is however Champagne. "St. Auguſtin holding a Crucifix," from the ſame, an upright folio. "A Holy Family," in which two angels are ſeen ſupporting a baſket of flowers; from S. Bourdon, in folio. "The Nuptials of St. Catherine," from the ſame painter. "The Preſentation in the Temple," from le Brun, in 4to. "The Return of the Holy Family from Egypt," after the ſame, in 4to. "The Holy Family, with the Virgin having the Infant Jeſus aſleep on her Lap," from the ſame; a celebrated piece, known under the name of the *Silence*, in folio. "Repoſe during the Flight into Egypt," Chaprin pinx. in folio. "Chriſt on the Croſs between the two Thieves," from Pouſſin. Note, This ſubject is engraved in a much ſuperior ſtyle by Claudine Stella.

Among his beſt portraits are thoſe of Louis XIV. in a frame ornamented with laurels, an oval, ſurrounded by angels bearing emblems, after N. Mignard of Avignon. Louis XIV. dated 1683, the head of the natural ſize. Maria Thereſa, queen of France, 1680, of the ſame form and dimenſions. Louis, dauphin of France, ſon of Louis XIV. of the ſame ſize. Marie Anne Victoire de Baviere, dauphineſs of France, of the ſame ſize. Louis de Bourbon, ſtyled the Great Condé, of the ſame ſize. Pierre du Cambout de Coiſlin, grand almoner of France, biſhop of Orleans, of the ſame ſize. Francis de Borgia, a Jeſuit. Francis de Coetlogen, biſhop of Rennes. René Potier, duke of Geſvre, peer of France; after Cl. le Fevre. Nicholas Edward Olier, counſellor to the king, after the ſame. Noel de Bullien, marquis of Gallarden, regiſtrer to the king; theſe are all of the folio dimenſions.

Jean Baptiſte de Poilly, the ſon of Nicolas and nephew of Francis, was born at Paris in 1669, and died in the ſame city in 1728. After having acquired the elements of deſign and engraving, he viſited Rome, with the view of improving his knowledge of theſe arts. On his return to his native country, he diſtinguiſhed himſelf by ſeveral works of merit, in conſequence of which he was admitted a member of the Royal Academy. His ſtyle of engraving did not much reſemble that of his father and uncle; he advanced his plates conſiderably in the etching, and further improved upon the manner of his inſtructors by mingling ſtippling with his courſes of lines. By this method he produced a very picturesque effect, both in his portraits and hiſtorical ſubjects; and acquired great honour in his own country, by engraving Mignard's gallery of St. Cloud.

Among other ſubjects, the following were engraved by him, after different maſters:

"The Nativity of Chriſt," after Gaudentio Ferrari. "Danae in a golden Shower," from a cartoon of Julio Romano, in the cabinet of the duke of Orleans, in folio. "The Virgin worſhipping the Infant Chriſt," after Benvenuto Garofalo, in folio. Note, The three latter are in the Crozat collection. "The Martyrdom of St. Cecilia," after Dominichino, an upright folio, intended as companion to the "Alms of St. Cecilia," engraved by Francis de Poilly (his brother) after the ſame painter. "The Nativity," after the picture of Carlo Maratti, in the cabinet of the king; a beautiful piece, in folio, almoſt ſquare. "Aaron's Rod, changed into a Serpent, devouring thoſe of the Magicians;" after Pouſſin, in folio. "The Adoration of the Golden Calf," from the ſame, in folio. "The Holy Family," inſcribed "Sacra Chriſti Familia;" after the

ſame, from the cabinet of the king, in folio. The grand ſaloon at St. Cloud, (by Mignard) namely, "The Banquet of the Gods;" "The Workſhop of Vulcan;" "The God Pan, accompanied by Bacchantes and Fauns," and "Mars and Venus accompanied by the Loves and Graces;" beſide which, belonging to the ſet, are eight plates of Caryatides, richly ornamented. "Faith and Hope," two emblematical pieces, after the ſame, in folio. The four ſeaſons, painted in the gallery of St. Cloud, after the ſame. "Spring, the Nuptials of Flora and Zephyrus." "Summer, Sacrifice in Honour of Ceres." "Autumn, the Triumph of Bacchus and Ariadne." "Winter, Cybele imploring the Return of Sol," in folio. A ſtatue of Truth, after Bernini, in folio. "The Judgment of Solomon," after Antoine Coypel, in folio. "Suſanna accuſed by the Elders," after the ſame. A pair, "Neptune armed with his Trident, and ſtanding on a Dolphin," and "Jupiter graſping Thunder, and ſeated on a Cloud," inſcribed Fr. Verdier inv. J. de Poilly ſc. in folio.

His beſt portraits are thoſe of Corneille van Cleve, ſculptor, painted by Vivien. Francis de Troy, painter; from a picture by himſelf. Clement XIII. Pontifex max. Prince Charles Edward Stuart, a whole length figure on foot, after Dupra. Louis XIV, after Mignard. They are all of the folio ſize.

Nicolas Loir, the ſon of a goldſmith, was born at Paris in 1624, and died in the ſame city in 1679. He frequented the ſchools of S. Bourdon, le Sueur, and le Brun; and in his youth went to Rome, where he ſucceſsfully ſtudied and imitated the works of Pouſſin. On his return to Paris, he ſoon became diſtinguiſhed by the merit of his productions. He painted many pieces for the palace of the Thuilleries, and the chateau of Verſailles; and ſo delighted was the king with his works, that he conferred on him a penſion of four thouſand livres. Strutt ſays that he beſtowed too little attention in reviſing his firſt thoughts: yet his compoſitions are not without intelligence; and his figures, eſpecially thoſe of his women and children, poſſeſs a certain degree of delicacy and expreſſion. He was early admitted a member of the royal academy, and at the time of his death held the ſituation of rector.

Loir engraved, with conſiderable freedom and ſome taſte, about a hundred and fifty pieces of different forms, ſome of which are much more finiſhed than the generality of painters' etchings. Of theſe the following are eſteemed the moſt valuable:

A ſeries of twelve plates illuſtrative of the hiſtory of the holy family, in ſmall quarto, and of the upright form. "A Madonna claſping the Infant Saviour." "A Madonna ſitting, with the Infant on her Knees." "A Madonna, with the Infant aſleep," inſcribed "Ego dormio." "A Madonna, with the Infant holding a Croſs in his Hand." "A recumbent Chriſt, embracing the Croſs and Crown of Thorns, with his Eyes turned towards Heaven." "The Judgment of Paris." "Daphne changed into a Laurel." "The filial Piety of Cleobis and Biton," who drew the chariot of their mother Argia to the temple of Juno, of which ſhe was a prieſteſs; the above are all in folio, and the laſt is eſteemed to be, on the whole, the beſt of Loir's performances. Two large landſcapes, lengthways.

Alexis Loir, the younger brother of Nicholas, was born at Paris in 1640, and died in the ſame city in 1713. Young Loir was an excellent deſigner and engraver, though partly educated a goldſmith; his manner was eaſy, vigorous, and expreſſive, and he knew how, to a certain degree, to vary his ſtyle according to the maſters after whom he engraved. He executed ſeveral etchings, but his croſſed hatchings were too ſquare, and his lights too much and too equally covered for this ſpecies of engraving. We add a liſt of the beſt of the works of this artiſt, which are in general of large dimenſions.

"The Education of Mary de Medicis;" after one of the paintings of Rubens in the gallery of the Luxembourg, in folio. "Time diſcovering Truth, and treading Herely under Foot," from the ſame maſter, in folio. "The different Nations of Europe;" after Ch. le Brun, in folio. "The Fall of the rebellious Angels," after the ſame; large and engraved on two plates. "The Maſſacre of the Innocents," after the ſame, and alſo engraved from a motive of convenience to the engraver, on two plates. "A weeping Madonna, with the dead Chriſt on her Knees," after P. Mignard, in folio, a large upright, arched at the top. "The Finding of Moſes," after Pouſſin. "Venus preſenting Arms to Æneas," after the ſame, in folio. "The Adoration of the Kings," after Jouvenot, in folio. "The Preſentation in the Temple," after the ſame, in folio. "A dead Chriſt ſurrounded by many Figures, at the Foot of the Croſs," after the ſame, in folio. "A Madonna with a ſleeping Chriſt," after Nic. Loir, in folio. "A Holy Family," in which the infant Jeſus is ſitting on a croſs, after the ſame, in folio, and of the circular form. "A Holy Family," compriſing four figures, after the ſame, in folio. "A Magdalen at Prayers," after the ſame; a capital piece.

Nicholas Regneſſon was born at Rheims about the year 1625, and died at Paris in 1676. He was the brother-in-law, and according to ſome French writers, the inſtructor, of the celebrated Nanteuil, but he was only five years older, and Strutt with more probability aſſerts that he learned from Nanteuil the art of engraving. Their ſtyles bear conſiderable reſemblance, but the argument which may be derived from the evident vigour of original feeling, is entirely in favour of Nanteuil.

The engravings of Regneſſon are however juſtly held in eſteem. They conſiſt partly of frontiſpieces, and other book-plates, from his own deſigns, but chiefly of portraits on a larger ſcale, and alſo from drawings by himſelf, which were performed in crayons, of which the following will be found moſt worthy of notice:

Anthony Fremin, ſecretary to the queen-mother. Cardinal Julius de Mazarin in an octagonal frame of oak-leaves, dated 1656. A young magiſtrate, dated 1661, all in folio. Francis de Vendoſme, duke of Beaufort, grand admiral of France, after Carelle, in folio; and the princeſs of Conti, a buſt after Beaubrunn, in quarto.

Of his hiſtorical works, thoſe of moſt importance are,

"The Marriage of St. Catherine," round, bordered with oak-leaves, inſcribed Nic. Regneſſon fec. in folio. "The Holy Family," by Regneſſon and Nanteuil, in folio. "A Madonna, with her Eyes raiſed," after Le Brun, in folio. "A Buſt of the Infant Saviour," after the ſame, without the name of the engraver, but which is known to be from the graver of Regneſſon, in folio. "The Deſcent of the Holy Ghoſt," after a painting in the cathedral of Notre Dame, from Blanchard, in folio. "A Holy Family," ſurrounded by a border of roſes and lilies, after N. Coypel, in folio. "A Madonna with the Infant Jeſus and the little St. John," after F. Bourdon, in folio.

Stephen Gantrel was born at Paris in 1626, but the year of his death is not recorded. He publiſhed ſeveral prints, of which the ſubjects are hiſtorical, as alſo a great number of portraits, engraved by himſelf in a tolerably good ſtyle.

We begin our liſt with his hiſtorical works, which are chiefly of the folio ſize.

" The Rod of Moſes changed into a Serpent devouring thoſe of Pharoah's Magicians," after Pouſſin. " The Paſſage of the Red Sea." " The Worſhip of the Golden Calf." " The Deſcent from the Croſs." " St. Francis Xavier reſtoring an Indian to Life;" all after the ſame maſter, and in folio. " St. Gervaiſe, and St. Protais, before the Proconſul," after Le Sueur, a diſtinguiſhed piece. " St. Benedict kneeling," after Ph. de Champagne. " St. Francis in a Trance, upheld by Angels," after Caracci; and a " Buſt of the Saviour," from Le Brun; theſe are alſo in folio, as are the following portraits:

Sebaſtian Piſani, biſhop of Verona, inſcribed Steph. Gantrell ſc. Antoine Bruneau, counſellor-preſident of Tournelle, La Dam pinx. Jean Louis de la Bourdonnaye, count-biſhop of Lyons, Eligius Fontaine pinx. Mathew Poncet de la Riviere, maſter of requeſts, inſcribed Stef. Gantrel ſc. 1681. Louis Berryer, firſt counſellor to the king, almoſt as large as life, dated 1674. Louis XIV., king of France, the head as large as life, and inſcribed Stef. Gantrel fec.

Of the family of the Coypels, and their characters as artiſts, we have already given an account. (See COYPEL.) Noel, the elder, etched a Madonna careſſed by the infant Chriſt, dated 1664; another plate of the ſame ſubject, larger, and " The Holy Family," including St. Joſeph and St. John. But Antony produced a more conſiderable number, which have obtained from Strutt more praiſe than they will probably be found to deſerve. They are however ſought after by ſome connoiſſeurs, and the beſt of them are entitled as follows:

Two portraits of Le Voiſin, who was burnt in the Place de Greve, one large, the other ſmall. A buſt of Democritus, inſcribed A. Coypel pinxit incidit et excudit 1691, in quarto. " The Meeting of Abraham and Melchiſedec," a medallion. " Judith," the plate of which was finiſhed by C. Simoneau, a ſmall upright. " The Baptiſm of Chriſt," inſcribed A. Coypel pinx. et fecit. " An Ecce Homo," alſo finiſhed by C. Simoneau, a ſmall upright. " Chriſt in his Winding Sheet." " A Madonna and Child," an oval. " A Madonna ſuckling the Infant." " A Magdalen periſhing in the Deſert," anonymous. " A St. Cecilia," inſcribed " Cantabo Domino in vita mea." " An Allegory," illuſtrative of the fame of the Dauphin, or the ſycophancy of the times. " The Infant Jupiter confided to the Nymphs." " Cupid conquering Pan," dated 1691, inſcribed A. C. " Bacchus and Ariadne," a large and excellent plate finiſhed by Audran; and " The Triumph of Galatea," another large plate, finiſhed by C. Simoneau.

The etchings of Noel Nicholas Coypel, of which the ſubjects follow, are ſomewhat inferior to thoſe of his elder brother Anthony.

" St. Thereſa ſurrounded by numerous Angels," an oval in quarto. " The Triumph of Amphitrite," in quarto. " A ſleeping Nymph ſurpriſed by a Satyr," in quarto. " A young Woman careſſing a Dove," the plate of which was afterwards finiſhed with the graver by N. Edelinck.

The ſtyle of Charles Antoine Coypel was by far too much made up of the affectation and inſipidity of the old French ſchool, for him to have merited the praiſes which are beſtowed on him by Strutt. Though he had the advantage of being inſtructed by his father Anthony, and of inheriting his court patronage, he laboured both in the arts and belles lettres to little purpoſe. Yet the following engravings by this artiſt cannot properly be omitted in collections of the productions of the French ſchool, *viz.*: Portraits of M. de Maroulles, duke of St. Paul, and François Potet, ovals, in quarto. Portrait of the painter Cigoli, in chiaro-ſcuro. " The Madonna worſhipping the Infant Jeſus while aſleep in his Cradle," an anonymous engraving, in imitation of the ſtyle of Guido. " A Crucifix embraced by Mary Magdalen." Two heads, of which one is the St. Paul from the cartoon of Raphael. A ſtanding figure of Cupid, in folio, one of the beſt of this artiſt's productions, and certainly a work of merit. " Apollo with his Lyre," after Michael Angelo, in folio. " A Shepherd converſing with two Shepherdeſſes." " Two young Girls predicting the Fortune of a Lord." A ſet of three plates of the delights of a French devotee. In the firſt ſhe is repreſented on her knees, in the ſecond returning from church, with her prayer book, and in the third ſcolding her waiting woman. Charles alſo engraved ſome other comic and farcical ſubjects, conſiſting of old maids, cats, coquettes, petit maitres, &c. and, in conjunction with count Caylus, he etched a deſign for a tomb, and ſix or eight caricatures of opera figurantes.

Antoine Bouſonnet Stella, the nephew of Jacques, whom we have already mentioned, was born at Lyons in the year 1630, and died in the ſame city in 1682. He acquired the rudimental principles of his art under his uncle, whoſe ſtyle he ſucceſsfully imitated. While he remained in his native city he executed ſeveral good pictures, and on afterwards repairing to Paris, he acquired ſo much celebrity by his talents, that he was received into the Royal Academy.

The following, among other pieces, were engraven by this artiſt:

" A Landſcape," on one ſide of which is repreſented Tiber with his urn, and the ſhe-wolf that nurſed Remus and Romulus; on the oppoſite ſide appears another river god, and in the middle a view of the city of Rome; a ſmall piece in folio, dated 1654. " Moſes defending the Daughters of Jethro," after Pouſſin, inſcribed Bonnart excud. This appears without the name of the engraver, but Huber aſcribes it to the artiſt now under notice.

Claudine Bouſonnet Stella was born at Lyons A. D. 1634, and died at Paris in 1697. She acquired the elements of painting from her uncle Jaques Stella, but ſhe attached herſelf in preference to engraving, which ſhe executed in a very ſuperior ſtyle.

Strutt ſays of the prints by Claudine, that they " prove the ſtrength of her genius, and the ſoundneſs of her judgment:" that the naked parts of her human figures are exceedingly well drawn, and the characters of her heads finely expreſſed; and Watelet proceeds ſtill further in her praiſe: he ſays, " it muſt be admitted that no one ſeized with ſo much accuracy the true art of Pouſſin; no one has ſucceeded ſo well in indicating the colouring of this maſter, and, in ſhort, on viewing the prints of Claudine, we behold in this reſpect a complete repreſentation of the pictures. She far ſurpaſſed Peſne, and even improved upon Gerard Audran." Such is the encomium of Watelet, but in the opinion of the writer of this article, our countryman Strutt has more juſtly eſtimated this lady's talents. Her merits reſide far leſs in her indications of local colour, than in the drawing, characters, and expreſſions of her heads and hands. In the plate of Moſes ſtriking the rock, particularly, theſe parts are ſo ſuperior to the reſt of the performance, as to beget a ſuſpicion that the draperies and landſcape are the work of ſome inferior hand, and perhaps of her ſiſter Frances. Yet the whole is very well kept together, and a pretty good general tone prevails. Of the engravings by this lady we ſhall notice a 4to. book of paſtorals, engraved on ſeventeen plates, including the title-page, after Jac. Stella A ſeries of fifty plates of children's ſports and ruſtic ſubjects, from the ſame maſter, in folio. " The Myſterious Marriage of St. Catherine,

therine, with the Infant Chriſt," from the ſame, in folio. "Medallion of a Cardinal ſupported by Religion, and ſurrounded by the Virtues," Ant. B. Stella pinx. Cl. Stella ſ. 1678, in folio. "Moſes expoſed on the Nile." Nic. Pouſſin pinx. Cl. Stella ſc. 1672, in two plates, in folio. "Moſes Striking the Rock," Id. pinx. id. ſc. in folio. This piece is eſteemed a chef-d'œuvre of Claudine. "The Crucifixion of our Saviour between the Two Thieves," uſually termed "Le Grand Calvaire," id. pinx. id. ſc. This is another of the beſt works of Claudine. "Peter and John curing a Lame Man in their way to the Temple," Id. pinx. Cl. Stella ſc. dated 1679. "A Holy Family," from the cabinet of the king of France, id. pinx. id. ſc. in folio. "A Holy Family," with ſeveral children carrying flowers, Nic. Pouſſin pinx. Cl. Stella ſc. dated 1661, in folio.

Antoinnette Bouſonnet Stella, ſiſter of Claudine, was born at Lyons about 1635. She enjoyed the ſame inſtruction as her brother and ſiſter, and as an engraver was ſcarcely inferior to either of them. The two following pieces are the only ones executed by this lady, which have been handed down to us; but they are ſufficient to evince that ſhe poſſeſſed very ſuperior talents.

"Remus and Romulus, nurſed by a ſhe-wolf on the Banks of the Tiber," after Antoine Bouſonnet Stella, her brother, in folio. "The Entrance of the Emperor Sigiſmund into Mantua," from a long frieze executed in ſtucco, in the palace del T. after a deſign of Julia Romano.

The Stellas had another brother, named Francis, and, according to Mr. Strutt, a ſiſter, named Francoiſe, who aſſiſted Claudine in executing her plates, and who died in the year 1676.

Louis Ferdinand was born at Paris ſome time about the year 1630, and was the ſon of Ferdinand Elle, who had the honour of inſtructing Pouſſin. Elle had another ſon, of the name of Pierre, who was alſo an engraver, and worked in conjunction with Louis, but why they aſſumed the baptiſmal name of their father, and diſcontinued the ſirname of Elle, does not appear.

Neither of the ſons diſplayed much talent as an engraver, yet Louis attained ſome diſtinction as a painter of portraits, and became a profeſſor in the French Academy.

A drawing-book, entitled "Le Livre Original de la Portraiture, pour la Jeuneſſe, tiré de Bologne et autres bon Peintres, a Paris, 1644," has been aſcribed ſeverally, both to Louis and Pierre, and it is not improbable that they were mutually concerned in producing it. The maſſes of light and ſhade are tolerably well diſpoſed in this work, but the outlines not being correct, it is radically defective. Other engravings by theſe artiſts, are,

The head of a lady, after Van Dyke, in quarto. The portrait of Nicolaus Pouſſin, inſcribed V. E. pinxit, L. Ferdinand fecit, an oval, in ſmall folio. A ſeries of ornaments, in the form of friezes, with genii, intermingled with feſtoons and garlands after L. Teſtelin, ſix plates. L. Ferdinand fec. P. Mariette exc. in quarto. A ſeries of groupes of children, after the ſame; ſix plates, in ſmall folio. St. Potentiana, in a frame, from Correggio, in quarto.

Nicolas Bazin was born at Troyes, in Champagne, about 1636. He was the pupil of Claude Mellan at Paris, where he became a printſeller. He himſelf engraved a great number of pieces, but he alſo employed ſeveral young artiſts to aſſiſt him in his labours. His productions, for the moſt part, conſiſt of portraits and devotional ſubjects, engraved in a ſtiff and dry manner. They are uſually in quarto, inſcribed with the name of Bazin, and the beſt of them are entitled as follow:

"The *true* Portrait of the Virgin, painted by St. Luke." "The Annunciation of the Virgin," in folio. "A Chriſt crowned with Thorns," in folio. "The Criſifixion," in folio. "St. Jerome and St. Peter," a pair, after Lichery. "St. Francis branded," after Baroccio. "St. Iſabella of France, the Founder of the Abbey of Long-champ," after Ph. de Champagne. "St. Anne learning to read from the Holy Virgin," after Le Brun. "St. Mary the Egyptian, and St. Bozime," after the ſame. "A Madonna giving ſuck to the infant Jeſus," after Correggio, copied from the print of Spierre. "A Female in a faſhionable Dreſs, and a Lady of Quality undreſſed to enter the Bath," after Jean Dieu, called St. John, a pair, in folio.

Among the portraits of this artiſt, the following are perhaps the beſt.

Madame Helyot, a celebrated abbeſs, Bazin del. et ſc. 1686. Madame Guyon, the celebrated viſionary. Jean du Houſſay de Challiot, who lived as a hermit during forty-eight years at mount Valerien. Father Emanuel Magnan of Toulouſe, of the order of the Minor Brothers. Father Antoine Verjus, who firſt led the Jeſuit miſſionaries to China, after B. Cary. Father Jean Craſſet, of the fraternity of the Jeſuits, and director of their congregation at Paris, after Mee. St. Francis Xavier, the Jeſuit apoſtle of India. St. Ignatius Loyola, founder of the order of Jeſuits, Louis the Great, on horſeback, N. Bazin ſc. 1682, in folio. Louis, dauphin of France, painted by J. B. Martin, and engraved by N. Bazin, 1686, in folio.

Peter Landry, who was born at Paris in the year 1630, according to Huber, is one of thoſe artiſts who did not enjoy a reputation commenſurate with their merits. He engraved various pieces, both from his own compoſitions, and after thoſe of other artiſts. His portraits are executed with much ſtrength and neatneſs. Strutt, however, is of a different opinion, and calls them "ſtiff and heavy."

The following are a few of his hiſtorical works, which are beſt known, and are all of the folio dimenſions. "St. Jerome." "A Madonna, with the infant Chriſt in his Cradle." "The Samaritan," after Albano. "A large Head of John the Baptiſt," after Caracci.

Of his portraits, we ſhall mention thoſe of Louis XIV. after J. François. Louis de Bourbon, prince of Conti, after Gribelin. Charles de Bourbon, biſhop of Soiſſons, inſcribed Jo. Laniele del Petrus Landry ſc. 1666. Charles Brulart, marquis of Genlis. An anonymous portrait, which is known to be that of count Harcourt, commonly called le Cadet de la Perle; all of which are in folio.

Jean Froſne was born at Paris about the year 1630. He appears to have dedicated his attention ſolely to engraving portraits, in which he imitated, with ſome ſucceſs, the ſtyle of Nanteuil; of theſe portraits forty-three were collected by the abbé Marolles. He was, however, qualified to ſucceed in other departments of his art, as may be ſeen from the ornamental plates which he engraved for the collection of grand views of Sebaſtian de Beaulieu. We may mention the following folio portraits by Froſne, as poſſeſſing much merit in the execution.

Claude Baudry, abbé of the Holy Croſs, after le Bon, dated 1657. Nicholas Dauvet, count Deſmarez, grand falconer of France, after Streton. Louis de Lorrain, duke of Joyeuſe. Henry d'Orleans, duke of Longueville. Nicholas Putier of Blancmeſnil, preſident of the French parliament; and M. Dreux d'Aubray.

But all theſe are engravers of mere mediocrity, compared with Robert Nanteuil, who muſt ever be regarded as one of the wonders of his profeſſion. This admirable artiſt was born at Rheims in the year 1630, and died at Paris in 1678. Being the ſon of a merchant of ſmall fortune, he received a

claſſical

claſſical education, yet during the intervals of literature, found time to cultivate the fine arts alſo; and to mark his decided predilection for that of engraving, he even engraved his theſis in philoſophy. He married at an early age, and on viſiting the French metropolis, he voluntarily abandoned all other purſuits, and devoting himſelf entirely to the art of engraving portraits, became the moſt original, and perhaps, on the whole, the beſt portrait engraver that ever exiſted.

He happily lived in an age when his art was patronized. Louis XIV. being made acquainted with his merit, cauſed him to draw his portrait in crayons, and was ſo pleaſed with the performance, that, according to Strutt, he created purpoſely for Nanteuil, "the place of deſigner and engraver of the cabinet, with the yearly penſion of a thouſand livres, which was confirmed by letters patent," and which our artiſt continued to enjoy with the higheſt reputation to the time of his death.

When the great care and preciſion beſtowed on his engravings are conſidered, and when is conſidered alſo the ſhort period of his life, and that the charms of his converſation occaſioned his ſociety to be courted by men of the firſt rank in the ſtate, as well as thoſe of the firſt genius in fine art, it may juſtly excite ſurpriſe that he ſhould have produced no fewer than two hundred and eighty plates, ſome few of which are hiſtorical ſubjects, but moſt of them portraits, of which ſome are as large as life, and were engraven from nature, through the medium of crayon pictures executed by the engraver himſelf. We have mentioned two hundred and eighty, becauſe that number were found in the collection of Mariette; but it is not known that Mariette had collected the whole of his works.

Nanteuil appears to have underſtood the "human face divine" better than any of his predeceſſors. He drew correctly; even his ſlighteſt prints manifeſt the hand and mind of a maſter; and in his more highly finiſhed works, the perfect keeping of his heads, as they appear in the fine impreſſions, is admirable. Strutt argues that "from the great difference we perceive in the characters of his heads, we may conclude they were faithful copies of Nature," and when this is combined with the ſtill ſtronger preſumption ariſing from homogeneouſneſs of parts, it will probably be received as the ſtrongeſt internal evidence, and the beſt aſſurance that can now be obtained, of the reſemblance of Nanteuil's portraits to their reſpective originals.

His ſtyle of engraving he appears to have varied on principle, at different periods of his life; at firſt, probably, as his feelings, and afterwards as his judgment, directed. It was Nanteuil who firſt explored the unknown practicabilities of this department of art, and invented modes of combining lines with ſtippling, ſo as to expreſs the firm ſoftneſs of fleſh whether in light, ſhade, or middle tint: hair, with all its lightneſs of forms, its native gloſs, and its varieties of flow and colour: ermine he alſo taught his ſucceſſors to characteriſe, and the peculiar textures of the various articles of dreſs. The engravers who will compare Nanteuil's works with each other, may trace in them what ought to be called a courſe of the experimental philoſophy of portrait engraving, over which genius preſided. He appears at firſt, like Mellan, to have employed ſingle courſes of lines, as may be ſeen in his portrait of Louis Heſſelin: in the fleſh of that of Chriſtina of Sweden, he employed ſtippling alone; while in that of the preſident Mole, he employed only unbroken lines. It would appear that he was now analyſing his art, and meaſuring his own powers againſt its difficulties, and that in his ſubſequent works, he combined the elements which he now aſcertained, of ſoft, firm, clear, rich, mellow, and characteriſtic ſurface, as occaſion admitted or required. His moſt frequent and moſt admired practice was, to ſtipple the lights and half tints of his faces, and employ croſs hatchings, ſometimes with interwork, for the ſhadows, inſenſibly blending his carnation tints, (as a painter would ſay,) except where abruptneſs was demanded by the ſubject; and over all, unſwayed by the ornamental tendency in that luxurious age of the art of his country, he threw the ineffable charm of ſimplicity.

The more rare and beautiful of the works of this diſtinguiſhed artiſt are as follow:

A folio plate of "The Holy Family," which, as has been mentioned, he engraved for the theſis of philoſophy which he ſupported at Rheims. From the date of this print, 1645, it appears that it was engraved at the early age of fifteen. An allegorical print of Time diſplaying the buſt of Louis XIV., while Hiſtory records his exploits, in folio. "A Muſe or Genius, and an Eagle ſupporting a Crown and various Heraldry, with the Motto, "Fides," in folio. "Cardinal Mazarin, ſeated in the midſt of a Gallery of Buſts and Statues, conſulting ſome Maps which are diſplayed before him," after F. Chauveau, in folio. "Chancellor Seguier, ſurrounded with the Attributes of Juſtice, and of the Arts and Sciences," after Le Brun, in folio. A large head of Chriſt, after Guido, dated 1653, in folio. "A Siſter of the Order of Mercy," a buſt, dated 1664, after the ſame, in folio.

Portraits of the potentates of Europe, of the folio ſize, (N. B. when no painter's name is mentioned, they are engraved from the crayon pictures of Nanteuil himſelf,) Anne, Infanta of Spain, queen of France, and mother of Louis XIV. R. Nanteuil pinx. et ſculp. 1666, very large. Eight different portraits of Louis XIV. engraved in the various modes which our artiſt from time to time invented or adopted.

Louis dauphin, ſon of Louis XIV. 1677. Louis prince of Condé, 1662. Henry Julius Bourbon, duke d'Anguin, after P. Mignard 1662. Chriſtina queen of Sweden, after S. Bourdon, 1654, ſmall, and in the peculiar ſtyle which has been already mentioned.

Louiſa-Maria, queen of Poland and Sweden, after Juſte, 1653. Charles Emmanuel, duke of Savoy, 1668. Maria Jean-Baptiſte, ducheſs of Savoy, and Regent, after Laur du Sour, 1678. Charles, duke of Lorrain, 1660. John-Frederic, duke of Brunſwick Lunenburg, after Michelin, 1674. Charles II. duke of Mantua, 1652. William Egon, prince of Fuſtenburg, cardinal and biſhop of Straſburg, 1671.

The following portraits of illuſtrious ſtateſmen, warriors, and men of letters, are alſo in folio, and are arranged in alphabetical order.

N. duke d'Albret, 1649; this is extremely ſcarce. Jaques Amelot, firſt preſident of the court of aids, 1655. Louis Dony d'Attichy, biſhop of Autun, 1663. Henry de Baradat, biſhop of Noyon, Velut pinx. with the biſhop's arms, but without date or ſignature. Antoine Barberini, cardinal and archbiſhop of Rheims, 1663. Emmanuel Philibert Beaumanoir de Lavardin, biſhop of Mans, after Champagne. Pomponne de Bellievre, preſident of the parliament. Francis Blanchard, abbé of St. Genevieve, 1673. Francis Blondeau, preſident of the chamber of accounts, 1653. Antoine Bachart, abbé of Champigny. Peter de Bonſy, archbiſhop of Narbonne, 1678. Jacque Benigne Boſſuet, biſhop of Meaux, 1674. Louis de Boucheret, chancellor of France, 1676. Emmanuel Theodore de la Tour of l'Avergne, duke of Bouillon and a cardinal, 1670. Leon le Bouthillier, count of Chavigny, miniſter of ſtate after Champagne, 1652. Anne Philipeaux Villeſavin,

ſavin, widow of Leon le Bouthillier, 1656. Henry-Auguſtus de Lomènie, count de Brienne, ſecretary of ſtate, 1660. Jean le Camus, maſter of requeſts, 1674. Jaques, marquis de Caſteinau, mareſchal of France, 1658. Marin Careau de la chambre, phyſician to the king. Guy Chamillard, maſter of requeſts, 1664. Jean Chapelin, counſellor of ſtate, 1655. Charles d'Ailly, duke de Chaulnes, governor of Brittany, 1676. Francis de Clermont, biſhop of Noyon, 1655. Peter de Cambert de Coiſlin, biſhop, and afterwards cardinal of Orleans, 1666. Peter Armand du Cambout de Coiſlin, abbé of St. Gildas, 1658. Jaques-Nicolas Colbert, abbé of Becq, and afterwards archbiſhop of Rouen 1670. Jean-Baptiſt Colbert, miniſter of ſtate, 1676. Francis de Bonne, duke de Crequy des Leſdiguieres, lieutenant-general, 1662. Dreux Daubray, count d'Offremont, counſellor of ſtate, 1658. Peter Payen Deſlandes, 1659. Jean Dorieu, preſident of aids, 1660. Francis-Antoine Dulieu maſter of the chamber of accounts, 1667. John Evelyn, eſq. author of "Sylva Sylvarum; a treatiſe on Calcography," &c. Ferdinand de Foix de la Valette, duke of Eſpernon, colonel-general, 1650. Ceſar d'Etree, biſhop of London, then cardinal, 1660. Andre le Fébre d'Ormeſſon, counſellor of ſtate, 1654. Gaſpar de Fieubet, counſellor of the parliament of Toulouſe. Nicolas Fouquet, ſuperintendant of the finances, 1661. Pierre Gaſſendi the philoſopher, 1658. Melchior de Gillier, counſellor of the king, 1652, and madame de Gillier his wife, a companion print. Francis Guenault phyſician, 1664. Henry de Guenegand, marquis de Plancy, ſecretary of ſtate after Champagne. Francis de Harlay de Chauvallon, archbiſhop of Paris, 1675. Louis Hepelin, counſellor of ſtate, engraved in the ſtyle of Mellan, 1660. William de Lamoignon, marquis de Baville, preſident of the parliament, 1659. Another plate of the ſame nobleman, dated 1676. Peter Jeannen, firſt preſident of the parliament. Dominick de Ligny, abbé and afterwards biſhop of Meaux, 1654. René de Longueil, marquis de Maiſon, miniſter of ſtate and preſident of the parliament, 1660. Henry d'Orleans, duke de Longueville, after Champagne. Francis Lotin de Charny, preſident of the parliament, 1657. Jean Loret of Carenton in Lower Normandy, 1658, ſmall folio. Francis Mallier, biſhop of Troyes, after Velut. Leonor de Matignon, biſhop of Liſieux, after P. Antonin. Cardinal Julius Mazarin, with a back-ground of ſtars, 1655. The ſame ſubject, engraved in the taſte of Mellan. Jean de Maupeoux, biſhop and count of Cavaillon, 1671. Charles de la Porte, duke de la Mellerage, mareſchal of France, after Juſte, 1662. Jean de Megrins, preſident of the parliament of Toulouſe, after Daret, 1652. Jean-Antoine de Meſme, count d'Avaux, 1662. Edward Mole, preſident of the parliament, 1653, (noticed in our biography of the artiſt.) Henry de Lorraine, marquis of Mony, 1651. Francis de Neſmond, biſhop of Bayeux, 1663. Nicholas Potier de Novion, firſt preſident of the parliament, 1656. Charles Paris d'Orleans, count de St. Paul, after Ferdinand, 1660. Hardouin de Perefixe de Beaumont, archbiſhop of Paris, 1662. Louis Phelipeaux de la Vrilliere, ſecretary of ſtate, 1662. Simon Arnauld de Pomponne, ſecretary of ſtate, 1657. Jean Francis Paul de Gondy, cardinal de Retz, 1650. Armand-Jean du Pleſſis, cardinal de Richelieu, after Champagne, 1657. Jean Francis Sarraſin, counſellor to the king, 1656, in 4to. Henri de Savoye d'Aumale, archbiſhop of Rheims, 1651. Pierre Seguier, chancellor of France, after le Brun, 1656. Pierre Seguier, marquis de St. Briſſen, mayor of Paris, 1659. Francis Servien, biſhop of Bayeux, after Champagne, 1656. Jean Baptiſte van Steenberghen, termed "the Dutch advocate," after du Chaſtel, 1668. This is eſteemed a chef-d'œuvre of Nanteuil. Denis Talon, advocate-general. Charles-Maurice le Tellier, archbiſhop of Rheims, 1663. Michel le Tellier, chancellor of France, 1662. Michel le Tellier, marquis de Louvois, ſecretary of ſtate, 1677. Henri de la Tour d'Auvergne, viſcount de Turenne, 1665. Francis de la Mothe le Vayer, 1661.

Germain Audran was born at Lyons A. D. 1631. He acquired the rudiments of his art in his natal city, and under the ſanction of his father Claude, of whom we have already ſpoken; after which he repaired to Paris, where he purſued his ſtudies under the direction of his uncle Karle. He afterward returned to Lyons, where he engraved and publiſhed a conſiderable number of prints, conſiſting of ornaments, ceilings, vaſes, &c. and a few portraits, which Strutt ſays do honour to his graver. He was made a member, and afterwards choſen profeſſor of the academy eſtabliſhed at Lyons, in which city he died in the year 1710, leaving four ſons who were all artiſts.

His beſt portraits are thoſe of Charles Emanuel II. and Frances d'Orleans, in the ſame oval, after Caravaglia; cardinal Richelieu in an oval, ornamented by laurels, and Theophilus Reynard, dated 1663, in folio.

The chief of his other engravings are a ſet of ſix plates of deſigns for ceilings, after George Charmetin; another ſet of ſix ornamented vaſes after N. Robert; a book of friezes, after la Fage, a large book of Italian views after Funcus, ſix landſcapes from le Gaſpie, and a ſet of thirty deſigns for fountains and maritime friezes, after le Brun.

Of Claude Audran, the ſecond of that name, and whoſe virtues, ſays the abbé Fontenai, were as praiſe-worthy as his talents were great, no engravings have been mentioned by his biographers, and none have been ſeen by the preſent writer, though Heinnekin ſpeaks of him as having been an engraver. He was born in the year 1639, and died at Paris in 1684.

Girard or Gerard Audran is at once the moſt celebrated of his family, and the boaſt of his country and his profeſſion. Though he did not invent the art of mingling etching with the work of the graver, he improved ſo much upon what had previouſly been done in this way, and ſo out-ſtripped his competitors in the race, that it may eaſily be believed he would have invented this art, had it not previouſly exiſted. Untrammelled, or not ſubmitting to ſuch trammels as the mechanical part of the art of engraving impoſed on his contemporaries, he looked with bolder viſion into that of painting, or rather he looked both abroad into the phyſical world, and into the reſources of his own vigorous mind, for the materials of honeſt fame, and was guided alone by the light which they mutually reflected on each other.

That he was thoroughly verſed in the academical part, or grammar, of his art, may be ſeen in his work, entitled "Les proportions du corps humain ſur les plus belles ſtatues de l'antiquité, à Paris, chez Audran Graveur du Roi," a folio work publiſhed in 1682; and it may be heard in the liberal encomium of Le Brun, that the engraver had in this reſpect ſurpaſſed the painter. In juſtice to both theſe diſtinguiſhed artiſts, who ſeemed born for each other, this declaration of Le Brun ſhould not be paſſed in ſilence.

So broad, original, and comprehenſive was the ſtyle of our artiſt, that Watelet has emphatically ſaid of him, "he *painted* with the etching-needle and graver," and ſo ſurpaſſing thoſe of all other artiſts are his engravings after Le Brun, Pouſſin, and Le Sueur, that it may be aſſerted of Audran, almoſt without an hyperbole, that he poſſeſſed the power of animating their forms with his own ſoul, as was fabled of the oriental philoſopher of old.

Thus

Thus much it has been thought neceſſary to ſay in this place, in addition to what the reader will find under the article AUDRAN GIRARD, reſpecting this truly great artiſt. The collector may not be diſpleaſed to find here a more copious liſt of his principal engravings, than we were at that time able to furniſh, beginning with the portraits and other pieces which he engraved after his own pictures and drawings.

Pope Clement IX. Andreas Argolus, S. Marci Eques, in quarto. Samuel de Sorbiere, (a man of letters,) engraven at Rome in 1667. Henri Arnaud, biſhop of Angier. Father Benedict Langeois, a capuchin. Francis du Queſnoy, ſculptor, commonly ſtyled Fiamingo. "St. Paul preaching at Athens," a vignette, with the inſcription :—"Non enim ſumus adulterantes, &c." "Minerva" and "Abundance," two ſtanding figures, and on high two genii holding a ſcroll, with the words "Louis le Grand," a frontiſpiece, in ſmall folio, dated 1680.

After Italian maſters, we find the following ſubjects in folio, and for the moſt part very large; "The Filial Piety of Æneas," after a picture of Dominichino, formerly in the cabinet of the French king, performed with the graver only, and ſomewhat harſh in its chiaro-ſcuro. "The Myſtery of the Roſary," after a painting of Dominichino at St. John du Mont de Bologne. "The Martyrdom of St. Agnes," after a painting of the ſame maſter at Bologna, in the church of that ſaint. "The Temptation of St. Jerome," after the ſame. "The Four Angles of the Church of St. Charles de Catenari, repreſenting Juſtice, Temperance, Prudence and Courage," after the ſame, in four plates, engraven at Rome in 1675. "The Gift of Tongues," and "St. Paul preaching at Athens," after Pietro da Cortona, two friezes on the ſame plate. The gallery painted at Rome in the palace of Pamphili, by the ſame maſter, repreſenting the hiſtory of Æneas, engraven on ſixteen plates, and forming a ſeries. The gallery painted by the ſame artiſt, at the palace of the marquis Sachetti, and engraven at Rome in 1668 in three large plates, repreſenting the triumphs of David over Goliah and the Philiſtines. "The Death of St. Francis," after Annibal Carracci. "The Martyrdom of St. Sebaſtian," after a painting of Carracci formerly in the poſſeſſion of the French king. "The Temptation of St. Anthony," painted for the Borgheſe gallery by Annibal Carracci. "Ulyſſes diſcovering Achilles in Diſguiſe," after the ſame. "St. Hyacinthe," after Guerchino, ſmall. "A Magdalen," after Guido. "St. Peter walking on the Sea," after Lanfranc. "The Nativity of our Saviour," a ſmall piece, engraven after a deſign of Palma the younger, without the name of the engraver. Thirteen plates of arabeſque figures, painted by Raphael in one of the halls of the Vatican. A ſet of fifteen plates from Raphael's Cupid and Pſyche, dedicated to Le Brun. "God ſpeaking to Moſes from the Burning Buſh," after the ſame. "Paul and Barnabus at Lyſtra," after the ſame. "St. Paul ſcourged by Demons," a ſmall piece, known under this title, though in fact it repreſents "St. Ignatius tormented by Devils during his Slumber." It is engraven after a deſign of Rubens, but falſely attributed to Raphael on the plate. "Jeſus Chriſt delivering the Keys to St. Peter on taking leave of the aſſembled Apoſtles," R. V. inv. G. Au. ſc. "The Death of Ananias," after Raphael. "The Landing of the Saracens at the Port of Oſtia;" after a deſign of Raphael, an anonymous engraving, but known to be from the hand of Audran. "A recumbent Silenus, pouring forth Wine," after Julio Romano. "Dejanira carried away by the Centaur Neſſus," after the ſame, in quarto. "The Clemency of Scipio," another anonymous folio engraving, after Raphael. "The Rape of Ganymede," an octagonal print from a painting by Titian on the cieling of the gallery of antique ſtatues at Venice.

Hiſtoric and allegoric ſubjects after French maſters, beginning with Pouſſin. "St. John baptizing his Proſelytes in the River Jordan," a finely executed engraving, on two plates. "The Woman taken in Adultery." A pair of large and admirable engravings of "The Preſervation of Pyrrhus," and "The Reſentment of Coriolanus appeaſed by his Family," each engraved on two plates. "Camillus delivering up the Schoolmaſter to his Scholars," "The Vengeance of Armida," in which plate Gerard was aſſiſted by his nephews Benoit and John Audran. "St. Franciſco kneeling before the Virgin Mary," who is holding arrows. A pair from Ovid's Metamorphoſes of "Daphne transformed into a Laurel," and "Narciſſus to a Daffodil." "The Empire of Flora," or the metamorphoſes of heroes into flowers. "The Plague of Rome," from a large picture which Pouſſin painted from a deſign of Le Main, and which Audran engraved in conjunction with Baronius. "Time and Truth," from a cieling in the hotel de Richelieu, of which plate, the impreſſions before the drapery was engraved over the figure of truth are very rare.

The above are all after Pouſſin: from P. Mignard he has engraven "The Plague of Egina," commonly termed "The Peſt." (In the early impreſſions of this plate, the figure in the clouds is evidently Juno, attended by her peacock; in the latter impreſſions, the peacock is eraſed, and the wings of an angel are added to the figure of the goddeſs. "Chriſt bearing his Croſs," from an original in the king of France's collection. The cieling of the leſſer gallery of Verſailles, engraved on three plates, of which the ſubjects are "Apollo and the Muſes," "Foreſight and Secrecy," and "Vigilance and Alacrity." Six large plates forming a ſet from the cieling of the Val de Grace, containing upwards of two hundred figures, and repreſenting the felicity of the bleſſed.

From the pictures of Le Sueur he has engraved the Martyrdom of St. Gervais and St. Protais; and on another plate, arched at the top, that of St. Laurence, in folio; and in quarto, "Aurora bringing forth the Horſes of Phœbus." "Time aſſiſted by Love and Truth diſpelling the Clouds of Ignorance," a circle, after L. Teſtelin, folio. "The Army of Pharaoh ſwallowed up in the Red Sea," after Fr. Verdier, in folio. "The Flight into Egypt," after the ſame, in folio. "Battle with the Saracens," after le Bourguignon, in folio. "The Surrender of the City of Damietta," in folio. "The Deciſion of Solomon," after Ant. Coypel, in folio. "The Deluge," after La Fage, in folio. "The Paſſage of the Red Sea," after the ſame. "The Rape of Proſerpine," after the group in the garden of Verſailles, by Gerardon, in folio. "God ſpeaking to Moſes from the Burning Buſh," after Le Brun, in folio. "The Gift of Tongues," after the ſame painter, wherein he has introduced his own portrait. "The Martyrdom of St. Stephen," after a painting by the ſame maſter in the church of Notre-Dame, in folio. "The Triumphal Entrance of Conſtantine the Great into Rome," after the ſame. "The Cieling of the Chapel de Saulx," repreſenting the fulfilment of the ancient law by the new, after Le Brun, in ſix large plates, dated 1681, and remarkable for a ſuperior diſplay of character, expreſſion, and fine drawing. The cieling of the pavillon at Saulx, known under the name of the Pavillion of Aurora. In this work Le Brun repreſents the riſing of the ſun, and the four ſeaſons; engraved on four large plates, and inſcribed to Louis XIV. Four very large engravings from Le Brun's battles of Alexander the Great, of which

which the ſubjects are, "The Paſſage of the Granicus," "The Battle of Arbela, and Defeat of Darius," "The Reception of Porus," and "The Triumphal Entry of Alexander into Babylon;" from the largeneſs of their dimenſions, the artiſt has thought it neceſſary, or found it moſt convenient, to engrave each of theſe ſubjects on four plates, from which the impreſſions are afterwards paſted together. They are at once the largeſt and beſt of hiſtorical engravings, and conſtitute the triumphal entry of that art into Europe.

Of Benoit Audran the nephew of Girard, having already given a biographical ſketch, (ſee AUDRAN, BENOIT,) it remains only to add the liſt of his beſt engravings. We begin with the hiſtorical ſubjects, which are of the folio ſize.

"The Baptiſm of Jeſus Chriſt," after a painting of Albano in the Luxembourg. "The Rape of Dejanira," after Guido. "David beheading Goliah," after a painting (formerly in the cabinet of the French king,) by Michael Angelo, painted on the two ſides of a ſlate, and each repreſenting the ſame ſubject differently treated, engraved on two plates in the years 1716 and 1717, by the two brothers, B. and I. Audran, in folio. "A Gypſey telling Fortunes," after the ſame maſter, in the collection of Crozat. "Lot and his Daughters," after Paul Veroneſe, in the collection of Crozat. "Diſguſt," after the ſame maſter, the original of which was in the Palais Royal.

The following are after pictures by Le Brun: "Moſes defending the Daughters of Jethro," a large piece engraven by John and Benedict Audran in conjunction. "The betrothing of Moſes and Zipporah," companion to the preceding, wholly engraven by Benedict. "The Brazen Serpent raiſed by Moſes in the Deſert." "The Purification of the Virgin, or Simeon in the Temple," a piece marked Audran fec. et exc. "Jeſus Chriſt taken from the Croſs," after a painting in the Luxembourg. "Deſcent from the Croſs," after a painting in the Louvre, dedicated to cardinal de Noailles. "Holland accepting Peace," after a painting in the gallery of Verſailles. "The Baptiſm of Jeſus Chriſt," after P. Mignard. "The Pleaſures of Horticulture," after the ſame maſter, two large friezes engraven by Benedict and John Audran. "Our Saviour at the Houſe of Martha and Mary," after Le Sueur, a large plate, dated 1690. "St. Paul preaching at Epheſus," after the ſame. "Alexander during his Sickneſs taking the Potion preſented to him by his Phyſician," a circular print, after the ſame maſter, from a painting in the Palais Royal, engraven 1711, and eſteemed one of the beſt works of Benoit. "The Accouchement of Mary de Medicis," and "The Exchange of Two Queens," two beautiful engravings from the gallery of Rubens in the Luxembourg. The twelve months of the year, on ſix folio plates, forming a ſet, from paintings by Cl. Audran the younger.

His principal portraits are as follow; Benedict or Benoit Audran, engraver to the king, painted by J. Vivien, and engraven by himſelf, in octavo. Louis Thomas de la Valette, general of the oratory, inſcribed B. Audran fecit ad vivum, in folio. Renaud of the oratory, after Bonnet, in folio. Charles le Gout, archbiſhop of Narbonne, after Bon of Boulogne, an oval, engraven in 1708. John-Baptiſte Colbert, after Cl. le Fevre, an oval, with acceſſaries. Joſeph-Clement, elector of Cologne, after J. Vivien, in folio. Maximilian-Emanuel, elector of Bavaria, marked J. Vivien pinx. Il ſe vend le dit Sieur, in folio. Henry de Beringhen, firſt equerry to the king, marked Nanteuil del. 1663. Bened. Audran ſc. 1710, in folio. Samuel Friſching, general of the Swiſs. J. Huber pinx. Bened. Audran ſc. Pariſiis 1713, in folio. John Frederic de Willading, conſul of the republic of Berne, 1718. J. Huber pinx. B. Audran ſc. in folio. The equeſtrian ſtatue of Louis XIV. erected at Lyons, after Desjardins, conjointly engraven by B. and J. Audran, in folio.

John Audran, the younger brother of Benoit, having diſtinguiſhed himſelf, as has already been obſerved, at the early age of twenty years, and continuing to engrave till he was eighty, produced a conſiderable number of prints which are highly eſteemed. To the liſt of his engravings, which the reader will find under the article AUDRAN, JOHN, we are now enabled to add the following, beginning with the religious ſubjects and thoſe from claſſic hiſtory, which are moſtly of the folio ſize.

"Jeſus Chriſt preaching on ſhipboard," after Raphael. "A Landſcape," in which the infant Jeſus is repreſented in a recumbent poſture, contemplating a croſs, which is held by three angels in the clouds, after Albano. "The Nativity," after P. da Cortona, an oval. "The Good Samaritan," after Annibal Carracci, round. "Saint John adminiſtering the Sacrament to the Virgin," after L. Carracci. "Jeſus on the Mount of Olives," after Dominichino. "St. Andrew adoring the Croſs on which he was to ſuffer Martyrdom," after Guido. "The Martyrdom of St. Peter," after Guido, erroneouſly inſcribed with the name of Dominichino. "St. Paul preaching at Athens," after Ciro Ferri, a ſmall piece in the form of a frieze. "Galatea on the Waters," after C. Maratti, a very beautiful piece, in folio. "The Miracle of the Loaves and Fiſhes," after Claude Audran, in folio. "Jacob complaining to Laban," and "The Reſurrection," both after Coypel, the latter of which is eſteemed amongſt the French, one of the moſt diſtinguiſhed works of that painter. "The Elevation of the Croſs," and "The Crucifixion," both after Vandyke. "The French Parnaſſus of Titon du Tillet," a very large plate, of which the original is executed in bronze. "Acis and Galatea," with Polyphemus on his rock, after F. Marot. "Venus irritated againſt Pſyche," and "Pſyche conſoled by Cupid," both after Nattier. A landſcape after Pouſſin, in which is introduced St. John, the two Maries, Nicodemus, and two angels weeping over the body of Jeſus Chriſt. "The Rape of the Sabines," after the ſame maſter, eſteemed the beſt of the engravings of Audran, and a very ſucceſsful tranſlation of the original picture. "Andromache flying to the Aid of her Son," after L. Silveſtre, and three mixtures of fact and allegory, after Rubens, *viz.* "Henry IV. deliberating on his future Marriage." "The ſame Monarch preparing for the War in Germany," and "The Coronation of the Queen."

The following are portraits, and are all of the folio ſize. Louis XV. on foot, inſcribed Gobert pinx. Audran ſc. Anonymous portrait of the prince with a page, after Vivien. Clement Auguſtus, prince of Bavaria, after the ſame. Jean-Baptiſte Colbert, marquis de Torcy, without his name, after Largilliere, in an oval. Duke of Autin, alſo in an oval. The abbe Victor-Marie d'Etrees, after Largilliere. Cardinal Pierre Ottoboni, after Le Treviſan. Fenelon, archbiſhop of Cambray, after Vivien. Pierre Gillet, after Tortebat. Francis-Robert Secouſſe, doctor of the Sorbonne, ſeated in an arm chair, after Rigaud. Peter-Paul Rubens, after Van Dyke. Noel Coypel, painter in ordinary to the king, after himſelf, and Anthony Coyſevox, ſculptor in ordinary to the king, after H. Rigaud. The two latter were engraven at the time of our artiſt's reception into the Royal Academy, (namely in the year 1703,) and, either on account of their merits or their ſubjects, were the means of that reception.

John Baron, or Baronius, alſo called the *Taloſano*, from the

the place of his nativity, was born at Toulouſe in the year 1631, but ſettled at Rome early in life, where he engraved and publiſhed almoſt the whole of his works. He executed his plates entirely with the graver, in a ſervile, dry manner, neat indeed, but exceedingly defective in drawing, expreſſion, and effect. Yet he had the inſenſibility to attempt great things, of which the following are the ſubjects of a few:

"The Martyrdom of St. Stephen," and that of "St. Andrew," a pair of folio prints, after Nicolo del Abbate. "St. Peter," and "St. Paul," after A. Carracci, a plate in which the heads and hands are engraven by Bloemart. "A Madonna in the act of Adoration," from Guido, in 4to. and another from Bernini. "St. Romualdo," founder of the Camaldales, in which ſeveral eccleſiaſtics are introduced, aſcending to heaven, an upright folio, after Andrea Sacchi. A ſet of twelve plates forming an elementary drawing book, after P. Ferrerio, in folio, and the "Plague of the Philiſtines, with the fallen Idol Dagon," a folio plate after Pouſſin.

But we are chiefly indebted to Baronius for the following portraits, which are of the folio ſize. John de Plantevit de la Pauſe, biſhop of Loudon. Cardinal Aquaviva. Leonardo Alberti, architect. Vito de Bramante, architect. Giovani Franceſco Ruſtici, ſculptor. Marc Antonio Raimondi, engraver. Raphael d'Urbino, painter. Leonardo da Vinci, painter, and others of diſtinguiſhed artiſts, amounting in the whole to fifty.

Charles Mace has been frequently confounded with F. B. Maſſe, the miniature painter. He was employed by M. Jabach, to copy drawings in his poſſeſſion, and to etch the mafterward; and the following hiſtorical landſcapes, after Caſtiglione, are from his hand.

"The Angel commanding Noah to ſtore the Ark with Animals." "Abraham and Sarah on their Way to Egypt." "The Bleſſing of Abraham." "Abraham taking leave of Hagar." "Rebecca departing for Meſopotamia." "Jacob returning to his Father's Houſe." "Rachael returning from Meſopotamia." "Jacob ſending Preſents to his Brother Eſau." "Moſes expoſed on the Nile." "Moſes departing with his Wife and Children for Egypt." The "Nativity," and the "Crucifixion."

The time of the birth of John Picart, who flouriſhed about the middle of the ſeventeenth century, has not been mentioned. He is believed to have been a native of Paris, and to have reſided chiefly in that city; but to have ſtudied engraving under Criſpin de Paſſe. He engraved ſeveral portraits, among which are thoſe of Edward, infant of Portugal, in a ſmall upright oval, with emblems; and a whole length of Eraſmus ſtanding in a niche, beſide other frontiſpieces for books; but his merit is too inconſiderable to deſerve further notice here.

Etienne, or Stephen Picart, is preſumed by Strutt to have been related to John, and to have aſſumed the appellation of "La Romain," (the Roman,) that his works might not be confounded with thoſe of his relation; but from this miſtake his ſuperiority as an artiſt ſufficiently protected him, nor need he, nor would he, with the conſciouſneſs of this ſuperiority, have aſſumed a ſir-name to mark it. A more reaſonable ſuppoſition is, that he choſe to be called Picart the Roman, from a vanity of telling the world that he had ſtudied at Rome. He was born at Paris A. D. 1631, and after reſiding ſome years in Rome returned to his native city, where he became a member of the French academy, and obtained the title of engraver to the king. He died at Amſterdam, (whither he had retired with his ſons,) at the advanced age of ninety.

According to Watelet, Picart executed ſome plates in which etching predominates; but his principal works are performed with the graver only, in a ſtyle ſomewhat reſembling that of Fr. de Poilly, though with inferior ability; yet it is worthy of remark, that ſome paſſages in his works are very ſuperior to the reſt, as for example, the boy who ſtands in the left-hand corner of his "Peſtilence among the Philiſtines," after Pouſſin, and the livid female who lies dead toward the middle of the fore-ground, and whom the child would ſuck, are ſuperior to the tenor of the plate, though it be reckoned among the very beſt of his engravings. The cold lividneſs, which is properly ſpread over the boſom of this dead mother, pervades his ſtyle; his heads in general are thoſe of Pouſſin vulgarized, his extremities are not marked with feeling, and his chiaro-ſcuro is deficient in harmony.

Of the numerous engravings of S. Picart, it may ſuffice to mention the following, which are all in folio.

"An Ecce Homo," accompanied by three Angels, after C. Albano. "The Nativity of the Virgin," after Guido, dedicated to Le Brun. "The Nuptials of St. Catherine," after Correggio. A pair from the ſame painter, of "Heroic Virtue triumphing over Vice," and "Man delivered up to the Pleaſures of Senſe," dated in 1676. Another pair, of "St. Cecilia playing on the Baſs-Viol," and a "Concert of Muſic," after Dominichino, in folio. "A Holy Family," known under the name of "Silence," after Carracci, which has ſince been put to ſhame by the beautiful and maſterly engraving of the ſame ſubject, from the hand of Bartolozzi. "The Holy Family," after a grand compoſition of the elder Palma. "The Separation of St. Peter and St. Paul," after J. Lanfranc. "The Plague of the Philiſtines, and the Overthrow of the Idol of Dagon," after Pouſſin. "Jeſus curing the Blind, on leaving Jericho," after the ſame, inſcribed Picart, (le Romain,) exc. "The Adoration of the Shepherds," after the ſame. "St. Paul cauſing the Books of the Epheſians to be burnt," after le Sueur. "The Martyrdom of St. Gervais, and St. Protais," after the ſame. "The Martyrdom of St. Andrew, and that of St. Stephen," after Le Brun. "The Adoration of the Kings," after Guil. Courtois. "A Madonna, with the infant Jeſus on her Knees," after Noel Coypel. "St. Anthony of Padua, adoring the infant Jeſus," after Vandyke.

The beſt portraits engraved by this artiſt are as follow: Jean-Francois, Paul Gendy, cardinal of Retz, in 4to. A piece executed in the ſtyle of Mellan, and from Picart's own drawing. A buſt of cardinal Fachenettus, after J. M. Morand, in 4to. P. Lucas Waddingus, miniſter-general of the order of St. Francis, after Carlo Maratti. Melchiſedech de Thevenot, a famous traveller, in the oriental coſtume. F. Chauveau del. in folio. Francis Tillemont, abbé of Valchretien, R. Nanteuil del. in folio. Andrew Hameau, doctor of the Sorbonne, Ant. Paillet pinx. in folio. Nicholas Pavillon, biſhop of Aleth. Stef. Picart fecit, in folio. Nicholas Choart de Buſanval, biſhop of Beauvais, inſcribed Stephanus Picart Romanus, fec. et exc. The preſident Claude de Brion, after A. Paillet, in folio, Pierre Loiſel, doctor of the Sorbonne, after F. le Maire, Jean Michel Cigula, a prince of the Ottoman empire, who was converted to the Chriſtian faith, and Frances Athenais de Rochechouart, marchioneſs of Monteſpan.

Bernard Picart, the ſon of Stephen, was born at Paris in the year 1663. He ſtudied under his father, and being admitted to draw from the life at the French Academy at the age of ſixteen, he two years afterwards gained the prize. It is ſaid that he took up the graver with reluctance: he contin-

nued, however, both to design and engrave at Paris until the year 1710, when he accompanied his father to Amsterdam, with some intention of proceeding to Sweden; but certain offers that were made him by the Dutch booksellers induced him to alter his mind, and he continued to reside at Amsterdam to the time of his death, which happened on the 8th of May 1733. He was twice married, but it does not appear that he left any children.

Great part of Picart's life was spent in making drawings, which are highly finished, and sufficiently testify the fertility of his invention. He understood the human figure, but in the airs of his heads followed too much the fashion of affectation which Coypel had led. His professional industry must have been great, for besides making these highly finished designs, the number of his engravings are not fewer than thirteen hundred.

Most of these plates indeed were small, and were engraved as embellishments to books, for which he was famous. His style consisted chiefly of etching, and bears considerable resemblance to that of Le Clerc. According to Watelet, the taste of the Dutch amateurs of that day impaired the talents of our artist, by inducing him to deviate from the path which nature had pointed out to him, and while he accumulated a fortune, he lost the esteem of the judicious. If his larger works were done to please those amateurs, Watelet's remark is not without foundation, for they are cold, tame, and tasteless, when compared with his small plates.

He scraped a few mezzotintos, among which is a Nativity from Carlo Maratti, and, possessing a certain degree of dexterity in imitating the works of other artists, he undertook, towards the close of his life, what he called *innocent impostures*, which, however, were not published till after his death, and which Strutt thinks had better not have been published at all; it consists of seventy-eight plates, forming, with the preliminary discourse, explanations, and list of his works, a small folio volume.

Of his other engravings, the most remarkable are, "The Massacre of the Innocents," in small folio, from his own design, the first impressions of which are known by their being printed before the crown was placed on the head of Herod. "The Epithalamia," a set of twelve plates, valued for the taste and delicacy with which they are executed, and consisting of eight prints lengthways, and four uprights, in quarto. "The Annals of the Dutch Republic." Of these are particularly remarkable the frontispiece, which is "The prince of Orange," "The Massacre of De Wit," and "The Synod of Dort;" five allegorical frontispieces for Roman Antiquities, Religious Ceremonies, Banier's Ovid, and the Dictionnaire and Atlas Historique, folio. "Philosophers in Search of Truth, at the Head of whom is Descartes," dated 1703, in folio. "Festival of the Gods, and of the Cæsars," a subject taken from the Cæsars of the Emperor Julian, in folio. "The Triumph of Painting," engraven in 1725, in folio. "The Children of Niobé, pierced by Arrows," in folio. Two satirical folio prints, against the administration of law. "A Monument consecrated to Posterity, in Commemoration of the incredible Folly of the 20th Year of the Eighteenth Century."

From the compositions of other masters Picart has engraven "Time delivering Truth from the Yoke of the Passions." "The Remembrance of Death, or Shepherds of Arcadia;" and an allegorical dance, entitled, "The Picture of Human Life," all after Poussin. After Le Sueur he has engraven a pair of "The Muses, Calliope and Terpsichore," and "Darius causing the Tomb of Queen Nitocris to be opened, in the Hope of discovering a Treasure;" and after Le Brun, "Hagar dismissed from the House of Abraham," dated 1707.

His principal portraits are those of Stephen Picart the Roman, engraver to the king, &c. designed in 1715, (en Medallion,) and engraven by his son Bernard in 1730, in small quarto; Roger de Piles of Nevers, ipse pinxit, an etching dated 1714. The following kings of England after Vandyke, Kneller, and Vanderwerf, Charles I, Charles II., James II., William III., and George I. Prince Eugene of Savoy, after Van Skuppen. Louis, prince of Asturias; John de Wit, grand pensionary of Holland; Edward Clarendon, lord chancellor of England, after Zoust. Lord William Russel, and Frederic, duke of Schomberg, after Kneller. Bishop Burnet, after Hoadley. Francis Pierre, cardinal de Fox, (who terminated the schism, and gave peace to the see of Rome,) and a medallion of Philip, duke of Orleans, supported by Apollo and Minerva; after A. Coypel.

Nicholas Petau was the son of James Petau, an engraver from Antwerp. He was born at Paris in the year 1633, and died in the same city in 1676. He probably, judging from the style and character of his engraving, studied in the school of de Poilly. He worked with the graver only, and appears to have handled that instrument with facility, but his extremities are somewhat heavy, the degree of correctness he has attained in his drawing is a laboured correctness, and the similarity of texture which he has spread over his flesh, draperies, and back-grounds, give a certain character of insipidity to his engravings. Watelet however praises the works of this artist somewhat highly, and particularly his Holy Family, after Raphael, for beauty of tooling, purity of outline, vigour and justness of effect, and the true rendering of the characters of Raphael.

The following engravings by this master are held in most esteem, beginning with the historical subjects, which are all in folio.

Ths above-mentioned "Holy Family," after Raphael, wherein St. John is kneeling, as if to receive the benediction of the infant Saviour. "A Madonna reading, with the Infant in her Arms," after Guerchino, an oval. "Angels weeping over a Dead Christ," after the same. "Christ in the Sepulchre, with several attendant Angels," after Carracci. "The Annunciation," after Ph. Champagne. "Jesus Christ, the Virgin, and St. John in the Clouds, interceding for St. Bruno, while several Monks are seen on their Knees," after the same, engraven in 1657. "A Magdalen in the Desert," after the same. "A Holy Family," where the infant Jesus is seen caressing the little St John, after I. B. de Champagne. "St. Sulpice, or the Bishops assembled in Council," after the same. "A Bust of the Virgin," after Le Brun. "A Holy Family." wherein an angel is seen presenting a basket of flowers to the infant Jesus, after Villequin.

His principal portraits are in folio, and are those of Alexander VII., on a pedestal, inscribed P. Mignard pinx. Romæ, N. Pitau sculp. Parisiis, 1662. Louis XIV., a three-quarter figure in armour, Cl. le Feure pinx. Louis Dauphin, son of Louis XIV., after the same. Benjamin Prioli writing the history of France in Italian; after the same, smaller in size. Nicholas Colbert, bishop of Luçon, after the same. Alexander Paul Peteau, counsellor to the parliament, after the same. Henri-Louis Hubert de Montmor, after Champagne, 1667. Oliver Cromwell, after Vanderwerf. Ambrose Chapelle, bishop of Anvers, seated at a table, after H. Perez Brant. Caspar de Daillon du Lude, bishop of Albi, after Juste van Egmont. Vincent de Paul, pastor of the congregation of St. Lazarus, after S. François

çois. Sir Francis de Sales, biſhop and prince of Geneva, after nature, and Louis Alexandre de Bourbon, count de Thouloufe, and admiral of France, after Gobert, inſcribed N. Pitau junior ſc.

Louis Coſſin was born at Troyes, in Champagne, A. D. 1633, and lived till about the cloſe of the century. For ſome reaſon or other, he frequently altered the orthography of his name, and Coquin, Cauquin, Coſſin, and Coſſinus, are all the ſame perſon. He worked, with the graver alone, in a poor and taſtel ſ; ſtyle, and is alſo deficient in drawing and chiaro-ſcuro. His beſt hiſtorical engravings are in folio, and their ſubjects as follow :

" A Madonna" after Le Brun, and, from the ſame maſter, " The Martyrdom of St. John the Evangeliſt." " The School of Athens," after Raphael, a very large plate. " Paul ſtoned at Lyſtra," after J. B. Champagne, and a figure of ſculpture, publiſhed in the Cabinet des Beaux Artes, 1690.

The chief of Coſſin's portraits, which are juſtly held in more eſteem than his hiſtorical works, are thoſe of Louis XV., as large as life ; and inſcribed L. Coſſin ad vivum pinx. et. ſc. Jean Doujat Juris-conſulto François, after F. Suré. Valentin Conrat, of the French Academy, after C. Le Fevre. Francis Chauveau, deſigner and engraver, after the ſame. Louis Roupert, a goldſmith of Metz, inſcribed P. Rabon pinx. L. Coſſinus ſc. Jean de Schulenbourg, comte de Mondejeux, after Bernard, L. Coquin ſc.; and Charles Jean Comte de Koenigſmark, after M. Dahl, all in folio.

Gerard Edelinck, the countryman of Bolſwert, Vorſterman, and Pontius, appears to have formed his ſtyle of engraving before he quitted Antwerp, and probably from ſtudying the works of thoſe diſtinguiſhed maſters. He arrived in Paris ſoon after the middle of the ſeventeenth century ; where his merit immediately ſhone forth, and in that age and country of liberal patronage readily procured him the favour and protection of Louis XIV. He became a member of the French Royal Academy, and the king honoured him with an apartment at the Gobelins, an annual penſion, and the title of Chevalier. In the year 1707 he died in the French metropolis at a very advanced age.

Though Edelinck was contemporary with Audran, and muſt have ſeen the vigour and pictureſque feeling which the admixture of etching imparted to his hiſtorical works, and muſt have heard, and probably joined in, the encomiums that were juſtly beſtowed on them, he did not deviate from that mode of building up for himſelf, a lofty and laſting reputation, which nature and education had marked out for him. Reckleſs of the halcyon gales which ſeemed to court his canvas, he ſteadily purſued his original courſe ; and with the graver alone he ploughed up the ample field of his fame. Wedded to the ſtyle he had adopted in the earlier period of his life, he did not, in his maturer age, allow the ſuperior charms of the youthful and admired miſtreſs of Audran to diſturb his ſettled affections.

It would appear, however, that the cognoſcenti of the ſeventeenth century were much divided in opinion, as to the relative merits of theſe two modes of engraving, and, notwithſtanding what is now thought on the ſubject, Edelinck might poſſibly, among his contemporaries, find even more admirers than Audran. Much to the honour of the latter artiſt, it has been ſaid that he recommended Edelinck to Le Brun's notice, to engrave " the Tent of Darius," from a modeſt perſuaſion that his own powers were inadequate to the delicacy of the taſk. It is pretty well known that at the period now ſpoken of, the means were by many miſtaken for the end of engraving. The ignorant gradually learn to worſhip the idol itſelf, that was at firſt ſet up merely to ſtimulate their devotion, and lead their minds to the contemplation of divine perfections ; and clear and clean cut lines were a quality in the engraver's art more vulgarly obvious than exquiſite drawing, or delicate energy of expreſſion.

Such might be the nature of the admiration of the majority with reſpect to engraving at that period; but the art of Edelinck added, to theſe more obvious and ſuperficial qualities, the profundities of ſcience ; and though the freedom, delicacy, and addreſs, with which he handled his graver, are admirable, yet his application of that freedom, delicacy, and addreſs, is not leſs ſo. How well he underſtood the human figure, and how beautifully, in engraving his fleſh, he tempered his courſes of lines, and mingled them with ſtippling, may be ſeen in the figure of Chriſt in his large plate of " The Crucifixion," after Le Brun : the head of this figure alſo ſhews how deeply he ſtudied the energies and ordonnances of character and expreſſion in the originals which he copied, and how thoroughly empowered he was to render them with effect.

Under ſuch circumſtances, though poſterity ſhould beſtow the palm of ſuperiority on Girard Audran, it will not be ſurpriſed that Edelinck choſe rather to be the firſt engraver in a ſtyle that had already been honoured with general approbation, than to enter into a rivalry, which might have ended in confirming him *the ſecond* hiſtorical engraver of his age.

Strutt writes of our artiſt with great truth, that " he ſucceeded particularly in the heads of his figures, which are often uncommonly fine. He certainly underſtood the human figure, yet he did not draw it with that great taſte and correctneſs which is ſo remarkable in the prints of Girard Audran; neither are his hands and feet marked in that maſterly manner, or with equal truth. And if we compare that excellent engraving by him, repreſenting the tent of Darius, from Le Brun, which he has finiſhed in ſo beautiful a manner, with the battles of Alexander, by Audran, from the ſame maſter, we ſhall readily agree, I believe, that the animation, correctneſs, and taſte, which we find in the latter, amply compenſate for the want of that clearneſs and neatneſs, which appear in the execution of the former.

Among the moſt eſtimable prints by this great artiſt, may be reckoned the following:

" A Battle between four Horſemen," with much of the general air and character of a compoſition of Rubens, after Leonardo da Vinci, miſtakenly inſcribed on the plate " De la Finſe pinxit," a ſcarce and valuable print, in large folio. " A Holy Family," with Elizabeth, St. John, and two angels, one of which is ſcattering flowers, an upright folio, from the famous picture of Raffaelle, which was in the king of France's collection. The firſt impreſſions are known by their having been taken before the arms of Colbert were added at the bottom of the plate; the ſecond edition is with the arms, and in the third the arms are taken out, but the place where they had been inſerted is very perceptible.

From the pictures of Le Brun, Edelinck has engraven " The Crucifixion of Chriſt," a very large and beautiful engraving, on which we have already commented, and which, from its large dimenſions, (three feet in height,) the artiſt has engraven on two plates. " Mary Magdalen bewailing her Sins, and trampling upon the Riches of the World," a middling-ſized upright, the proof impreſſions of which are known by their having been taken before the ſubject was ſurrounded by a narrow border. " St. Louis at Prayers," and St. Charles Boromeus, its companion. " Alexander entering the Tent of Darius," a very large print, engraved

on

on two plates of a ſize correſponding with Audran's battles and triumphal entry into Babylon, (of which the firſt impreſſions have the name of Guyton, the printer, ſcratched underneath with the dry needle.)

Edelinck has alſo engraven, in concert with Drevet, another large print, on two plates, of the ſame ſubject, (Alexander entering the Tent of Darius,) from the original of P. Mignard: and from P. Champagne, "Moſes with the Tables of the Law," engraved in concert with Nanteuil.

Among his beſt portraits will be found thoſe of C. Le Brun, from a painting by himſelf; the three following, after Hyacinthe Rigaud; namely, M. d'Hozier the genealogiſt; Martin Vanden Bogaert, the ſculptor; and Madame Helyot; and after P. Champagne, a portrait of himſelf, and thoſe of Arnald d'Andilli, and Nathaniel Dilgerus.

Guillaume Chateau, (or Caſtellus,) was born at Orleans A.D. 1633. His ſtrong deſire of purſuing the fine arts induced him at an early period of his life to remove to Lyons, in order to viſit Italy at a convenient opportunity. After having worked in that city for ſome time at the profeſſion of engraving, he determined to go to Rome; where hearing, on his arrival, of the reputation which Frederic Greuter had acquired as an engraver, he courted his acquaintance and became his diſciple. Under Greuter he completed his ſtudies; was ſoon employed to engrave the portraits of the popes; and had numerous other plates put into his hands, in which he ſucceeded ſo well as to eſtabliſh his character as an artiſt.

He now travelled to Florence, Parma, Genoa, and other ſeats of art, in order to contemplate the works of the great maſters, and afterwards returned to Lyons, where he remained ſome time with the marquis de Sonozin. From Lyons he removed to Paris, and continued to reſide there under the patronage of M. Colbert till the time of his death, which was occaſioned by a violent fit of the cholic in the year 1683.

Chateau worked chiefly with the graver, of which he poſſeſſed great command; but in ſome inſtances has etched his landſcape back grounds. There is much clearneſs in his ſtyle, but from the ſquare manner in which his firſt and ſecond courſes of lines interſect each other, a cold and metallic effect is produced. His drawing is ſtiff and laboured, and not always correct, and the extremities of his figures are but poorly marked: in ſhort, his works ſeem produced by labour and care, rather than by genius and taſte.

The principal hiſtorical engravings of Chateau are of the folio ſize, and their ſubjects as follow:

"The Prophets David, Daniel, Jonas, and Habakkuk," from a painting attributed to Raffaelle, in the church of Madonna del Popolo, but according to Botari, painted by Roſſo, engraved on two plates. On a third plate, our artiſt has converted theſe doubtful prophets into the four evangeliſts. "The miraculous Fiſh," after Raffaelle. "The Baptiſm of Jeſus Chriſt," after Albano. "Ananias reſtoring Sight to St. Paul," after P. da Cortona. "The ſtoning of St. Stephen," after Carracci. "The Aſſumption of the Virgin," after Carracci. "The Saviour with the Croſs, meeting St. Peter," who ſays to him, "Domine quo vadis, &c." after the ſame. "Repoſe during the Flight into Egypt, or a kneeling Madonna admiring the infant Jeſus lying aſleep on ſome Straw," an oval, engraven by Chateau, but without his name, or that of the painter, which is Correggio. "A Holy Family," in which the infant Saviour is ſtanding on a globe, after Carlo Maratti.

From the admirable picture of Pouſſin, Chateau has engraven "The Iſraelites collecting Manna in the Wilderneſs;" "Chriſt reſtoring Sight to the two blind Men of Jericho;" "St. Paul caught up into the third Heaven;" "The Death of Germanicus," one of his beſt prints; and "The Preſervation of the young Pyrrhus," all, excepting the latter, engraved for the collection entitled "The king of France's Cabinet." After Noel Coypel we find "A Holy Family," containing five figures, and a Madonna and Child, in a border of flowers; and after his own compoſition, "A Holy Family," and "A Repoſe during the Flight into Egypt," the latter of which is partly a plagiariſm from Correggio.

Of his portraits the beſt are, the biſhop of Ruette; Jean Baptiſte Colbert, an oval; and thoſe of the popes, which have been already mentioned.

Nicholas Chateau is ſuppoſed to have been a relation, and perhaps the ſon, of William. He was born at Paris A.D. 1680, but of his death, or the courſe of his ſtudies, we find no account.

His beſt works are a portrait of Boucherat, from a drawing of his own. A half-length figure of "A young Lady richly attired and holding a Maſk," after Santerre, and dated 1708. "A young Lady dreſſed in the Spaniſh Coſtume, ſitting," after the ſame painter. "Summer," after Peter Van de Berg. "A young Female ſinging, habited in the Grecian Coſtume," a ſmall folio, dated 1708. "Venus attempting to diſſuade Adonis from going to the Chace," dated 1706. "The Transformation of Daphne into a Laurel." "Rinaldo and Armida," dated 1708, all after L. Silveſtre. "St. Jerome in the Deſart," after Balth. Peruzzi, engraven by Chateau in conjunction with L. Surrugue.

Pierre Simon was born at Paris in the year 1640. He preſumptively ſtudied in the ſchool of Nanteuil. Like him he painted and engraved portraits from the life, and theſe are his beſt works: indeed they poſſeſs no inconſiderable degree of merit.

The only hiſtorical work of Simon with which we are acquainted is the "Martyrdom of St. Cormo and St Damien," a folio plate, after Salvator Roſa. His portraits, which in ſtyle reſemble thoſe by Nanteuil, are not uncommon. Among the beſt of them will be found thoſe of Frederic Baroccio, the painter, in quarto. Charles D'Aelley, duke de Chaulneſs, after de la Borde, in folio. Jacobus Cardinalis Roſpigliоſius, a half-length figure in an oval, very large and ſurrounded by an ornamental border.

In the following, the heads (as appears to have been much the faſhion of the times) are as large as life. That portraits of this very large ſize ſhould be engraven in lines, would appear as ſurpriſing as it is unneceſſary, if it were not ſo common. Louis XIV. after Le Brun, dated 1677. Louis de Bourbon, prince of Condé, dated 1678. Anne Maria Louiſa of Orleans, ducheſs de Montpenſier. Elizabeth Charlotte Palatine, ducheſs of Orleans; all from pictures by Simon himſelf, and Leo Potier de Geſores, abbé and count of Bernais, after De Troy.

Guillaume Vallet was born at Paris A.D. 1636. After acquiring the rudiments of engraving in France, and apparently in the ſchool of F. de Poilly, he travelled to Italy for improvement, but returned after ſome years reſidence at Rome, and died in his native city in the year 1704. He worked with the graver only, and his ſtyle bears an inferior reſemblance to that of de Poilly: yet he is occaſionally deep-toned and vigorous in his chiaro-ſcuro. His principal hiſtorical engravings, which are of the folio ſize, are as follow:

"The Nativity," almoſt ſquare; "Melchiſedec bringing Preſents to Abraham," and the "Lord's Supper," all after Raphael, and the latter inſcribed "Pictum a Raphaele Urbinate Romæ in Palatio Vaticano." "A Holy Family" after

after C. Cæfio, in which the infant St. John is receiving the bleſſing of our Lord. "The Virgin waſhing Linen," after a painting of Albano; a piece commonly known under the name of the "Laveuſe." "A Holy Family, or the Virgin adoring the Sleeping Jeſus," after Guido, almoſt ſquare. Two other holy families after A. Carracci. "Repoſe during the Flight into Egypt," after C. Maratte; inſcribed "Torrentum pertranſivit anima noſtra." "The Annunciation," after Guil. Courtois, brother of Bourguignon. "The Reſurrection of our Saviour," after N. Loir. "St. John the Baptiſt in the Preſence of Herod," after Le Brun. "The Adoration of the Kings," painted at Rome by Pouſſin. "The Aſſumption of the Virgin," after J. Miel, engraved at Rome. "A Holy Family," in which the Virgin is ſeen with the infant Jeſus on her knees, holding out a branch of cherries to St. Joſeph, after Jac. Stella. "Jeſus Chriſt on the Croſs, adored by Angels," after the ſame.

The moſt eſteemed portraits from the graver of Vallet, are thoſe of Alexander Algardi, ſculptor and architect, in 4to. Andrea Sacchi, painter, after C. Maratte, engraven in 1662, in 4to. Olympia Maidalchini Pamphili, Principeſſa di S. Martino, engraven at Rome in 1657. Charles Emanuel, duke of Savoy, in folio, after his own drawing.

The following are all after Paillet, and of the folio ſize. Buſt of Pierre Corneille, crowned by Melpomene and Thalia. William le Roux, biſhop of Perigueux. Antoine Daubray, count d'Offremont, counſellor of ſtate. Nicolas Favre de Berlife, count of the holy conſiſtory, and "St. Francis de Sales preſented to pope Alexander VII." large, and engraved on two plates.

Anthony Maſſon was born in the Orleannois in the year 1636. He viſited Paris in his youth, but had previouſly been brought up like Coſmo Armſtrong of England, (of whom future biographers will ſpeak,) to the profeſſion of gun-engraving. He who has acquired the power of cutting ſteel with preciſion, has well prepared himſelf for the taſk of cutting copper with freedom, firmneſs, and facility. It was probably in part owing to this early circumſtance of the education of Maſſon, that he acquired thoſe ſurpriſing powers in handling his graver, which Europe has ſince beheld with admiration.

After the example of Nanteuil, who was but ſix years older than himſelf, he now ſat down to acquire the talent of painting portraits from the life, and many of his engravings are done after his own originals. He appears to have had no maſter in fine art, as in ſome reſpects he had no equal: he probably formed his ſtyle, partly from ſtudying the engravings of Nanteuil, but his invention was more vigorous and unbridled; and though he has much leſs of ſimplicity, he has, in his beſt performances, not leſs of exquiſite feeling, of which it was ſcarcely poſſible to have more. In ſome of his works indeed, he appears as if he meant to be capricious and extraordinary, rather than natural, and to ſurpriſe our ſenſes rather than ſatisfy our judgment; and in his "Jeſus Chriſt with his Diſciples at the Houſe of Emmaus," commonly known by the name of "The Table Cloth," as well as in the face of his elector of Brandenbourg, and other of his portraits, are many of theſe eccentric paſſages, though mingled with others of uncommon merit. In the arms of the figure immediately to the left of Jeſus Chriſt, in the drapery and hat of the diſciple to the right, and in the clouds above, Maſſon has twiſted and twirled his lines about, as if to ſet ſyſtems at defiance. The whole of the back ground is wild and ſingular, and Watelet has remarked of the dog which is under the table, that he looks as if formed of ſtraw: yet notwithſtanding theſe, and other ſeeming aberrations from all pre-conceived rule, here is ſuch varied expreſſion of the textures of ſubſtances; ſo much harmonious keeping; and the tone of Titian, after whom it is engraved, is ſo truly rendered, that it has, ever ſince its production, been regarded as a valuable ſchool for engravers, and a maſter-piece of the art.

His portrait of Guillaume de Briſacier, commonly known in England by the appellation of "the Grey-headed Man," is another wonderful piece of engraving; and Watelet has juſtly ſaid of it that here we at once recognize the complexion of the original, and the firm ſoftneſs of fleſh in the face, while his hair, and the fine lace of his neck-bands, are not leſs delicately and beautifully wrought.

His portrait of Oliver d'Ormiſſon is alſo extremely beautiful, and is engraved with much more ſimplicity of ſtyle, if we except the operoſity of the hair; while in that of Guido Patin, he has daſhed and pranced about in all his former curvetings and vagaries, yet has harmoniſed the whole ſo admirably, that the moſt faſtidious taſte cannot but acquieſce in the pleaſure it inſpires, and welcome home the performer after his *ad libitum* flouriſhing.

Watelet has many ſenſible and judicious remarks on the ſtyle of this very celebrated engraver. He diſcommends his favourite practice of repreſenting ſingle hairs, detached from the maſs; and in ſpeaking of a portrait which the preſent writer has not ſeen, that of Charles Patin, he ſays "it poſſeſſes much depth of tone, and almoſt exhibits the appearance of real life: we ſee the ſatirical ſmile of this phyſician finely diſplayed—leſs ſo it is true, than that of his father—and his eyes gliſtening with malice; (this ſeems more than ſhould belong to the portrait of a phyſician)—the ermine of his robe is likewiſe pourtrayed with the greateſt accuracy; but in viewing more nearly the lines which conſtitute the face, I obſerve much ſingularity in their diſpoſition, as thoſe which deſignate the noſe proceed afterward to form the cheek; I am diſpleaſed when I examine thoſe of the forehead, and overwhelmed with aſtoniſhment when I behold one ſtiff courſe of lines employed to expreſs the chin."

Another of his moſt meritorious works is the portrait of Gaſper Charrier, after Blanchet, where, though the hair appears too briſtly for human hair, the face is moſt exquiſitely engraven, and the eyes have never been ſurpaſſed either for form, feeling, fire, or the animated humidity of the cryſtalline humour.

On the whole, that characteriſtic mark of genius which diſpoſes us to regard an artiſt rather by the dimenſions of his merit, than by his freedom from defects, belongs among engravers pre-eminently to Maſſon. His hiſtorical works, of which we ſhall next proceed to mention the moſt eſteemed, are few compared with his portraits, but are of the folio dimenſions.

"The Holy Family," from N. Mignard; "St. Jerome," and "Jeſus of Nazareth," the latter ſmall; "The Aſſumption of the Virgin," a large upright from Rubens, eſteemed one of the moſt rare and beautiful of the engravings of Maſſon, though it bears not his name. "The Brazen Serpent," after a grand compoſition of Le Brun, engraved on two plates on account of its large dimenſions, and the before-mentioned Jeſus Chriſt at the table of Emmaus, after Titian.

The portraits from the graver of Maſſon are ſome of them in large, and others in ſmall folio, and are principally as follows, beginning with the ſmaller.

Antoine Maſſon of the royal academy, engraver in ordinary to the king, ſe ipſe fecit; Frederic William elector of Brandenbourg, dated 1683, (a ſcarce print). Guy, or

Guido Patin, doctor of medicine at Paris 1670, extremely rare and in an extraordinary ſtyle. Charles Patin, (ſon of Guy) doctor of medicine; another of the chef d'œuvres of Maſſor. Marin Caræus, phyſician to the king; after P. Mignard, dated 1665. François Marie, doge of the moſt ſerene republic of Geneva, 1685. Pierre Dupuis, painter to the king, N. Mignard pinx. 1663. Hardouin de Beaumont, archbiſhop of Paris, N. Mignard pinx. 1664. Gaſpar Charrier, ſecretary to the king, Thomas Blanchet pinx. Emanuel Theodore de la Tour, of Auvergne, duke d'Albert, N. Mignard pinx. Alexander du Puy, marquis of St. Andre, De Seve pinx. Louis, duke de Vendome, P. Mignard pinx. Michael Colbert, abbé of Premontres, 1674, Maſſon pinxit. William de Briſacier, ſecretary to the benefices in the gift of the queen, N. Mignard pinx, 1664; a very capital engraving, commented upon in our biography of the artiſt. Olivier le Fevre d'Ormeſſon, preſident of the parliament, 1668. Antoine Turgot de St. Clair, maſter of requeſts, 1668. Marie de Lorraine, ducheſs of Guiſe, N. Mignard pinx.

Portraits in very large folio. Anne of Auſtria, queen of France, P. Mignard pinx. Maria Thereſa of Auſtria, queen of France, N. Mignard pinx. Maria Anne Victoire de Baviere, dauphineſs of France. Louis Auguſte, duke of Maine, ad vivum ſc. Jean Jacques de Meſmes, count d'Aveaux, 1683. François de Beauvilliers, duke of St. Aignau. François Rouxel de Medavi, archbiſhop of Rouen, 1677. Jerome Bignon, librarian to the king, 1686. Denis Marin, ſecretary to the king, 1672. Louis Verjus, count de Crecy, counſellor of ſtate, 1679. Nicolas de Lamoignon, count de Courſon, 1676. Count of Harcourt, repreſented as far as the knees, a celebrated portrait, known under the name of "Cadet de la peree," N. Mignard Aveni pinx. Ant. Maſſon ſc. a maſterpiece of engraving.

In the following inſtances the heads are of the natural ſize; but on this immenſe ſcale Maſſon did not attain the ſame perfection, as on a ſmaller; his force being laviſhed and loſt in unneceſſary exertion. Louis XIV, in a hat, ad vivum fecit, 1687. Louis XIV., after le Brun; a large oval. Louis dauphin, ſon of Louis XIV, in a hat. Jean Baptiſte Colbert, miniſter to the king, 1677. Francis de Harley, archbiſhop of Paris, 1684. Claude du Houſſet, chancellor to the king's brother, 1681. Henri de la Tour d'Auvergne, viſcount de Turenne. Francis Michael le Tellier, marquis de Louvois. Nicolas Potier de Novien, firſt preſident of the parliament, 1679. William de Lamoignon, firſt preſident of the parliament, 1675. Charles Colbert, marquis de Croiſſi, H. Caſcar pinx. 1681.

Madeleine Maſſon, the daughter of Antoine, was born at Paris about the year 1646. She was educated under her father, and engraved in the ſame ſtyle as himſelf. Her prints are much valued, and are equally rare as thoſe of her father.

The following are a few of her moſt diſtinguiſhed productions:

Elizabeth Charlotte, Palatine, Ducheſs of Orleans, the head as large as life, and inſcribed "Mad. Maſſon ſc. under the direction of her father," in folio. Elizabeth d'Orleans, Ducheſs of Alencon. P. Mignard pinx. the ſame ſize. Maria Thereſa of Auſtria, queen of France and Navarre. Mad. Maſſon fec. the ſame ſize. Elizabeth Maria Joſephine, Infanta. Id. ſc. ſame ſize. Victor Amadee II. duke of Savoy. Mad. Maſſon, ſc. the ſame ſize. Louis-Henri de Gendrin de Monteſpan, a portrait painted by her father, and engraven by Madeleine Maſſon, of the ſame ſize as the above. The great number of thoſe coloſſal engravings that were performed about this period may be regarded as one of the faſhionable follies of an age, when the *big* was too much miſtaken for the *great*.

René Lochon was born at Poiſſy about the year 1636. He ſettled at Paris, where he publiſhed a great number of portraits, as well as hiſtorical ſubjects after different maſters. His ſtyle of engraving reſembled that of Nanteuil, eſpecially by its mellowneſs, though his works are decidedly inferior to thoſe of that great maſter. Thoſe moſt worthy of diſtinction, are "Jeſus Chriſt bearing the Croſs," after Carracci, and a "Holy Family," after N. Coypel, dated 1668, both in folio.

The beſt of his portraits are alſo in folio, and are thoſe of, a young magiſtrate in an octagonal border of oak leaves, inſcribed R. Lochon ad vivum del. et fec. 1657. Charles de Bourbon, biſhop of Soiſſons, Ib. 1657. Euſtaches de Lepeville, biſhop of Conſtance, 1661. Felix Vialart, biſhop of Chalon. Belthaſar Phelipeaux de la Vrilliere, abbe; ad vivum fec. 1667. Jerome Bignon, a celebrated author of the laſt century. R. Lochon ad vivum furtim del. et ſc. Louis de Marillac, doctor of the Sorbonne, 1696. Paul the younger, of the company of Jeſus. Harduin de Pereſix, archbiſhop of Paris, 1676, after Champagne. Antoine Arnauld, after the ſame.

Jean Berain was born at Paris A.D. 1636 and died in the ſame city in the year 1711. He has the title of ornamental deſigner to the king, and ſo great was the reputation he enjoyed, that he was conſtantly employed, either for the court or city, in ornamental decorations. His brother Louis, who was alſo a ſkilful deſigner, aſſiſted him in theſe works, and he was alſo occaſionally aſſiſted by Chaveau and Le Moine.

To his etchings he has not often ſubſcribed his name; they are neat, but too ſtiff and taſteleſs to merit any other praiſe. His principal work is a large folio book, (of which the frontiſpiece is by Scotin,) entitled "Ornamens du Peinture et de Sculpture, dans de Gallerie d'Apollon du Louvre, et dans le grand apartement du Roi aux Tuilleries."

His other works on copper are fourteen plates forming a ſet of heraldic devices in 4to. three folio plates of ornaments, invented and executed by J. Berain; a comic ſubject of a man leading two dogs; an opera ballet, and two plates of Mauſolea.

Simon de la Roiſſiere was born at Paris in 1637. He engraved not only after his own deſigns, but alſo after thoſe of Sebaſtien le Clerc. He likewiſe executed medallions of the popes from Martin to Innocent XI. for the edition of P. Molinet canon of St. Genevieve, a work in folio, printed in 1679. Several of the plates in the work entitled "the Cabinet of the King," were alſo from the hand of this artiſt; whoſe beſt performances, on the whole, are, "The Death of a Prince ſurrounded by his Court;" frontiſpiece and ſeveral vignettes for M Blondel's grand courſe d'architecture. Some plates for Jean Picart's work on the dimenſions of the earth. Some plates for the work of Antoine Deſgodets, entitled, "Traité des edifices antiques de Rome;" a ſet of forty plates of antique medals in folio; "A View of the Palais Royal," in two plates, and a ſet of twenty-ſix plates of views, plans, elevations, &c. of the royal palaces, of which, however, Boiſſiere engraved only a part.

Jacques Lubin was born at Paris in the year 1637. He was probably the diſciple of G. Edelinck, whoſe ſtyle he ſucceſsfully imitated. Lubin engraved a great number of portraits, and was employed, in conjunction with other able engravers, in executing the plates for Perault's memoirs of illuſtrious men. His principal works are, the portraits of Armand Jean du Pleſſis, Cardinal duke de Richelieu,

Jean

Jean Pierre Camus, biſhop of Belley. Robert Arnauld d'Andilly, (a celebrated author.) Jean Paſſire Maſſon, (a celebrated advocate.) Vincent Voiture, of the French academy. Pierre Corneille, of the French academy. Olivier Patru, of the French academy, and Jean Baptiſte Colbert, miniſter of ſtate, all in folio. The only hiſtorical plate from his graver, with which we are acquainted, is alſo in folio, and its ſubject "Jeſus Chriſt laid in the Sepulchre;" after le Sueur.

Simon Thomaſſin was born at Troyes in Champagne in the year 1638, and was a deſcendant of Philip Thomaſſin, the tutor of Callot, who flouriſhed at Rome toward the cloſe of the ſixteenth century. After acquiring the rudiments of drawing and engraving in his natal city, he repaired to Paris, and from thence to Rome, where he ſtudied in the academy founded by the French king for the improvement of thoſe young artiſts who were ſent from France. He afterwards returned to Paris, where he became a member of the Royal Academy, and where he died in the year 1722.

The ſtyle of Thomaſſin's engraving, which is performed with the graver alone, is neat and clear, but laboured and dry; his drawing is tolerably correct, but ſomewhat manncred; he appears to have ſuffered, rather than enjoyed, his various taſks, and to have poſſeſſed "patience under his ſufferings."

His largeſt work is a folio volume, containing two hundred and eighteen plates of the ſculptures which adorn the chateau and gardens of Verſailles; and his beſt hiſtorical works are "The Miraculous Fiſh of St. Peter," after Raphael. "The Reception of the Emperor," after Bon Boulogne, engraven in 1684. "St. Paul carried up into the third Heaven," a circle, engraven in 1684, after Pouſſin. "Jeſus on the Mount of Olives," after le Brun. "Sancta Scholaſtica, cujus Anima de Corpore egreſſa," after J. Jouvenal, all in folio; and the "Transfiguration," after Raphael, the largeſt and beſt of Thomaſſin's hiſtorical works, engraved on two plates.

The beſt of his portraits, are thoſe of Louis, duke de Bourgogne, ſon of Louis dauphin, deſigned and engraven by S. Thomaſſin, 1698; in folio. Maria Adelaide of Savoy, Ducheſs de Bourgogne. Id. del. et ſc. Paul Beauvillier, duke de Aignon, peer of France. S. Thomaſſin ſc. 1695, in folio. Arnauld, cardinal d'Oſſat. S. Thomaſſin fecit, ſculptor Regius, in 4to. Charles XII. king of Sweden, S. Thomaſſin fecit, 4to. Francis Hebert, biſhop of Agen; after du Mee, in folio. Antoine Furetiere, of the French academy. De Seve pinx. in folio. Pierre Corneille, of the French academy. C. le Brun pinx. in folio. Equeſtrian ſtatue of Louis XIV. in bronze, executed by Coyzevox, in folio, and a grand Theſé, with the portrait of Alexander Bournonville. S. Thomaſſin del. et ſc. on two folio plates.

Henri Simon Thomaſſin was born at Paris in 1688, and died in the ſame city in 1741. After having learned the principles of his art from his father, he ſtudied under Picart, whom he accompanied to Holland. After a ſtay of two years at Amſterdam he returned to Paris, and was nominated a member of the academy of painting in 1728. His ſtyle of engraving being coarſe and diſſonant, neither reſembles that of his father Simon, nor that of Picart; neither is he at all ſuperior to his father in his knowledge of the human figure.

His principal hiſtorical works are in folio, and are entitled as follows: "Adam and Eve out of Paradiſe, or the Man condemned to Labour," after a painting of Dem. Feti, in the cabinet of Crozat. "Melancholy," a kneeling figure, meditating on a ſcull, after the ſame maſter, and from the ſame collection. This print is one of the beſt of his engravings, and ably executed. "The Pilgrims of Emmaus," after a painting of Paul Veroneſe, in the collection of Crozat. "A Woman at the Bath, attended by two others, one of whom raiſes her Robe, while the other waſhes her Feet," after Rubens, engraven by H. S. Thomaſſin, under the direction of B. Picart. "The Magnificat, or the Canticle of the Virgin," from a celebrated painting by Jouvenet, in the choir of Notre Dame. "The Wrath of Coriolanus appeaſed by the Tears of his Family," after la Foſſe. "The Plague in the City of Marſeilles, during 1721," (with a deſcription,) painted by J. Fr. de Troy. "Apollo diſtributing Rewards to the Arts and Sciences, and Minerva crowning the Genius of France," a cieling piece painted by P. Mignard for the ſmall apartments of the king at Verſailles. Sim. Thomaſſin filius ſculp. Amſtel. "Nymphs ſurpriſed by Satyrs," from L. Sylveſtre. "A naked Venus aſleep," from Le Brun. "Eneas and Achates entering the Temple where Dido is ſitting," from Coypel, and the following ſubjects from Watteau,

"The Return from a Ball," "Recruits marching to join their Regiment," a Buffoon (dedicated to count Caylus,) "Mezetin playing on the Guitar," a ſet of twelve plates of faſhionable figures, by Thomaſſin, Cochin and others; and another ſet of eight, which are much ſought after by connoiſſeurs. Note, the two latter works are of the 8vo. ſize.

The following portraits are alſo from the graver of the Junior Thomaſſin:

Michal Angelo Caravaggio, reflected in a mirror, which is held by the painter, in 4to. Charles Cignani of Bologna, painted by himſelf. Jean Theery, ſculptor in ordinary to the kings of France and Spain, after Largilliere. Cardinal Fleury, ſupported by Diogenes; after Rigaud and Autreau. Louis, dauphin of France, after Jean Louis Tocqué; and a medallion of Louis XIV. preſented to the Arts by Minerva, after L. de Bologna, all in folio.

Sebaſtian le Clerc was an artiſt of very ſuperior powers. He was the ſon of a celebrated goldſmith of Metz, in which city our engraver was born in the year 1637. He is ſaid to have been educated an engineer, but from an engraved view of his native city, which bears the date of 1650, and which therefore, if his biographers have truly recorded the year of his birth, muſt have been engraven at the age of thirteen; and from an engraved head of Jeſus Chriſt, which is dated in the year 1655, it appears that his paſſion for fine art manifeſted itſelf at a very early period of his life; ſo early, as may well incline us to doubt the fact of his having been educated an engineer, or to abſorb it in the ſtrong and unqueſtionable evidence afforded by this early manifeſtation of his genius for the art of engraving.

He learned the firſt principles of drawing, and probably of mathematics, from his father, or under his paternal roof; and, beſide the above mentioned head, executed ſeveral plates with the graver alone, before he became acquainted with that branch of the art in which he was deſtined to hold ſo diſtinguiſhed a rank.

He was probably unacquainted with etching until after his arrival in the French metropolis, which he viſited with the view of improving himſelf as an artiſt, and of aſſociating with the men of ſcience with whoſe preſence Paris was at that time adorned. Here he became acquainted, and finally formed a ſtrict friendſhip with Le Brun, by whoſe recommendation he diſcontinued his architectural and engineering purſuits, and confined his attention to deſigning and engraving; and here he was introduced, probably by Le Brun himſelf, to the miniſter Colbert, who being made acquainted

with his merits, obtained for him an apartment in the Gobelins and a penſion of eighteen hundred livres, which however was aſſigned to him upon condition of his working for the king alone, who honoured him with the title of engraver royal. He was ſoon after created profeſſor of perſpective in the royal academy, and a Roman knight by pope Clement XI.

In the year 1672, he was appointed to engrave the Mauſoleum, erected by the Royal Academy of Arts, in the church of l'Oratoire at Paris, under the direction of Le Brun, for which he received a penſion of three hundred livres from the academy, and the following year he married Charlotte Jeaune, daughter of Vanden Kirchove, the king's dyer at the Gobelins, by whom he had eighteen children.

It appears that the advantage of a royal penſion in France might, even at that time, be more ſeeming than real. The rapid increaſe of his family, and a ſecret conſciouſneſs, probably, that his inventive talent was reſtrained by his royal engagement, obliged le Clerc to give up that ſettled upon him by the king, on account of the condition annexed to it. Anticipating that he ſhould be more profitably patronized by the public, and feeling the vigorous expanſion of his own powers for original compoſition, he now began that vaſt number of engravings, from his own deſigns, to which his name is annexed, and which amount to upward of three thouſand! many of which are peopled by prodigious multitudes, in all the diverſity of coſtume of the various ages and nations of the earth.

Le Clerc died at Paris A.D. 1714, aged ſeventy-ſeven years, and was buried in the church of St. Hippolito, in which pariſh he reſided.

Perhaps no artiſt has diſplayed a greater diverſity of endowment than Le Clerc. From his mathematical ſcience, and the ſtudies he connected therewith, he became an enlightened architect, engineer, and a teacher of perſpective; from his knowledge of drawing, his various reading, and his ſtudy of the works of Le Brun and Callot; above all from the energy of his own genius, he became an accompliſhed deſigner and engraver, excelling, to uſe the ſentiments of a French writer, in almoſt every department of fine art; hiſtory, landſcapes, animals, ruined and modern edifices, were by turns the ſubjects of his pencil and his graver. His compoſitions are full of knowledge and variety, his draperies ſimple and beautiful, his forms elegant and correct, his heads noble and characteriſtic, while their expreſſion is indicated with the addreſs of a conſummate artiſt. He ſtudied in the ſchool of Le Brun, and if to ſome he ſhould rather appear to have ſtudied Raphael and the antique, this proceeds from the learned manner of Le Brun when reduced to the ſmall ſcale of le Clerc's engravings; for, in conſequence of ſuch reduction, Le Brun loſes his own defects, and retains only the grand ſtyle of the Roman ſchool.

From theſe praiſes of the French writers, Huber, Roſt, and Baſan, ſome ſmall deductions ſhould perhaps be made on the ſcore of national partiality. In his engraving, Le Clerc generally employed ſingle courſes of lines, and with more of the ſpirit and firmneſs of Callot, than of the taſteful airineſs which charms us in the works of Della Bella.

Our limits allow us to mention but few, comparatively ſpeaking, of his numerous works. We begin with thoſe taken from *ſacred hiſtory*.

"The Dream of the Prophet Elias." "The Apotheoſis of the ſame Prophet," wherein the landſcape is a view of the falls of Niagara, both in ſmall folio. "The Repentance of the Ninevites." "The young Tobias with the Angel on the Banks of the Tigris," ſmall folio. "The Calling of Abraham," in 4to. "The Annunciation," inſcribed Virgini ab Angelo ſalutatæ. "The Adoration of the Kings," where a page is ſeen carrying a robe to one of them, a very ſcarce print. "A Holy Family," where the Infant Jeſus is ſeen between the Virgin and St. Joſeph, all three ſtanding. "The Infant Jeſus ſitting, and before him the little St. John, who kiſſes his Hand." "The Good Shepherd," as deſcribed by the prophet Iſaiah. An allegory on the viſions of madame Guyon, a diſtinguiſhed piece in ſmall folio. "St. John the Baptiſt ſitting beneath a Rock." "The Miracle of the Loaves and Fiſhes," one of the chef-d'œuvres of the artiſt, in ſmall folio. "The Saviour ſitting in the midſt of ten Apoſtles." "An Ecce Homo," accompanied with ſeveral ſoldiers. "A Crucifix on a ground of dark Clouds." "The Martyrdom of St. Stephen." "A ſtanding Madonna, incloſed in a Border." "The Virgin borne on Clouds, and attended by Angels," a round piece. "The Virgin with Angels, ſeated with the Infant Jeſus in a Landſcape." "Our Lady of mount Carmel." "The miraculous Image of our Lady of Conſolation at Premy." "St. John the Evangeliſt writing in the Iſle of Patmos." "The Bark of St. Peter," inſcribed Annuerant iis, qui erant, &c.

Subjects from profane Hiſtory, ancient and modern.—"The entrance of Alexander into Babylon," a diſtinguiſhed piece in folio. In the firſt proofs the hero is ſeen in profile, in the ſubſequent impreſſions it is a three-quarter face. "The Apotheoſis of Iſis," in folio. In the firſt proofs dancers are repreſented ſurrounding an altar, in the ſubſequent impreſſions their place is ſupplied by ſacrificers. "Mars" and "Diana," a pair of ſingle figures, in 8vo. extremely ſcarce. "The Map of the Gobelins," a folio print in honour of Le Brun. "The Academy of Sciences," in the firſt proofs of which the ſkeleton of a ſtag and tortoiſe are repreſented in the foreground; a capital piece. "The triumphal Arch of Louis XIV. at the Gate of St. Antoine," a capital piece, in folio. "The Chapel of St. Catherine at Stockholm," which contains the burial place of the kings of Sweden, improperly called the tomb of the king of Portugal, in folio, 1654. "Catafalque erected in the Church of Stockholm for the Obſequies of Charles XI. of Sweden," 1697, in folio. "Catafalque of Chancellor Seguier," a print in great requeſt among connoiſſeurs. A pair in folio of the cielings of the hall and bed-chamber of baron Teſſin, in his hotel at Stockholm, much valued for their taſteful execution. "Proceſſion of the Knights of the Order of the Holy Ghoſt, on the Quay of St. Auguſtin at Paris," in folio. "The Game Keeper of Nantes," a very remarkable piece, engraven in 1668, in folio; (a bad artiſt retouched this plate in 1694, and put upon it re-engraved by Carreau.) Allegory in praiſe of Louis XIV. repreſenting Hercules and Alexander with the motto: "Plures non capit orbes," 1684, in 4to. "Venus riſing from the Sea." A piece termed "la premiere Venus," and engraved for M. Potier, in 1693, in 4to. The ſame piece called "la ſeconde Venus," re-engraven by le Clerc 1711, in the contrary direction. (After the death of le Clerc M. Eiſen added to this plate a Triton, which puſhes the Chariot, and a Cupid flying before it.) "The Tomb of M. Bonneau in the church of Tournay," after Girardon, 1685. "Two Vaſes of Flowers on one Plate, ſurrounded with an ornamental Border," 1656. "The Fortreſs of Montmelion," taken by M. de Catinat, the 21ſt Dec. 1691, in folio.

The following are uſually bound in ſets or ſeries.—Figures illuſtrative of the paſſion of our Saviour, in thirty-ſix ſmall plates. Repreſentation of the inſtitution of the order of Mathurius for the redemption of captives, on eleven plates, including the frontiſpiece, 1654. Another ſeries of prints for the order of Mathurius, eleven plates, 1656; ſcarce. The triumphs

triumphs of Charles IV. duke of Lorraine, on twenty-three plates, of which two are engraved by Dervet of Nancy, 1664, in folio. Hiſtory of Charles, duke of Lorraine, conſiſting of thirty-ſeven plates of hiſtorical ſubjects, and vignettes, in quarto. Twenty-eight plates for the Hiſtory of the Preſent State of the Ottoman Empire, by Briot, Paris 1670, in quarto. A collection of academic figures, in thirty-two plates, with the frontiſpiece, executed for the ſecond edition of "L'Art de Peinture, par Dufreſnoy," Paris, 1673, in 12mo. Ovid's Metamorphoſes, by Benſerade, thirty-nine plates, Paris, 1676, in quarto. The Labyrinth of Verſailles, containing thirty-nine plates of fables, with the frontiſpiece, Paris, 1677, in octavo, of which the firſt edition is now ſcarce. The Fables of Eſop, twenty-three pieces, in ovals. A collection of figures, horſes, landſcapes, &c. dedicated to the duke of Bourgogne, in nine books, including ſixty plates. Characters of the Paſſions, an elementary book after Le Brun, in twenty plates. Elements of Deſign, by Seb. le Clerc, in fifty-two plates. Treatiſe on Geometry, containing (beſides the figures engraven in wood, after Le Clerc, to the number of near three hundred,) eighteen copper-plates by himſelf, Paris, 1690, in octavo. Tapeſtries of the king, on which are repreſented the four Elements, and the four Seaſons, making, with the ornamental accompaniments, forty-eight plates, after Le Brun. The firſt edition is dated 1670, and is in imperial folio. "The Battles of Alexander," after Le Brun, ſix plates with the frontiſpiece, (which repreſents the gallery of the Gobelins,) in ſmall folio. "The Loves of Cupid and Pſyche," four plates, in folio. "The four Victories," repreſenting the ſurrender of Tournay, and that of Douay, the defeat of count de Marſan, and that of the Swiſs Confederacy, in folio. "The Conqueſts of the King," in twenty-eight plates, thirteen of which are engraven by Le Clerc; namely, The Iſle of Rez; Fort de Schenk; the Town of Nimeguen; City of de Grey; Battles of Sintzheim; of Fenette; Meſſina; Views of Agoſta, Bouchain; Battle of Agoſta; Battle of Palermo; L'Eſcalette; Battle of Caſſel; in folio: the other pieces of this collection were engraven by Chatillon, after the deſigns of Le Clerc. "The Leſſer Conqueſts of the King," in eight plates; namely, Views of Meſſina, and Dinant; the Battles of Caſſel, and St. Omer; Audience given to the Ambaſſador of Siam; Demolition of the temple of Charenton; the Combat of Leuze; the Blockade of Namur, in quarto.

Views and other Landſcapes.—"Side View of the City of Metz," engraven in 1650, the firſt eſſay of Le Clerc in the art of engraving. "The Remains of the Aqueduct of Joui, near Metz, and the village of Joui," a pair of landſcapes, engraven in 1656. "The Plan of the City of Metz," taken from the Siege of Metz, by Charles V. deſcribed by Saligna, 1665, in quarto. "A ſtrong Cheateau, built on Rocks in the middle of the Sea," from the hiſtory of the wars of Louis XIV. againſt the Dutch, in 1672. "A ſmall Landſcape," in which three Children are ſeen unrolling a printed Bill, 1620. Twelve views of the Fauxbourgs of Paris, dated 1695. A ſeries of views of gardens, perſpectives of cities, rocks, and ruins, dedicated to the marquis of Beringhen, twelve ſmall pieces, numbered. Thirty-ſeven plates of ſmall landſcapes and figures, deſigned and engraven for the inſtruction of the marquis of Courtenvaux, the two laſt of which are not always found in this collection. In the one is ſeen a cavalier turning his horſe; and in the other an arcade, 1690.

The beſt portraits by Le Clerc are, Sebaſtian Le Clerc ſtanding before a deſk, with ſeveral other figures, a piece entitled "Le Cabinet de M. le Clerc," not finiſhed. Small portrait of a Turk, dated 1656. Abraham Fabert, ſeigneur de Moulin, 1657. Marſhal de la Ferte, rare. Egonde Furſtenberg, biſhop of Straſbourg. Louis Fremin, ſcarce. A knight of Malta, 1659. "Vera Effigies R. P. Di. Philippi, Abbatis S. Agerici Virdunenſis," a whole length figure in a ſmall border, 1660. Torquato Taſſo, and M. Potier, "en medallion."

Louis de Chatillon was born at St. Menehould, in Champagne, in 1639, and died at Paris in 1734. Whoſe diſciple he was, Strutt could not find, nor have the French writers mentioned. He evidently imitated the free ſtyle of Girard Audran, and though he falls ſhort of that great maſter, his prints are not deſtitute of merit. Among the beſt of them may be reckoned,

"The Woman taken in Adultery," after S. Bourdon. "The Converſion of St. Paul," after the ſame. "The Seven Sacraments," painted at Rome by Pouſſin for the Chevalier de Pozzo. "St. John in the Iſle of Patmos," after the ſame. "The Fates weaving the Deſtiny of Maria de Medicis," after Rubens, all in folio. He alſo engraved three books, two of which contain the fountains for the iron horſe at Verſailles, and the third for the pavilions of Marly.

Jaques Blondeau, or Blondel, was born at Langres A.D. 1639. He travelled to Rome for profeſſional improvement, and probably, judging from his ſtyle of engraving, ſtudied there under Cornelius Bloemart, in conjunction with whom, Spierre, Clouet, and ſome others, he engraved a work from the pictures of Pietro da Cortona, in the palace of Pitti at Florence. Blondeau worked, entirely with the graver, in a ſtyle reſembling that of Bloemart, but he by no means equalled that maſter, either in drawing or freedom of execution. His prints are comparatively cold and metallic, and the extremities of his figures heavy, and frequently incorrect.

Of the plates already mentioned from P. da Cortona, he engraved eight of mythological and allegorical ſubjects: they are in ſmall folio, and the few following engravings by this artiſt, (the beſt of his works,) are all of the folio ſize,

"The Martyrdom of St. Lawrence," after the ſame painter. "The Chair of St. Peter," after Bernini. "A Magdalen," after Hyacinthe Calandrucci. "The Circumciſion," after Ciri Ferri. "Chriſt, with the two Maries and St. John at the Foot of the Croſs," after the ſame. "St. Auguſtin appearing to St. Thereſa," after the ſame.

Portraits.—Cardinal François Laurent Brancati, 1681. Cardinal Fortuna Caraffa, 1686. Cardinal Maximilian Gandolfi, archbiſhop of Salzburgh, 1686. Cardinal Opitius Pallavicini. General Eneas, count de Caprara. René d'Eſt, duke of Modena. Jean-George III. elector of Saxony. John Sobieſki, king of Poland. Cardinal Bichi, after Le Bourguignon, in an oval.

Charles Simonneau was born at Orleans in the year 1639, and died at Paris in 1728. He learned the principles of drawing from Noel Coypel, and the art of engraving in the ſchool of William Chateau. His firſt plates were executed with the graver only, in a ſtyle founded upon that of De Poilly; but he afterwards took up the point; and the prints which he produced by an union of both, are infinitely ſuperior to thoſe on which etching was not employed. He drew correctly, and his beſt plates, (which are as follow,) are finiſhed in a neat and pleaſing ſtyle; and are, with an exception or two which we ſhall mention, of the folio claſs.

"The Virgin kneeling, in a Landſcape, holding the infant Jeſus ſeated on the Fragment of a ruined Building, and before him the little St. John on his Knees," after a painting of Raffaelle in the Eſcurial. "Hagar in Deſpair comforted by an Angel," after Andrea Sacchi. "The Vir-

gin kneeling, and holding the infant Jeſus in her Arms, in the midſt of a Concert of Angels," after a painting of Fra. Bartolomeo, in the cabinet of Crozat, almoſt ſquare. "The infant Jeſus ſleeping in a Manger, and adored by the Shepherds," after Carracci. "Jeſus Chriſt converſing with the Samaritan Woman." "Jeſus Chriſt taken down from the Croſs, and placed on the Knees of his Mother," and "The ſtoning of St. Stephen," are alſo after Carracci. "Jeſus Chriſt at the Houſe of Martha and Mary," after Dominichino. "The Paſſage of the Rhine by the French Army," after Vandermeulen. "The Voyage of Mary de Medicis to Pont-de-Le," after Rubens, for the Luxembourg gallery. "Winter," after the ſtatue which Girardin executed in marble, for the gardens of Verſailles. Seven plates containing different views of "The Tomb of Cardinal Richelieu, erected in the church of the Sorbonne. "Aſtronomy," an allegorical compoſition, after Michel Corneille, the ſon, an oval. "Venus bringing the Dictamnum to cure the Wound of Eneas," after Ch. de la Foſſe.

The ſix following are after Le Brun, *viz.* "The Entrance of Jeſus into Jeruſalem." "The bearing of the Croſs." "The Death of Hypolitus." "Hercules driving away the Stymphalides," an oval, in ſmall folio. "Hercules ſtriking the Hind with the brazen Feet," an upright. "The Conqueſt of Franche Comté, in 1674," a large allegorical engraving, with an arched top, and generally and juſtly eſteemed the maſter-piece of Simonneau. "Lot with his Daughters," and "The Nativity," are both after Noel Coypel, and the three following are after Anthony Coypel: "Chriſt diſputing among the Doctors," the original of which is in the cathedral of Notre Dame. An "Ecce Homo," and "The Triumph of Galatea." The two latter plates are etched by the painter, and finiſhed with the graver by Simonneau.

The following folio portraits by this artiſt have alſo conſiderable merit: Henrietta Maria, queen of Charles I. of England, after Vanderwerf. Charlotte Elizabeth, ducheſs dowager of Orleans, after Rigaud. Julius Hardouin Manſert, architect to the king, after Fr. de Troy. Charles François de Lomenie, of Brienne, biſhop of Coutances, after Dumee. Antoin François Ferrand, maſter of requeſts, after De Launay. Louis XIV., according to different painters, and at different periods of his life, a ſtring of medallions attached to a palm-tree. He alſo engraved two or three plates of the ſickening, or ridiculouſly refined, court flattery of Ant. Coypel, with portraits of the king, and Colbert d'Ormoy, *ſuperintendant* of the arts.

Simonneau had a ſon, Philip, whom he brought up to the profeſſion of engraving. His ſtyle was ſimilar, but his talents inferior to thoſe of his father, and he engraved but few plates.

Two large friezes, the one repreſenting "The Rape of the Sabines," the other, "The Peace between the Romans and the Sabines," after Julio Romano. "The Three Goddeſſes preparing for the Judgment of Paris," after Perin del Vaga, in folio. "Venus and Adonis," after Albano, and two plates for the Crozat collection, are all that are known of the works of Philip Simonneau.

Louis Simonneau, younger brother of Charles, was born at Orleans in 1656, and died at Paris in 1728. He ſeems to have taken as a model the works of Audran; and by combining the etching-needle with the graver, he has imparted an agreeable variety to his works. He drew with great correctneſs, as is more particularly obſervable in the extremities of his figures. Like his elder brother, he was a member of the Academy, and in reſpect to talents, was ſcarcely his inferior. The beſt hiſtorical works of Louis Simonneau are as follow, beginning with thoſe after Ant. Dieu, which are of the folio claſs: "The Bearing of the Croſs." "Jeſus Chriſt nailed to the Croſs." "Jeſus Chriſt dead on the Croſs." Theſe three plates conſtitute part of a ſeries of twelve, the reſt of which are engraven by J. Audran. "St. Catherine." "The Aſſumption of the Virgin," after the cieling painted by Le Brun in the ſeminary of St. Sulpice. Thoſe which follow are after the ſame maſter, and are alſo in folio. "The Four Times of the Day." "The Four Seaſons," on the cieling of the Chateau de Vaux le Vicomte. "The Cieling of the Pavilion of Aurora, in the Gardens of Sceaux," in four plates, and "The Nymph of Sceaux." "Suſanna at the Bath ſurpriſed by the Elders," after Ant. Coypel, and "Jeſus at the Houſe of Martha and Mary," both in folio, after Ant. Coypel.

The beſt portraits by this artiſt are thoſe of Hyacinthe Serroni, firſt archbiſhop of Albi, in quarto. Antoine Arnauld, a celebrated theologian, after Ph. D. Champagne, in folio. Antoine le Maitre, advocate of the parliament, after the ſame. Martin Charmois, counſellor of ſtate, director of the royal academy of painting and ſculpture, after Seb. Bourdon, 1706, in folio.

Nicholas de Larmeſſin, the father, was born at Paris about 1640. Very little is known reſpecting the life of this artiſt, except that he engraved a great number of portraits of the illuſtrious men of France, and other countries. His ſtyle of engraving was far from diſagreeable, and he may juſtly be claſſed with the beſt engravers of the ſecond rank. The graver was the ſole inſtrument of his art, and he ſometimes marked his plates with the monogram which will be found in our plate of thoſe of the French ſchool. His beſt portraits are thoſe of Philippe de Bourbon, duke d'Orleans, brother of Louis XIV. Henrietta Stuard, ducheſs d'Orleans, conſort of Philippe. Charles XI. of Sweden. Henry-Julius de Bourbon, duke d'Enguien. Godefroy, count d'Eſtrade, marſhal of France. Gabriel Nicolas de la Reynie. Claude Felicite of Auſtria, conſort of the emperor Leopold I. Louiſa-Frances, ducheſs de la Valliere, in the dreſs of a carmelite nun. Theſe are all of the quarto claſs; the following are in folio; Maximilian-Henry, archbiſhop of Cologne. Balthaſar Moretus. Paul Manuce, a learned Italian. Laurent Coſter de Harlem, the pretended inventor of printing. Jean Guttemberg de Mayence, the real inventor of printing. The laſt is engraved without any croſs-hatchings, in the manner of Mellan.

Nicholas de Larmeſſin, the ſon, was born at Paris in 1684, and died in the ſame city in 1755, with the title of engraver to the king. He was the pupil of his father, and early diſplayed the greateſt induſtry in engraving portraits as well as hiſtorical ſubjects. This artiſt had acquired great reputation for the prints he had executed for the collection of Crozat, but afterwards, borne away by the torrent of faſhion, he only employed himſelf in engraving ſuch works as thoſe of Watteau, Lancret, Boucher, &c. His ſtyle of engraving, which conſiſted partly of etching, but chiefly of the work of the graver, poſſeſſed firmneſs and ſolidity, but his drawing was not correct.

The celebrated Schmidt of Berlin was the pupil of Larmeſſin, and engraved ſeveral ſubjects after Lancret, which are marked with the name of his maſter. The prints bearing the name of Schmidt are extremely ſcarce.

Larmeſſin's beſt engravings are thoſe which were done, chiefly after Raphael, for the Crozat collection, and which are entitled as follow:

Portraits of Raphael, with that of Pontormo. Cardinal Pole, with a long beard, ſeated in an arm-chair, from a picture attributed by ſome to Raphael, and by others to Sebaſtian

baſtian del Piombo. Frederic Carondelet, archdeacon of Bitento; this plate was engraven from a drawing in the poſſeſſion of M. de Crozat, which was copied from a picture in the poſſeſſion of the duke of Grafton, and the plate was afterwards worked upon in England, (preſumptively after the original picture,) by ſir N. Dorigny. "St. Michael overcoming the Devil." Another of the ſame ſubject, differently treated. "St. George encountering the Dragon." "St. John the Evangeliſt." "The Holy Family." "The Madonna with the Infant Chriſt aſleep on her Lap." "Chriſt bearing his Croſs," a very large print, from a very celebrated picture of this maſter, and "The Viſion of Ezekiel," a middle-ſized, upright folio. The portrait of Adam de Vignancourt, grand maſter of Malta, after Michael Angelo du Carravaggio; and that of a comedian in the ſervice of the duke of Mantua, after Dominico Feti, were alſo engraven for the Crozat collection.

The beſt of our artiſt's engravings after French painters are of the folio claſs, and are entitled "Louis XIV. conferring the Blue Ribbon on the Duke de Bourgogne, Father of Louis XV., from a Picture in the Cabinet of M. Julienne." "Cytheræ Inſulæ," and "Pagi Sponſa," after Watteau.

After Lancret he has engraven, "A Village Coquette." "The Play of Bull-leap." "The Gaſcon puniſhed." A ſet of four plates of "The Four Ages of Man," characterized by the amuſements proper for each period; and "The Four Seaſons," characterized by the occupations proper for each ſeaſon.

The beſt of his prints after Boucher, are, A monument to the memory of John Tillotſon. "The River Scamander." "The Amourous Courtezan." "A Nobleman," and "The Calendar of old Men," the four latter taken from the tales of Fontaine.

The portraits by this artiſt, which are held in moſt eſteem, are thoſe of Guillaume Couſtou, ſculptor in ordinary to the king, painted by Jean de Lien, and engraven by N. Larmeſſin the ſon, for his reception into the academy in 1730. Claude Hallé, painter to the king, painted by Le Gros, another reception piece. Philippe Vleughel, a Flemiſh painter, painted by Ch. de Champagne. Louis XV. on horſeback, after J. B. Vanloo and C. Parrocel. Louis XV. on foot, after J. B. Vanloo, and C. de Parrocel. Maria Leizincka, conſort of Louis XV. after the ſame. Maria-Joſephine of Saxony, dauphineſs of France, after the ſame. Charles-Henri de Lorraine, after Ranc. Woldemar de Lowendal, marſhal of France, after Boucher. Mademoiſelle Sallé dancing, after Lancret, all in folio.

M. G. Tournier was born at Toulouſe about the year 1640. He was the diſciple of Moiſe Valentin, and painted ſeveral ſubjects for the churches of his native city.

He etched ſeveral landſcapes after Salvator Roſa, ſome Madonnas after Guido, a few trophies after Polidore de Carravaggio, and ſeveral vaſes after Charles Errard. Strutt has confounded this artiſt with Robert Tourniere, who was a ſkilful portrait painter, and a native of Caen.

Jaques Grignon was born in France, but in what part is uncertain, ſome time in the year 1640, or thereabout, and flouriſhed till toward the cloſe of the century. The greater number, and beſt executed, of his engravings, are portraits, which are entirely the work of the graver, and are eſteemed for clearneſs, neatneſs, and truth of repreſentation. His hiſtorical ſubjects being dark, heavy, without much effect, and incorrectly drawn, are leſs worthy of notice.

The beſt portraits by Grignon are thoſe of François-Marie Rhima, an eccleſiaſtic, in ſmall folio, and of the oval form. Pierre Barbareau, doctor in theology, after Champagne. Jacques Caur, ſeigneur de St. Fargeau, ſuperintendant of the finances under Charles VII., in 1450. Jehan Bureau, a powerful nobleman, chevalier and mayor of Bourdeaux, chamberlain to Charles VII. and Louis XI., and maſter of the French artillery, all in folio.

Grignon alſo engraved ſeveral plates for a work in ſmall folio, entitled, "Les Tableaux de la Penitence," after the deſigns of Chauveau.

Charles de la Haye was born at Fontainebleau in 1641. He viſited Italy when he was very young, reſided there a conſiderable time, and in conjunction with Bloemaert, Spierre, Blondeau, and others, engraved the paintings of Pietro da Cortona, in the Pitti palace at Florence. His ſtyle of engraving ſomewhat reſembles that of Bloemart. His croſs-hatchings are thrown nearly at right angles over his firſt courſes of lines in a manner at which modern taſte revolts; and his chiaro-ſcuro is deficient in harmony; but his drawing of the naked is tolerably correct, which is certainly a cardinal requiſite, more eſpecially in engraving after the maſters of the Italian ſchools.

The beſt engravings of de la Haye are of the folio claſs, and their ſubjects

"The Virgin with the infant Jeſus on her Knees, who is diſtributing Palms to St. Catherine and other holy Martyrs," after Ciro Ferri. "The Virgin and Child appearing to St. Philip Neri," a large upright, after the ſame maſter. "Coriolanus refuſing to ſee the Roman Ambaſſadors, on being exiled from Rome," after the ſame. "The Grecian Philoſophers converſing in the Garden of Academus," J. F. Romanelli pinx., a fine plate, and probably his very beſt performance.

Jean Dolivan was born at Saragoſſa in 1641. He ſettled at Paris, and was chiefly employed in engraving ornaments, and decorations of various kinds. His prints may be claſſed with thoſe of Chauveau and le Pautre; but he had a leſs fertile genius than the latter. He engraved ſeveral works in conjunction with different artiſts, and among others, the ſeries termed, the little Conqueſts of Louis XIV. ſome of the plates for Berain's ornaments of the royal tapeſtries, one of the cielings for Perault's cabinet des Beaux Artes. "The Strangling of the Grand Vizier." "Funeral Decorations of the Chapel of Condé, at the Houſe of the Jeſuits." "Subject of Grief for the Divine Service at the Chapel of Condé." "Mauſoleum for the Funeral Obſequies of Maria de Guiſe d'Orleans, Queen of Spain, in 1695," all in folio, and after Berain.

Gerard Scotin was born at Goneſſe, near Paris, in 1642, and flouriſhed towards the end of the ſeventeenth century. He was the pupil of François Poilly, and handled the graver with much neatneſs; but his execution was not equally mellow with that of his maſter, nor was his drawing of the naked equally correct.

Of Gerard Scotin, the younger, who viſited England, and was a ſuperior artiſt to his father, we have ſpoken in our account of the *Origin and Progreſs of* ENGLISH *Engraving*.

The beſt works of Gerard Scotin the elder, are of the folio claſs, and their ſubjects, "The Marriage of St. Catherine," after Alex. Veroneſe. "The Magdalen receiving Communion from Angels," after Dominichino. "A rural Life," after Dominico Feti, an upright. "The Circumciſion," inſcribed "Vocatum eſt Jeſus," after P. Mignard. "The Baptiſm of Jeſus Chriſt," inſcribed "hic eſt filius," after the ſame painter. "Preſentation of the Infant Jeſus in the Temple," after Ch. le Brun. (B. Audran has engraven the ſame ſubject.) "Monumentum marmoreum Caſtellanorum," after the marble of Girardon. "The Siege of Courtray,"

tray," after Vandermeulen, the landſcape of which is engraven by Baudouin, the figures by Scotin.

François Spierre was born at Nancy in the year 1643. He ſtudied at Paris, in the ſchool of F. de Poilly, and ſoon attained a ſuperiority even over that able maſter. He was a man of a philoſophical turn of mind, great profeſſional induſtry, and extraordinary talent in his art. From Paris he travelled to Italy, in queſt of further improvement, where he remained a conſiderable time, and where his beſt works were performed. On his return from Italy he was taken ill at Marſeilles, and died there at the early age of thirty-three, according to Strutt, though, according to the French writers, he was thirty-eight, to the great regret of all who poſſeſſed the leaſt taſte for the art of engraving.

His beſt works are held in great requeſt among connoiſſeurs, and are worthy of great praiſe. Strutt ſays of him very truly, that he did not imitate the ſtyle of his tutor, though he worked entirely with the graver, which inſtrument he handled with great facility. He gave more play to the ſtrokes, and produced an effect more ſoft and pictureſque. But his ſtyle was ſo various upon different occaſions, that we may add the ſubſtance of what Watelet has ſaid of him, without overcharging the profeſſional character of our artiſt.

When he arrived at Rome, he found Cornelius Bloemart, whoſe ſtyle he occaſionally imitated, in the full vigour of his powers, and the meridian of his reputation. But Bloemart and de Poilly each confined himſelf to one ſtyle, whereas Spierre could vary his at pleaſure; he ſometimes employed only a ſingle courſe of lines, which he managed with a degree of eaſe and freedom, ſuperior to that of Mellan, ſo that he may be ſaid to have beaten three of the greateſt hiſtorical engravers of the age, each at his own weapons. Sometimes the connoiſſeur is ſurpriſed by the boldneſs and grandeur of his execution, and at others charmed with its delicacy and ſweetneſs; and he has an occaſional playfulneſs which may vie with that of etching, even from the hand of a maſter. Yet the preſent writer has ſeen prints from the graver of Spierre, or at leaſt inſcribed with his name, that are by no means worthy of theſe encomiums.

His abilities were not confined to engraving. He ſometimes painted hiſtory and allegory in a ſtyle which appears formed upon that of Pietro da Cortona, and ſometimes portraits. His portrait of count Laurent de Marſciano, which he engraved from a picture by himſelf, is remarkable for its harmonized variety of tints, though no part of the print be puſhed to the degree of blackneſs which has often been deemed indiſpenſable to a vigorous chiaro-ſcuro.

Conſidering the ſhort period of his life, his engravings are not few, and not many lives have been more completely filled with various and meritorious exertion. We begin our detail of the ſubjects of his plates, with thoſe which he engraved, after the pictures of the celebrated Italian maſters.

"The Virgin ſuckling the Infant Saviour," a circle, or ſhort oval, after Correggio. The earlieſt, and moſt rare proofs of this admirable engraving, are taken before drapery was introduced to cover the nudity of the infant, and are alſo without certain ſmall trees which are ſeen in the ſubſequent impreſſions to the left of the virgin; and theſe are ſo valuable, that at the ſale of M. Mariette, one of them brought five hundred livres.

"St. Michael encountering the Dragon," (a frontiſpiece to the Roman Miſſal;) this with the four following are all in folio, and all after Pietro da Cortona. "The miraculous Conception," engraved for the Miſſal of pope Alexander VII. "St. Martin before the Virgin, and the Infant Jeſus, who holds a Lily in one Hand, and in the other a Palm." "The Architect of Alexander VIII. preſenting to that Pope a Plan of Mount Athos, with his propoſed Improvements." "Cyrus refuſing to ſee Panthea, (his Captive,)" after a painting in the Pitti palace at Florence.

After Ciro-Ferri, Spierre has engraven the four following ſubjects, in folio. "The Circumciſion," for the Miſſal of pope Alexander VII. "Pallas in the Clouds, in a Chariot drawn by a Lion and a Lioneſs, with Jupiter on high, and a Philoſopher below." "A bird-hunting during Harveſt," and "The Innocence of Criſpe."

And from the pictures of Bernini, "A Madonna with her Hands croſſed," a circle in 4to. "St. John preaching in the Deſart." "The Miracle of the Loaves and Fiſhes." "Chriſt on the Croſs, ſuſpended over a Sea of Blood," which ſeems to have flowed from his own wounds; a ſingular performance executed without any croſs hatchings, the firſt impreſſions of which are diſtinguiſhed by having been printed before certain heads of cherubs were introduced; and "The Chain of St. Peter," (a large print engraved on two plates.) Theſe are all of the folio claſs, and the following are either painted from nature, or invented by Spierre himſelf.

Innocent XI. Odeſcalchi, ſovereign Pontiff, in 4to. The Grand duke of Tuſcany, engraven in 1659, in folio. Laurent count de Marſciano, in folio, a capital plate, of which we have already ſpoken. Medallion of Alexander VII. borne high in the air by a genius, while underneath is ſeen a Hercules entering the gardens of the Heſperides, and the three daughters of Heſperus preſenting him with oranges. An allegory on the culture of orange-trees, under the pontificate of that pope, in folio. "Mars and Minerva preſiding over the Culture of Roſes," with which three nymphs are occupied. "An Allegory on the Faculties of the ſoul," in folio, a diſtinguiſhed piece of our artiſt, and, which ſerves to ſhew his philoſophical turn of mind.

Jean Louis Roullet was born at Arles, in Provence, in the year 1643, and died at Paris in 1699. He learned the firſt principles of drawing and engraving from Jean L'enfant, and completed his ſtudies in the ſchool of F de Poilly, whoſe manner of engraving he adopted with great ſucceſs. Quitting the ſchool of de Poilly, he went to Italy, where he remained ten years, and where his merit recommended him to the favourable notice of Ciro-Ferri, and other celebrated artiſts, to whom he was alſo endeared by his amiable perſonal qualities.

Roullet handled the graver with great freedom and facility, and drew the human figure correctly; he therefore ranks high among the engravers of France. His large print of the three Maries at the ſepulchre, after A. Carracci, which according to Florent le Compte he engraved during his reſidence at Naples, is much admired for correctneſs of outline, force of chiaro-ſcuro, beauty of engraving, and the accuracy with which the expreſſion of the original is transfuſed. The ſubjects of his other productions are as follow, beginning with the hiſtorical:

A piece named "St. Claire." Here the infant Jeſus is ſeen on the knees of his mother, placing his right hand on the tabernacle, accompanied by St. Joſeph, after Aug. Carracci. (Several artiſts have engraven from the ſame picture.)

"The Virgin holding the Infant Jeſus, and a Book," after the ſame. "The Madonna, and Infant Jeſus, who embraces his Mother," after J. Lanfranc. Two of the angles of the dome of the church of the Jeſuits at Naples, on which are repreſented the Evangeliſts, St. Matthew, and St. Luke; the two others, St. Mark and St. John, are engraven by Fr. Louvemont, after J. Lanfranc. "A Nun receiving a Buckler from Heaven," dedicated to the biſhop of Paderborn, with his portrait. Ciro Ferri inv. "Jupiter ordering the Shield of Perſeus to be forged," dedicated to the

the emperor Leopold, a large ſubject executed by the ſame artiſts, in two plates. "Hercules preſenting to Jupiter the Monſters whom he had overcome," dedicated to pope Innocent XI. a ſubject executed by the ſame artiſts, engraven at Rome in 1678. "Perſeus cutting off the Head of Meduſa," and "Perſeus ſlaying the Sea Monſter," two plates in ſmall folio. "The Viſitation of St. Elizabeth," dedicated to the dauphineſs, after P. Mignard. "The Virgin with the Infant Jeſus in her Arms, who holds a Bunch of Grapes," a piece known under the name of "la Vierge au Raiſin," dedicated to Madame de Maintenon, after the ſame. The above are all in folio. "David preſenting the Head and Sword of Goliah to Saul," after Joſ. Parrocel, in 4to.

The beſt portraits by Roullet, are thoſe of Francis de Poilly, engraver to the king, inſcribed Fr. de Poilly ad vivum del. 1699, in ſmall folio. Catherine Touchelle, wife of Hilaire Clement, procureur to the parliament, after Cotelle. Aſcanius Philamarinus, cardinal archbiſhop of Naples, Fr. de Marcu pinx. J. L. Roullet del. et ſc. Neapoli. "Jacques-Louis, marquis of Beringhen, firſt equerry to the king, after P. Mignard, in folio. Jean-Baptiſte Lully, ſecretary to the king, &c. after P. Mignard. Jean-Chaillon de Thoiſy, doctor of the Sorbonne, after C. Gerardin. Edward Colbert Cher, marquis Villacerf, ſuperintendant of buildings, &c. by J. L. Roullet of Arles, 1698, an able engraving in imitation of bas relief. Camille le Tellier de Louvais, abbot of Bourdeaux, librarian to the king, after Nic. de Largilliere. Louis XIV. in regimentals, a three-quarter figure, after the ſame, all in folio.

Benoit Frajat was born at Lyons in 1646. He learned the elements of his art under Guillaume Chateau, whom he accompanied into Italy, and whom he very ſoon ſurpaſſed in the mellowneſs, neatneſs, and freedom of his engravings, though not in other reſpects.

Having ſettled at Rome, Frajat eſpouſed the daughter of the celebrated landſcape painter François Grimaldi, better known by the appellation of the Bologneſe. He engraved, after the moſt celebrated Italian maſters, a great number of plates, among which the following, which are of the folio claſs, are held in moſt eſteem.

"The Holy Family," after Albano, one of his earlier engravings, done under the direction of Chateau. Another "Holy Family," after Pietro da Cortona. St. John is here preſenting a croſs to the infant Saviour. "The Marriage, or the Coronation of St. Catharine," after Aug. Carracci, a large plate of the upright form. "The Holy Family," and "The Temptation of St. Anthony," both after Annibal Caracci. "The Death of St. Jerome," from Dominichino, another large upright. "St. Francis Xavier expiring, contemplated by Groups of Angels in the Clouds," after J. B. Gaulli. "Our Saviour baptized in the Waters of Jordan," after Carlo Maratti. "St. Bridget ſitting in the Clouds, triumphant over Envy, and venerated by Sages," after B. Lutti, engraven in 1707. "The Courſe of Atalanta," after P. Luccatelli.

The beſt portraits by this artiſt are alſo in folio, and are thoſe of Cardinal Frederic Coccia; Cardinal Cornaro; Cardinal Thomas Ferrari; Dom Cœleſtinus, cardinal Sfrondatus, all after the pictures of L. David.

The biography of the family of the Bonnarts is in a confuſed ſtate in all the books that we have conſulted, which, as they were mere men of mediocrity, will probably be the leſs regretted. It would appear that the brothers Robert and Nicholas were born at Paris about the middle of the 16th century, and perhaps alſo John Bonnart the elder, who engraved figures a-la-mode, and Italian comedians a-la-groteſque, with fifty-ſix plates of the coſtume of the different nations of the earth, all in folio, and after his own deſigns.

He who ſigns his name Joan Bonnart, jun. is ſuppoſed to have been the ſon of the former, and by him there is a ſpirited and free etching of a cieling adorned with poetical ſubjects, and publiſhed in Perault's Cabinet des Beaux Artes.

The beſt works of Robert and Nicholas are as follow, all of them being of the folio claſs:

Portrait of Louis XIV., Robert Bonnart fecit. Portrait of Louis, Dauphin, ſon of Louis XIV. Idem fec. "Valenciennes taken by Aſſault, and ſaved from Pillage by the Clemency of the King, 1677," after F. Vandermeulen, engraven by R. Bonnart. "The King taking Poſſeſſion of the Citadel, after the Capture of Cambray, 1677," "Arrival of the King before Douay, which he cauſes to be inveſted by his Cavalry," Id. ſc. "Entrance of the Queen into the City of Arras," Id. ſc. in two plates, all after Vandermeulen, and engraved in a coarſe ſtyle.

Pierre Giffart is another mediocre artiſt, who, however, ſubſcribes himſelf Sculptor Regius. He was born in Paris in the year 1648, and died there in 1723. What talent he poſſeſſed was chiefly exerciſed on portraits, medals, and ornaments, among which the following are held in moſt eſteem:

Marie-Anne Victoire of Bavaria, dauphineſs of France; below is repreſented the birth of the duke de Bourgogne, in folio. Frances d'Aubigné, marchioneſs de Monteſpan; executed by P. Giffart, engraver to the king, in folio. Philippe I. ſon of Thomas XIII. count of Savoy. J. D. Lange del. P. Giffart Sculptor Regius, Pariſiis, in ſmall folio. Odoard, ſon of Amadeus XV. count of Savoy. Id. del. id. ſc. Aymon, ſon of Amadeus XVI. count of Savoy. Id. del. id. ſc. Louis, ſon of Amadeus VIII. ſecond duke of Savoy. Id. del. id. ſc. all of the ſame ſmall folio ſize. Collection of medals of the princes of the Lower Empire. Series of friezes, of cornices, tapeſtries for an altar, and three chandeliers; five plates engraven by Giffart and Dolivart, after Berain, in folio. Frontiſpiece for the introduction to P. Violier's Geography, after S. Le Clerc, in quarto. Frontiſpiece to the Critical Hiſtory of Superſtitious Practices, after the ſame.

Of the family of Parrocel much more may with juſtice be ſaid; for both as painters and engravers they have ſome claims to be conſidered as men of genius. Joſeph was born at Brignolis, in Provence, in the year 1648, and died at Paris in 1704. He viſited Rome, and ſtudied there under Bourguignon the battle painter, with whom he formed an intimate friendſhip. He was remarkable for the energy and expreſſion of courage which he imparted to his warriors, and has been heard to obſerve of thoſe of Vandermeulen "ne ſavoit pas tuer ſon homme."

The following etchings of Joſ. Parrocel are from his own compoſitions: they are of the quarto ſize, and are believed to include the whole of his works on copper:

A ſet of four plates of the four times of the day, *viz.* "Aurora, or the Camp;" "Mid-day, or the Halt;" "Evening, or the Battle;" "Night, the Field of Battle." A ſeries of forty-eight plates from the life of Chriſt, and four other battle pieces.

Charles Parrocel, the ſon of Joſeph, was born at Paris A.D. 1689, and died in the ſame city in 1752. He dedicated his attention to the ſame ſpecies of art in which his father excelled, by whom he was inſtructed, and whom he had the misfortune to loſe at the age of ſixteen: he was

then

then placed under the tuition of La Foſſe, after which he viſited Italy, and remained there ſeveral years.

On his return to his native country with the reputation of an excellent painter of battles, he was attached to the French cavalry, in order that he might enjoy the beſt opportunities of ſtudying ſuch military ſubjects as occurred; and he was alſo ſelected to paint the conqueſts of Louis XV.

He handled both the graver and etching-needle with facility; yet his works are on the whole inferior to thoſe of his father. A ſeries of plates of cavalry and infantry, after his own deſigns, are executed with conſiderable ſpirit.

Etienne Parrocel was the nephew of Charles, and was born in Paris ſomewhere about the year 1720. He alſo painted, etched, and handled the graver. The following ſubjects from his hand are executed in a bold and free ſtyle.

"The Triumph of Mordecai," after J. F. de Troy. "The Triumph of Bacchus and Ariadne," after P. Subleyras, both large folios. A bacchanalian ſubject in quarto, from a compoſition of his own.

Elizabeth Sophie Cheron, (ſubſequently Madame le Hay,) a lady celebrated for the extenſiveneſs of her acquirements and her talents in the fine arts, was born in the year 1648, and was the daughter of Henry Cheron, an enamel painter of Paris, under whoſe inſtruction ſhe made rapid progreſs in the arts of deſign. She was patronized by Le Brun, and received with flattering diſtinction by the Royal Academy, in the year 1676. At the age of ſixty ſhe married M. le Hay of the royal engineers, and died in her native city at the age of ſixty-three.

The preſent writer has not ſeen her engravings, and from the vague manner in which they are ſpoken of by her French biographers, cannot be certain whether the three following ſubjects are copied from antique gems, or deſigned by Madam Cheron with the view to their being engraved on gems, but moſt probably the former. They were, however, etched by herſelf, of the quarto ſize. "Bacchus and Ariadne;" "Mars and Venus;" and "Night ſhedding her Poppies."

She alſo engraved a "Deſcent from the Croſs," in folio, from a model by the abbé Zumbo. The plate is etched, and afterward finiſhed with the graver in a ſtyle that does credit to the powers of the artiſt.

Her remaining prints are a group of ſaints after Raphael, and a drawing-book containing thirty-ſix plates from deſigns of her own.

Louis Cheron, born at Paris in the year 1660, was brother to Elizabeth Sophia. He went to Italy, and remained there eighteen years, partly ſupported by the bounty of his ſiſter. He compoſed with facility, and drew rather correctly than gracefully. In his religious principles he was a Calviniſt, and the perſecutions of that ſect, which took place ſoon after his return to his native country, obliged him to ſeek refuge in England, where he was employed by the duke of Montague, and where he died at the age of fifty-three.

The following prints from his hand diſplay taſte and ability: they are of the folio ſize, and from his own compoſitions.

"St. Peter healing the lame Man at the Gate of the Temple;" "The Death of Ananias and Sapphira;" "St. Philip baptizing the Eunuch of Queen Candace;" and "Hercules reſting from his Labours." We ſhould not omit twenty-three plates which he engraved for his ſiſter's French verſion of the pſalms of David.

Nicolas Habert was born at Paris about 1650. He engraved almoſt conſtantly for the bookſellers, beſides executing a great number of portraits of French men of letters and other celebrated characters of the laſt century. Habert was tolerably well inſtructed in the mechaniſm of his art, which is all the praiſe which can in juſtice be awarded him. The beſt of his engravings are the following portraits.

Louis Maimbourg, a celebrated Jeſuit and author, engraven after life by N. Habert, 1686. Jean Baptiſte Santeuil, canon of St. Victor, 1686. Corneille Janſénius, biſhop of Ipre, doctor in theology at Louvain, after Champagne. Felix Vialart, biſhop of Chalons. Maria Louiſa of Orleans, daughter of Monſieur, queen of Spain. John Milton, the celebrated Engliſh poet. Thomas Parr, a celebrated Engliſh centenarian, all in folio.

Jean and Louis Creſpy, or Crepy, father and ſon, were both born in Paris, the former about the middle of the ſeventeenth century, the latter in the year 1680. Strutt ſpeaks of their abilities rather worſe than they deſerve, though neither of them merit much praiſe, nor other notice from us than the taſk of mentioning their principal works, which are as follow, and which, excepting their portraits, are of the folio claſs.

"Mary Magdalen," Crepy inv. et fecit. "The Manger," here the Infant Jeſus is ſeen ſleeping on ſtraw, and adored by two angels, after Albano. This is a print of ſome merit, and probably the beſt work of the elder Crepy. "The Deſcent from the Croſs," after Carlo Cignani. "A Holy Family, or St. Benedicite," after le Brun. "The Preſentation of the Infant Jeſus in the Temple," after the ſame, in ſmall folio. "The Rehearſer of amatory Speeches," after Watteau, engraven by Crepy the ſon, in folio.

The following portraits are alſo by theſe *artizans*, for artiſts they may ſcarcely be called, and are neatly finiſhed. Maria-Adelaide, princeſs of Piedmont, oval, in 4to. The chancellor d'Agueſſeau, in 4to. R. P. Allizi, oval, in 4to. The biſhop of Caillebot, 4to. Mahomet Effendi, ambaſſador to France, in 8vo. Antoine Houdart de la Motte, in 8vo. Antoine Watteau, in 8vo. The duke of Marlborough, in 8vo.

From the inſipidity of Habert and the Crepys, attention rebounds to the noble daring of Raymond la Fage. He was born at Thouloufe, or according to ſome writers at Liſle in the Abigeois, in the year 1654. Strutt does not often riſe to the tone of energy with which he writes of this man of genius, and we therefore heſitate not to adopt his words in preference to our own, or the tame prolixity of Huber and Roſt. La Fage "never had any maſter, but following the dictates of his own genius applied himſelf to drawing; and his works ſufficiently teſtify the ſurprizing progreſs he made in that art. His drawings are compoſitions of his own, chiefly outlines and ſlight ſketches made with a pen, but executed in a moſt maſterly ſtyle. The actions of his figures are ſpirited, bold, graceful, or elegant, as the ſubject required. His groups are finely contraſted; and frequently, without the aſſiſtance of ſhadow, he has contrived to detach them from each other, in ſuch a manner that the ſubject is by no means confuſed, or the effect diſagreeable. Certainly no man ever poſſeſſed greater fertility of invention, or facility of execution, and though he has ſometimes borrowed whole figures from the works of other maſters, and engrafted them in his own, yet he ſo well adapted thoſe of his own invention, to the ſtyle and action of thoſe he borrowed, that the plagiariſm ſeems rather to do him honour, than tend to his diſcredit. He reſided ſome time in Italy, and when he ſhewed his deſigns at Rome, they aſtoniſhed every one who beheld them.

Going one day to viſit Carlo Maratti he found that artiſt at work. Maratti, pleaſed to ſee him, received him very affectionately,

affectionately, and riſing up from his place, offered to put his palette and pencils into the hands of his gueſt, but La Fage refuſed, declaring that he did not underſtand the management of the pencil. 'I am very happy' (replied Maratte) 'to find that is the caſe, for had you known how to paint, as well as you do how to draw, I ſhould have been the firſt to abandon the art, becauſe you could have filled my place ſo much better.' He led a looſe, depraved life, which his repeated debaucheries put an end to, A.D. 1690; he being only at the age of forty-two.

It is here to be obſerved that Strutt dates his birth in the year 1648, and the French writers in 1654; now if he was born in 1654, and died in 1690, he could only have been thirty-ſix years of age at the time of his death.

La Fage etched a conſiderable number of ſmall plates from his own compoſitions, which are marked with the eaſe and energy of a maſter, particularly his fall of the angels, and his Bacchanalian feſtivals and proceſſions. The following, which are in folio, are among his moſt eſteemed productions:

A pair "Jupiter and Semele," and "Juno and Eolus," of the frieze form; another pair of "Children Fiſhing," and a "Dance by Children;" a large plate of a Bacchanalian ſubject, and two large uprights of "The Brazen Serpent," and "The Fall of the Angels."

François Andriot, or Handriot, was born at Paris about 1655. He engraved both in France, and during his reſidence in Italy, various ſubjects after ſeveral celebrated painters of thoſe countries. His ſtyle reſembled that of Fr. de Poilly, but his productions were inferior in point of effect to thoſe of that celebrated artiſt. His prints are, however, ſought after by ſome connoiſſeurs, on account of the pictures of the great maſters from which he engraved. His beſt works are all in folio, and their ſubjects as follow:

"The Virgin ſitting, holding on her Knees the Infant Jeſus, to whom the little St. John preſents a Roſe," after Raphael, an oval. "The Virgin ſuckling the Infant Jeſus, attended by an Angel," after Guido, an oval. "A Magdalen," after the ſame. "Chriſt crowned with Thorns," after Ann. Carracci, without the name of the painter, oval. "Chriſt ſcoffed at, and crowned with Thorns," after Dominichino, oval. "The Madonna and Child, with St. Michael and St. Marguerite," anonymous. "The good Samaritan," after Pouſſin, a large plate. "The Incredulity of St. Thomas," after Le Sueur, a large plate. "Eſther before king Ahaſuerus," after Sim. Guillebault. "The Wedding at Cana," after the ſame. "Pope St. Gregory kneeling before the Altar in a Chapel, and three Eccleſiaſtics ſtanding on the Clouds." "Jean Everhard, cardinal Niclard," after Jonas de la Bonde, engraven in 1672, and ſome of the ſtatues publiſhed at Rome by Roſſi in 1691.

Jean-Baptiſte Nollen, or Nolen, was born at Paris in 1655. He was one of the beſt pupils of N. de Poilly, and was extremely expert at the mechanical part of his art. After viſiting Rome, he returned and ſettled in his own country. He engraved ſeveral of the large folio prints, entitled "Les Vües, Plans, Coupes, et Elevations du Chateau de Verſailles." "The Miracle of the Loaves and Fiſhes," after Raphael, and ſeveral plates from Carracci, Pouſſin, and other maſters.

John Mariette was a native of France, and ſtudied painting under his brother-in-law J. B. Corneille, but by the advice of Le Brun quitted that purſuit, and applied himſelf to deſigning and engraving. He alſo carried on a conſiderable commerce in prints. Some of his compoſitions poſſeſs conſiderable merit. The heads of his figures are often well characterized; his drawing, though mannered, is not incorrect. He worked both with the graver and etching needle, and his ſtyle of engraving is coarſe and ſlight. He died at Paris in the year 1742. The principal productions of Mariette are as follow: "Staniſlaus-John Jablonowſki," in folio. "St. Peter delivered out of Priſon," after Dominichino, in folio. "Jeſus Chriſt in the Deſart, ſerved by Angels," after Le Brun, in folio. "Deſcent from the Croſs," after the ſame, in folio. "The finding of Moſes," after Pouſſin, in folio. "Two Nymphs ſeated near a Fountain, in which Narciſſus is ſporting," a beautiful landſcape, in folio. "Joſeph revealing himſelf to his brethren," after M. Corneille, in folio. "The Cure of the Paralytics," after the ſame, in folio. "St. Louis receiving the Holy Viaticum," after J. B. Corneille, in folio. "St. Louis received into Heaven," after the ſame.

J. P. Mariette, the celebrated connoiſſeur, was the ſon of John, and etched a few plates after Guerchino, Carracci, and Perin del Vagu. He was born at Paris in 1694, died there in 1774, and the memorable ſale of his cabinet took place in the year 1775.

Benoit Thibouſt was born at Chartres A.D. 1660, but reſided for the greater part of his life at Rome; yet he may be reckoned to have been of the ſchool of Mellan. He engraved legendary and ſuperſtitious ſubjects in the ſtyle of that artiſt, though without attaining his excellence, of which the principal are:

A ſet of thirty-four plates after F. B. Gaetano, for "Vita beati Turribii, Archiepiſcopi Limani in Indiis," publiſhed in 4to. at Rome A.D. 1679. "St. Thereſa in an Extacy on the Clouds, while an Angel is preparing to pierce her Boſom with a flaming Dart," after Bernini, in folio. "The Statue of St. Bibiene in a Niche," after the ſame, in folio. "St. Thomas Aquinas," after Hyacinthe Calandrucci, engraven in 1690, in folio. "St. Roſe kneeling before the Virgin," after Ant. Baldi, in folio. "Martyrdom of St. Peter d'Arbues," after the ſame, in folio. "St. Peter of Alcantara in the Clouds, viewing the Croſs," after the ſame, in 4to. Portrait of John Baptiſte Coccinus, and "The Crucifixion," after Scipio Gaetano, both in folio.

Jean Baptiſte Boyer, marquis of Aiguilles, procureur general of the parliament of Aix, in Provence, was born at Aix in 1660, and died in his natal city about the middle of the laſt century. Connected by the moſt intimate ties of friendſhip with the celebrated Puget, he acquired, in his intercourſe with that ſkilful artiſt, a taſte for the fine arts, and thus became a connoiſſeur, deſigner, painter, and engraver.

During a journey, which he undertook, to Italy, and after his return to Aix, he formed a collection of paintings, ſculptures, drawings and prints, in which he took great delight. He cauſed this cabinet to be engraven, and it was publiſhed about the commencement of the laſt century; but not ſatisfied with the firſt edition, he brought an artiſt from Antwerp, Jaques Coelmans, who engraved anew the whole cabinet, which was publiſhed in 1744.

Theſe plates having afterwards fallen into the poſſeſſion of Pierre François Baſſan, he ſold them as the collection of Crozat.

The firſt edition of this collection contains ſix ſubjects engraved by the marquis himſelf; wherefore he is reckoned among the engravers of the French ſchool. The impreſſions of theſe plates, of which the ſubjects are as follow, are now become very rare, from the plates having been loſt or deſtroyed.

"The Marriage of St. Catherine," from And. del Sarto. Two figures of Jeſus Chriſt when young (engraved on the

ſame plate). A pair of landſcapes from Brecourt. "St John," from Manfredi, and a ſmall buſt of a man; the four former of which are engraved in lines, and the two latter in mezzotinto.

In the ſecond edition of his cabinet, are three other engravings by the marquis himſelf, *viz.* "A Magdalen," from J. F. Romanelli; "Portrait of the miſtreſs of Paolo Veroneſe," and "The Adoration of the Magi," from a compoſition of his own. The frontiſpiece of this ſecond edition, engraved by Coelmans, is alſo from a deſign by the marquis.

Antoine Aveline was born at Paris in the year 1662, and died in the ſame city in 1712. He engraved a great number of landſcapes, which are for the moſt part either compoſed, or drawn from nature, by himſelf, and are executed in a neat and agreeable ſtyle. Their ſubjects are principally as follow:

A ſeries of ſix landſcapes, marked Aveline inv. et fec. in 4to. Another ſeries of twelve landſcapes, not numbered, and marked in the ſame manner. Another ſeries of ſixteen views of Verſailles, in folio. Twelve views of chateaus and royal manſions, namely, Trianon, the Menagerie, two views of Clagny, Marly, St. Germain en Laye, Vincennes, St. Cloud, Meuden, Rambouillet, and Chantilli de Chambre, in folio. Twelve views of Paris and ſeveral of its edifices, namely, the city of Paris, the Invalids, two views of the Thuilleries, the Palais Royal, the Luxembourg, the Pont Neuf, Places des Victoires, Hotel de Ville, Notre Dame, the Obſervatory, and the Salpetrières, in folio. Series of twenty views of cities, namely, Lyons, Marſeilles, Havre de Grace, Rouen, Bourdeaux, Breſt, Straſburg, Baſle, London, Amſterdam, Rome, the church of St. Peter, Venice, the place de St. Mark, Turin, Liſbon, Conſtantinople, Jeruſalem, Tripoli, and Tangiers.

Gaſpar Duchange was born at Paris in the year 1662, and died there in 1759. Whether he ſtudied in the ſchool of Audran, or under any maſter, his biographers have not mentioned; but his ſtyle of engraving moſt reſembles that of John Audran, who was his contemporary, though a few years younger than himſelf. He deſervedly obtained the title of engraver to the king, and in the year 1707 was admitted a member of the Royal Academy of Arts. Strutt ſays of him, ſomewhat too coldly, that his ſtyle is neater than that of Audran, and the etching not ſo predominant, but that his drawing is leſs correct and his extremities not marked with ſo maſterly a hand, yet that his prints have much to recommend them to notice; more eſpecially to the notice of ſuch connoiſſeurs as are pleaſed with an agreeable management of the graver. Watelet, with more generous diſcernment, ſays of Duchange, that he was one of thoſe engravers who has beſt ſucceeded in combining mellowneſs with ſtrength in his plates, without imparting coldneſs. It may alſo be ſeen in his works that he repreſented moſt happily the delicate texture of fleſh in his female figures, and that no other of the French artiſts ever excelled him in this reſpect.

It ſeemed as if he had been eſpecially fitted by nature to engrave from the pictures of Correggio; he executed, after this painter, the three celebrated prints of Io, Leda, and Danaë; and, by the ſoftneſs and harmony of his ſtyle, perfectly transfuſed the ſpirit, and imparted to his prints the tone, of this great maſter.

Duchange continued his labours till he reached the advanced age of ninety. He engraved ſome prints of the gallery of the Luxembourg; and in that of the debarkment of the queen at Marſeilles, has ſcarcely been leſs ſucceſsful than in his engravings after Correggio, which is more particularly obſervable in the three ſirens or mermaids who are mooring the galley, and on whom Rubens has laviſhed the graces of his art.

The beſt performances of this artiſt are in folio, and their ſubjects, "Jupiter and Io," after Correggio, drawn at Rome by P. de Pietro, and engraven at Paris by G. Duchange 1705. "Jupiter deſcending in a Golden Shower to Danaë," and "Jupiter in the Form of a Swan careſſing Leda," after the ſame artiſts. The moſt valued impreſſions of theſe beautiful prints are thoſe which were taken before they were retouched by Sornique, who has added draperies to them. "Chriſt in the Sepulchre," after a painting of Paul Veroneſe, in the cabinet of Crozat. This is a bold and vigourous print, much ſuperior to the one formerly engraven by Auguſtino Carracci. "The Birth of Mary de Medicis." "The landing of the Queen at the Port of Marſeilles." "The Citizens of Lyons going to meet the Queen." "The Apotheoſis of Henry IV." all after Rubens. "Solon explaining his Laws to the Athenians," and its companion, "The emperor Trajan adminiſtering Juſtice to his Subjects," both after Noel Coypel. Two ſubjects after the four paintings of Coypel the father, preſerved in the Luxembourg, (Charles Dupuis has engraven the two other ſubjects.) "The Repaſt at the Houſe of Simon the Phariſee," after a painting of Jouvenet in the church of St. Martin in the Fields. "Jeſus expelling the Sellers of Merchandize from the Temple," from a picture of the ſame maſter, preſerved in the ſame church. "The Reſurrection of the Widow's Son," after the ſame, in the church of the Recollets at Verſailles. "Clytie abandoned by Phœbus," after Nic. Bertin, an oval. "Diana diſarming Cupid," after Deſormeaux, engraven in 1718.

The following are all after Antony Coypel: "The Sacrifice of Jephtha. "Tobias recovering his Sight through the Interpoſition of his Son," a capital engraving. "Mary Magdalen." "St. Cecilia," an upright. "The Death of Dido." "Juno borrowing the Ceſtus of Venus." "Venus aſleep." "Diana at the Bath." A ſet of four plates of "The Elements," engraven by Duchange and Des Places. "The Infant Jeſus in the Cradle," after Charles Coypel, engraved by Duchange, at the age of 87.

Duchange has likewiſe engraven ſeveral ſubjects from the paintings of Le Sueur in the hotel du Chatelet.

His beſt portraits are thoſe of Francis Girardon, painted by Rigaud. Charles de la Foſſe, painted by the ſame, and engraved for Duchange's reception into the Royal Academy. Antoine Coypel, ſeated at his eaſel, with his infant ſon Charles by his ſide, painted by himſelf, and engraven by Duchange in 1752.

Antoine Trouvain was born at Montdidier about 1666, and nominated a member of the academy of painting in 1707. He handled the graver with much dexterity, and executed his works in a very neat and agreeable ſtyle. It is not known in what ſchool he ſtudied, though it is probable he received leſſons from Bernard Picart, at leaſt he appears cloſely to have imitated the ſtyle of that artiſt.

He engraved with ſucceſs both portraits and hiſtorical ſubjects, of which the chief are of the folio claſs, and their ſubjects as follow:

"The Salutation of the Virgin," after Carlo Maratti. "Jeſus curing the Blind," after a painting of Ant. Coypel in the Chartreuſe. "The Nuptials of Queen Mary de Medicis with Henry IV." after Rubens. "The Minority of Louis XIII." after the ſame painter, which form part of the collection in the gallery of the Luxembourg. "A drunken Silenus ſurpriſed by two Shepherds," after Ant. Coypel.

Portraits

Portraits.—The holy Vincent de Paul II. Trouvain, ſc. (ſmall folio.) Father de la Chaiſe, confeſſor to Louis XIV. in 8vo. Pierre-Daniel Huet, biſhop of Avranches, after S. de Quoy, in 8vo. Alexis de Buc, prieſt of the congregation of Scribes, after P. Simon, engraven in 1689, in folio. Francis le Bouthillier, biſhop of Troyes, in folio. Claude-Francis Menetrier, of the ſociety of Jeſus, after P. Simon Jean Peſne, painter and engraver, painted by himſelf, engraven by Trouvain 1698. René Antoine Houaſſe, painter and rector of the academy, painted by Tortebat, engraven by Trouvain, for his reception into the academy in 1707, in folio, and Jean Jouvenet, painted by himſelf, engraven by Antoine Trouvain, for his reception into the academy; alſo in folio.

Pierre Drevet the elder was born at Lyons in the year 1664, and died at Paris in 1739. After receiving leſſons in drawing, and probably in engraving alſo, from Germain Audran in his natal city, he went to Paris for improvement, and as Strutt with great probability ſuppoſes, ſtudied for a time under Girard Edelink. He ſoon became a moſt admirable engraver of portraits, to which he chiefly confined his talents, and the encreaſe of his reputation was proportionably rapid. He now contributed to ſpread through Europe the likeneſſes of the royal and noble perſonages of the day; and the fame of Hyacinthe Rigaud the portrait painter, (the anceſtor of the preſent academician of the London Royal Academy,) went hand in hand with his own.

His command of the graver, which is believed to have been the ſole inſtrument of his art, was very great. His engraving is firm though delicate; and his plates highly finiſhed. He drew well, and had the rare art of transfuſing much of the ſtyle and feeling of the painter after whom he was working. In ſhort, the beauty of execution, ſoftneſs, and truth diſplayed in his portraits, have ſtamped on them a value which time ſhall yet be long in effacing.

The only hiſtorical ſubjects from his hand, with which we are acquainted, are "The Entrance of Jeſus Chriſt into Jeruſalem," from a grand compoſition of Ant. Drew, in folio, and "A Crucifixion," with the city of Jeruſalem in the back ground, a large folio, engraved on two plates, and inſcribed P. Drevet exc.

His portraits are numerous, and excepting that of André Felibien, after Le Brun, (which is in 4to.) are of the folio ſize. After N. de Largilliere he has engraven Jean Foreſt. Nicholas Lambert. Maria de Lambeſpine. Helena Lambert, after F. de Troy. Frederic Auguſtus king of Poland, and Nicholas Boileau Deſpreaux, (a ſmall folio.) After de Pelis, and after Vanderwerf, Oliver Cromwell, with attributes. But his principal performances, both in number and merit, are after H. Rigaud, and it is believed that few of theſe are omitted in the following liſt:

Mary de Serre, the mother of Rigaud. Hyacinthe Rigaud himſelf. Nicholas Boileau Deſpreaux. Chriſtina Caroline, margravine of Brandenbourg, &c. Erneſt Auguſtus duke of Brunſwick Lunenbourg, in an allegorical border. Alexander de Bourbon, Comte de Toulouſe, with a glove on the hand; another plate of the ſame ſubject, with the glove removed. Philip V. king of Spain. René-François de Bouveau, archbiſhop of Narbonne. André Hercule, cardinal de Fleury. Maria, ſovereign of Neufchatel, ducheſs of Nemours, engraven in 1707. Louis-Antoine, duke de Noailles. Louis Hector, duke of Villars, the moſt valued impreſſions of which are before the inſcription was altered. Louis, dauphin of France. Francis Louis de Bourbon, prince of Conti, a whole length. Louis XIV. in his royal robes, a whole length figure. Louis XV. ſeated on the throne, clad in his royal robes, companion to the former.

Pierre Devert, the younger, the ſon of the former, was born at Paris in the year 1697, and died in the ſame city in 1739, ſo that Europe loſt both theſe admirable artiſts in the courſe of the ſame year. The ſon had the advantage of the father's inſtruction in that art in which he was deſtined to ſhine ſo conſpicuouſly, and for which he manifeſted an early genius. At the age of thirteen he ſurpriſed the artiſts and amateurs of Paris with an engraving ſo well performed, that probably no man, his father excepted, could have ſurpaſſed it; at the age of nineteen he engraved his folio plate of the Reſurrection, and at the age of twenty-ſix he executed his celebrated whole length portrait of Boſſuet, which has ſince been the admiration of Europe.

Watelet obſerves of the ſenior Drevet, that he might have been regarded as the firſt portrait engraver in the world, in point of delicate and beautiful execution, had he not been exceeded in this reſpect by his ſon; but upon ſuch an occaſion, all idea of rivalry is abſorbed in the reſpect due to the filial and parental feelings. When a father transfers the fruits of his experience, and ſets before his ſon, as rudiments, the final reſults of his own ſtudies, nature ſteps in and identifies their fame.

His whole length portrait of Samuel Bernard is a ſtill more ſurpriſing effort of art; and in both theſe prints the varied expreſſion of the ſurfaces of natural objects;—of fleſh, hair, (particularly the white hair of Boſſuet,) ermine, lawn, lace, mohair, velvet, gold-fringes, carved wood, bronze, marble paper,—each engraven in a peculiar and appropriate manner, may well excite wonder, and moſt the wonder of thoſe moſt intimately converſant with the capabilities of the art. To all this variety of ſubſtances he has imparted the moſt exquiſite finiſh, yet no where is there any affected diſplay of dexterity in the uſe of the graver, as is too frequently obſervable in the works of other engravers, who do not poſſeſs half the powers of Drevet; on the contrary, a violet-like modeſty here adds the charm of innocence to the attractions of beauty.

Drevet did not, however, confine himſelf to portraits, but his abilities were perhaps leſs well adapted to the generaliſed energies of hiſtory, than to the details of portraiture; and it muſt be acknowledged, even of his "Preſentation of Chriſt in the Temple," which is eſteemed his maſterpiece, that its general complexion,—probably from being executed entirely with the graver and dry-needle,—is too metallic.

M. Cochin has obſerved of the engravings of Drevet the younger, "that they are admirable for delicacy and beauty of execution, but much too laboured for the character of hiſtory, which has led perſons of taſte to ſay that his fine engraving is extremely clever, but altogether miſplaced, and tends to impart to his figures the appearance of bronze;" and Huber remarks upon this critique, "that it is applicable only to thoſe prints which he engraved after Ant. Coypel." The truth however lies between theſe critics, who were each ſomewhat biaſſed on the occaſion, by his excluſive preference for a particular mode of art.

The principal hiſtorical works of the junior Drevet are of the folio claſs, and their ſubjects as follow:

"The Adoration of the Shepherds," after Hyacinthe Rigaud. "A Holy Family," which is inſcribed "le parfait modele de toutes les familles Chretiens," after Ant. Dieu. And from the ſame maſter, "John the Baptiſt reproaching

Herod for having eſpouſed his Brother's Wife;" and, "The Entrance of Jeſus Chriſt into Jeruſalem."

From the pictures of Ant. Coypel he has engraven, "The Eternal denouncing Adam and Eve after their Tranſgreſſion," with a copy of the ſame, of ſmaller dimenſions, engraven with the utmoſt delicacy. "Abraham about to ſacrifice his Son Iſaac," engraven in 1707. "The Servant of Abraham with Rebecca at the Well." "The Annunciation of the Virgin," with the ſame piece under the ſame title, of a ſmaller ſize. "A Chriſt on the Croſs." "Jeſus Chriſt in the Garden of Olives, comforted by Angels," after J. Reſtout. "The Preſentation of the infant Jeſus in the Temple," after a painting of L. de Boullongne in the choir of Notre Dame, at Paris, a large and capital piece. "The Reſurrection of our Lord," after J. André, engraven by P. Drevet at the age of nineteen.

His principal portraits are alſo in folio, and are thoſe of Francis de Salignac de la Mothe Fenelon, archbiſhop of Cambray, after Jean Vivien. Francis Paul de Neuville de Villeroy, archbiſhop of Lyons, after J. Santerre. Claude le Blanc, miniſter of war, after Ad. le Prieur. Louis, duke of Orleans, after Ch. Coypel. Adriana le Couvreur, in the part of Cornelia, after the ſame, a diſtinguiſhed piece. Louis XV. in his youth, conducted by Minerva to the temple of Glory, after Ant. Coypel. Dom Arnoul de Loo, ſuperior-general of the congregation of St. Maur, after Jouvenet. Nicolas-Pierre Camus de Pontcarré, firſt preſident of the parliament of Rouen, after the ſame. The Wife of the Pretender, Davids pinx. Romæ. Iſaac-Jacques de Vertamont, biſhop of Conferans, after Fr. de Troy. Robert Cotte, firſt intendant of buildings, gardens, arts, and manufactures of the king, &c. painted by Rigaud, and engraven by P. Drevet, jun. for the Academy. René Pucelle, abbé and counſellor of the parliament, after the ſame. Guillaume, cardinal Dubois, archbiſhop of Cambray, ſitting, engraven in 1724. Samuel Bernard, ſitting, after the ſame. The early impreſſions of this plate are known by having been taken before the words "Conſeiller d'Etat" were inſcribed beneath. Jacques-Benigne Boſſuet, biſhop of Meaux, a whole length figure, after the ſame, of which we have already ſpoken.

Claude Drevet, firſt couſin to the preceding, was born at Lyons in 1710, and died at Paris in 1768. Educated by Drevet, he diſtinguiſhed himſelf by engraving portraits, in which he imitated the ſtyle of his couſins with conſiderable ſucceſs. His principal works are in folio, and are the portraits of Madame le Bret, as Ceres. Henry Oſwald, cardinal d'Auvergne. Charles Gaſpar Guillaume de Vintimille, archbiſhop of Paris. Philippe Louis, count de Sinzendorf, all after H. Rigaud. Pierre Calvairac, doctor in theology, abbé of Pontignan, is after Adrien le Prieur.

Antoine Rivalz was born at Toulouſe in the year 1667, and died in the ſame city in 1735. He was the ſon of Jean-Pierre Rivalz, who was both architect and painter, and under whom, and the celebrated La Fage, our artiſt received the elementary part of his education. He afterwards proceeded to Paris, and from thence to Rome, in order to finiſh his ſtudies.

Rivalz was both painter and engraver, and during his ſtay at Rome painted the fall of the rebellious angels, for the prize given by the Academy of Luke, and being declared the ſucceſsful candidate, was crowned in the capitol by cardinal Albani, afterward pope Clement XI. He was recalled from Rome by his father, who died a ſhort time after his arrival at Toulouſe.

He poſſeſſed conſiderable talent at imitating the works of other artiſts, and even when he meant to be original, his own reſembled either the compoſitions of Pouſſin or thoſe of La Fage.

The following ſpirited etchings are by his hand, and from his own compoſitions: "Truth driving away the Vices, the Enemies to Art and Science," an allegory to the memory of Pouſſin, inſcribed to Le Brun. "The Martyrdom of St. Symphorianus," a middling-ſized plate, nearly ſquare; and four ſmall allegorical ſubjects, for a treatiſe on painting which Rivalz publiſhed at Toulouſe.

Bartholomew Rivalz was the nephew and pupil of Antoine, and etched the following ſubjects in ſmall folio, chiefly from the compoſitions of his uncle:

"The Fall of the rebellious Angels," the painting of which is at Narbonne. "Pætus and Arria;" "Cleopatra;" "Judith and Holofernes;" "Joſeph and the Wife of Potiphar;" "The Death of Mary Magdalen," after Benedetto Lutti, a ſmall upright.

Edme Jeaurat was born at Paris about 1672, and died in the ſame city in 1738. He was the pupil of B. Picart, and, like his maſter, poſſeſſed the happy talent of ſeizing the ſpirit of the great painters whoſe works he copied. Speaking of this engraver, Dandre Bardon obſerves, that he transfuſed all the fire of Du Mole into "The Flight into Egypt," which he engraved after this maſter; the pictureſque beauties of Paul Veroneſe into his "Finding of Moſes;" the ſpirit of Vleughel into his print of "Achilles plunged into the Waters of the Styx;" and the graces of Le Clerc into his print of "Achilles recognized by Ulyſſes in the Palace of Lycomedes."

Strutt has confounded this artiſt with Etienne Jeurat, the painter, an error which it is the more neceſſary to correct, ſince Etienne was a very inferior artiſt, incorrect in his deſign, cold in his execution, and whoſe knowledge did not extend beyond the mere mechaniſm of his art.

The principal works of Edme Jeaurat are the portraits of Nicolas Vleughel, a Pariſian painter, after Ant. Peſne, engraven in 1726. Pierre Pujet, painted by Pujet the ſon, both in folio. Eight fables of Fontaine, after Etienne Jeaurat.

After N. Vleughel he engraved "The Meeting of Abigail and David." "The Reſurrection of our Saviour," engraven in 1718. "Thetis plunging Achilles into the Waters of the Styx." "Telemachus in the Iſle of Calypſo," engraven in 1724, all of the folio claſs. A ſet of three plates of "A Roman Maiden," "A Virgin of Freſcati near Rome," and "A Greek Woman in a Pilgrimage to Rome," engraven in 1734, in quarto. "Jeſus Chriſt in the Temple diſputing among the Doctors," in quarto. "Achilles recognized by Ulyſſes in the midſt of the Daughters of Lycomedes," after Le Clerc. "Jupiter enamoured of a Nymph," after the ſame. "John the Baptiſt baptizing the Jews in the Waters of Jordan," after Pouſſin. "Syrinx, purſued by the God Pan, is received by the River Alpheus," after P. Mignard. "The Body of Jeſus on the Knees of the Virgin," after Le Brun. A ſet of three ſubjects, from Le Brun's deſigns for the Gobelin tapeſtries, repreſenting "The Reduction of the City of Marſal;" "The Interview in the Iſle of Pheaſants;" and "The Ceremony of the Marriage of Louis XIV." But the three following prints in the collection of Crozat are the moſt celebrated engravings of Jeaurat, and are all of the folio claſs, namely, "The Interview of Jacob and Rachel," after a painting of P. Fr. Mola. "Repoſe during the Flight into Egypt," after the ſame. "The finding of Moſes," after Paul Veroneſe.

Claude

Claude Gillot was born at Langres in 1673, and died at Paris in 1722. His father, who was a painter, communicated to young Claude all the knowledge of which he was maſter, and afterwards ſent him to Paris to proſecute his ſtudies in the ſchool of Jean Baptiſte Corneille.

Fauns, ſatyrs, and other comic and ſatirical ſubjects were the favourites of his pencil. On account, however, of ſome productions which he executed, of a more ſerious character, he was admitted into the Academy of Painting in 1715.

Gillot had the honour of giving leſſons to the celebrated Watteau; but they ſeparated after a ſhort time, as is ſaid, from the envy felt by the maſter at the ſuperior talents of his pupil. As Watteau roſe to eminence, Gillot gradually relinquiſhed painting, and dedicated his time to engraving. His pictures are now forgotten, but his drawings and etchings are ſtill ſought after by the curious.

The principal works of Claude Gillot are in ſmall folio, and their ſubjects as follow: "The Feſtival of Diana interrupted by Satyrs," Cl. Gillot fecit. "Feaſt of Bacchus celebrated by Satyrs and Bacchantes," id. fec. "Feſtival of Pan celebrated by Sylvans and Nymphs," id. fec. "Feſtival of the God Faunus," id. ſc. Theſe four are all of the ſame ſize, and form a ſet: the plates for the fables of La Motte Houdart are alſo by Gillot.

Nicholas Henry Tardieu was born at Paris A. D. 1674, and died in the ſame city in 1749. He ſtudied under Le Pautre and Jean Audran, was admitted a member of the French academy in the year 1720, and in the courſe of a long profeſſional career produced many excellent engravings, and educated many able pupils, among whom were Cars, B. Baron, Le Bas, and Tardieu the ſon.

Tardieu was a good draftſman, and brought his plates very forward in the etching, finiſhing them afterwards with the graver in a manner that ſhews the ſoundneſs of his taſte; few before him had mingled, with ſo much addreſs, free hatchings with regular courſes of lines. There is much depth of tone in his prints, and in general a vigorous and tolerably well harmonized chiaro-ſcuro. He was engaged in the execution of ſome of the moſt celebrated works of his time, ſuch as the collections of Crozat and of Verſailles, and the pictures of Le Brun.

Of his numerous hiſtorical engravings, which are in general of the folio dimenſions, the following will be found the moſt remarkable:

A pair of grand friezes, the one repreſenting the family of Coriolanus kneeling before him; the other, the taking of Carthage by Scipio, after Julio Romano. Another pair of large friezes, after the ſame maſter, one repreſenting the continence of Scipio; the other Scipio rewarding his ſoldiers. "Jupiter enamoured of Alcmena," after the ſame painter. "The Annunciation," after Carlo Maratti. "A Holy Family," in which the Virgin is ſeen ſeated, holding the infant Jeſus, to whom angels preſent fruits and flowers, after André Luigi d'Aſſiſe. "Adam and Eve after the Fall," from a painting of Dominichino, in the poſſeſſion of the duke of Devonſhire; one of the moſt beautiful prints of Tardieu, and engraven with much more preciſion than the ſame ſubject by Baudet. "The Scourging of Chriſt," after Le Brun, in folio. "Chriſt on the Croſs, at the Foot of which are ſeen Mary Magdalen, St. John, and the Virgin," after the ſame. "The Body of Chriſt," a compoſition containing three figures, after the ſame. "Holland," painted alſo by le Brun in the war ſaloon at Verſailles. "Wiſdom, Secrecy, Valour, and Prudence," the four chief qualities of a perfect miniſter, after Le Sueur, a rare print. "Jeſus ſpeaking to the Samaritan Woman," after Nic. Bertin. "Jeſus appearing to Mary Magdalen as a Gardener," or the "Noli me tangere," after the ſame. "The Martyrdom of St. Peter," after Seb. Bourdon. "A Crucifixion," after Joſeph Parrocel. "St. Charles Boromeus," after P. Dulin. "The Salutation of the Virgin," after a painting in the dome of the Aſſumption, by Ant. Coypel.

From the ſame maſter Tardieu has engraven "Vulcan ſhewing Venus the Arms prepared for Æneas." "Venus in the Aſſembly of the Gods, ſoliciting Jupiter in favour of Æneas." "Juno ſoliciting Æolus to raiſe a Tempeſt againſt the Fleet of Æneas;" which three prints make part of a ſeries engraven after the paintings of the hiſtory of Æneas in the Palais Royal. "Apollo and Daphne." A pair of capital engravings of "The Conteſt between Agamemnon and Achilles;" and "The Parting of Hector and Andromache," and another pair from the ſtory of Cupid and Pſyche.

From the pictures of Watteau he has engraven "The embarraſſing Propoſal;" "Paſtoral Pleaſure;" "The Elyſian Fields;" "The grand Embarkation for Cythera;" and from the pictures of Rubens, twelve plates of the Hiſtory of Conſtantine the Great.

Elizabeth-Claire Tournay, wife of N. H. Tardieu, alſo diſtinguiſhed herſelf by engraving the following ſubjects:

"The Concert," after J. F. de Troy. "The Muſtard Merchant," after Ch. Hutin. A pair of "The Charitable Lady," and the "Catechiſing Prieſt," after P. Dumeſnil, the ſon. "An Old Coquette," after the ſame, and "Tranquil Sleep," after Et. Jeaurat, all in folio.

Jaques-Nicholas Tardieu, the ſon, was born at Paris in 1718, and was alive in 1789. Being educated by his father, he aſſiſted in the execution of ſeveral large works. In general young Tardieu employed the graver much more than the point. Hence his prints are more ſolid than thoſe of his father, but leſs rich in thoſe rougher energies which charm the eye of the connoiſſeur. He was a member of the Royal Academy, and occaſionally occupied himſelf both with engraving portraits and hiſtorical ſubjects.

His wife, Louiſa du Vivier, who was the daughter of the celebrated medaller of that name, and is well known for ſeveral reſpectable engravings.

The following is a liſt of a few of the beſt works of J. N. Tardieu:

"Jeſus Chriſt appearing to the Virgin," after Guido. "A Magdalen in the Deſart," after Paul Pagani. "Our Saviour curing the Paralytic," after Reſtout. "Diana and Acteon," after Fr. Boucher. "Monument to the Memory of Andeſley Schovel," after the ſame. "The Flemiſh Breakfaſt," and "The Alchemiſt," two companion prints, after D. Teniers. "The Miſeries of War," after the ſame. Two landſcapes, entitled "The Sweeper," and "The Fruits of Autumn," after Cochin the ſon, all of the folio claſs.

He has likewiſe engraven, conjointly with his father, ſeveral frontiſpieces and vignettes after Cochin, as well as ſeveral ſubjects for the collection of the gallery of Verſailles, from the drawings of Maſſe, after Le Brun.

His beſt portraits are in folio, and are thoſe of Robert Le Lorrain, ſculptor in ordinary to the king, painted by Nonotte, and engraven by Jac. Nic. Tardieu, for his reception in the academy in 1749. Bon de Boullongne, painter in ordinary to the king, painted by Gilles Allon, engraven by the ſame Tardieu, for his reception at the academy in 1749. A whole length figure of Louis XV., after Vanloo. The queen of Louis XV., after Nattier. Maria Henrietta of France, after the ſame. Dimetri, prince Gallitzin, ambaſſador extraordinary from the court of Ruſſia to that of Vienna, after Drouais the ſon. The archbiſhop of Bourdeaux, after Reſtout.

Pierre-

Pierre-François Tardieu, couſin-german of the former, was born at Paris about 1720. He was taught the art of engraving in the houſe of Tardieu, whoſe manner he cloſely copied. The moſt conſiderable works of this artiſt are the following:

"The Judgment of Paris," after Rubens, in folio. "Perſeus and Andromeda," after the ſame, in folio. Different pieces of architecture, after Panini. Several plates for the large edition of Fontaine's Fables, after Oudry. Several plates of animals for Buffon's Natural Hiſtory.

Marie-Anne Rouſſelet, the wife of P. F. Tardieu, alſo engraved ſeveral ſubjects, and among others, "St. John in the Deſart," after Claude Vanloo, in folio; and ſome of the plates for Buffon's Natural Hiſtory.

Claude Duflos was born at Paris A. D. 1678, and died in the ſame city in 1747. Under what maſter he ſtudied has not been mentioned: his ſtyle appears to be formed from ſtudying the beſt works of Edelink and De Poilly, and though he occaſionally called in the aid of etching and the dry point, he worked chiefly with the graver, handling that inſtrument with great dexterity, yet with a dexterity perfectly ſubſervient to his knowledge of drawing, in which he was no mean proficient. His engravings are finiſhed with conſiderable care and neatneſs, but in their general complexion are ſomewhat cold and metallic when compared with thoſe of Audran and Duchange.

From the numerous catalogue of his hiſtorical works we ſelect the following, which are all of the folio dimenſions:

"The Victory of St. Michael over the Devil," an upright, engraved for the Crozat collection; and "The entombing of Chriſt," both after Raphael. The ſame ſubject. "The entombing of Chriſt," after Pietro Perugino, for the Crozat collection. "Jeſus Chriſt with his Diſciples at Emmaus," after Titian, from the ſame picture, which was engraven by Maſſon. The ſame ſubject, after Paul Veroneſe. "A Concert of Muſic," after Dominichino, and "A Buſt of the Virgin," after Guido.

From the pictures of Albano he has engraven "The Annunciation." "Jeſus Chriſt as a Gardener, appearing to Mary Magdalen," or the "Noli me Tangere." "St. Cecilia," and "Love deſpiſing Riches." "The Preſentation of our Saviour in the Temple," after a painting of Le Sueur, in the grand ſeminary of St. Sulpice. "The Deſcent from the Croſs," after a painting by the ſame artiſt, in the church of St. Gervais, an oval. "The Woman taken in Adultery," after Nic. Colombel. "The Repaſt at the Houſe of the Phariſee," after the ſame. A companion to the former is engraven by M. Doſſien. "Monk Zozimus adminiſtering the Holy Sacrament to St. Mary the Egyptian," after Lubin Baugin.

The following eight are from the pictures of Le Brun; "The Maſſacre of the Innocents." "Jeſus Chriſt on the Mount of Olives." A large crucifix, with the inſcription "Helas! eſt ce amour," &c. "A Crucifix with Angels," copied from the beautiful print of Edelink. "The Body of Chriſt at the Foot of the Croſs, with the Three Maries and St. John." "Deſcent of the Holy Spirit on the Apoſtles." "The Aſſumption of the Virgin." "The repentant Magdalen," (with four French verſes).

The following ſix are from Ant. Coypel, *viz.* "The Annunciation." "Mary Magdalen at the Foot of the Croſs." "The Triumph of Galatea." "Love ſtung by a Bee," an oval, with "Zephyrus and Flora," for a companion print, and "the Marriage of Bacchus and Ariadne." A pair of upright plates of "The Triumph of Amphitrite," and "The Triumph of Bacchus," after Charles Natoire, cloſes our liſt of the hiſtorical works of Claude Duflos.

His beſt portraits are thoſe of Jean François Paul de Gondy, cardinal de Retz, in 4to.; and in folio, Nicolas Lyon, procureur to the king, after L. Herluyſon. Denis François Bouthillier de Chavigny, biſhop of Troyes, after H. Rigaud. Jean Jacques Gaudart, counſellor to the king, after De Largilliere. Phillippe, duke of Orleans, after R. Tourniere, and Marc Renée de Voyer, after H. Rigaud.

François Chereau was born at Blois in the year 1680, and died at Paris in 1729. He viſited Paris when very young, and ſtudied in the ſchool of the Audrans; though his ſtyle of engraving rather reſembles that of the Drevets.

Chereau is diſtinguiſhed by the correctneſs of his outline, and the beauty of his execution. He appears to have worked entirely with the graver, which he handled with great care and ability, but which, when not mingled with the more pictureſque reſults of etching, is apt to produce a cold and laboured appearance, ſuch as is but too evident in the otherwiſe meritorious engravings of this artiſt. He has alſo impaired the brilliancy of his chiaro-ſcuro, by working his lights to too low a tone. The following, which are of the folio ſize, will probably be found among the beſt of his hiſtorical works:

"St. John in the Deſart," after Raphael, a ſmall upright, engraved for the Crozat collection. "The Crucifixion," (a large upright) from Guido. "St. Catherine of Sienna," after Frere Jean André. "St. Celicia chanting the Praiſes of the Almighty," after P. Mignard. "St. Thereſa in Contemplation," and "St. Ignatius," founder of the ſociety of Jeſuits.

The following five portraits are inſcribed with his own name, as the painter or deſigner, as well as the engraver. Raoux, biſhop of Montpellier, in folio. Charles Hyacinthe Dangot du Bouillon, procureur general, in folio, an oval. Jacques Saurin, a celebrated preacher of the reformed religion, in 4to. and alſo an oval. Pierre Bayle, the celebrated critic, in 4to. Chriſtine Renate Zorn, engraven in 1716, in 4to.

After other maſters, he has engraven, of the folio ſize, Louis de Boullongne, painted by himſelf, engraven by Fr. Chereau for his reception into the academy in 1718. Nicolas de Largilliere, painted by himſelf. Charles Nicolas Taffourréau de Fontaine, biſhop of Embrun, painted by Rigaud the younger. The ſix following are after the pictures of the elder Rigaud. Jean Baptiſte Louis Picon, counſellor to the king. Nicolas de Launay, director of the mint. Claude Bernard Rouſſeau, counſellor to the king. Conrad Detlew de Dehn, miniſter to the duke of Brunſwick Lunenbourg. Andre-Hercule, cardinal de Fleury, prime miniſter. Melchior, cardinal de Polignac; in folio, a capital portrait. Louis Pecour, ballet maſter, painted by Rob. Tournieres, another capital portrait. Elizabeth Sophia Cheron, wife of Jacques le Haye, painted by herſelf. Euſebe Renaudot, an abbé, and diſtinguiſhed ſcholar of the laſt century, after Ranc; and Louiſa Maria, princeſs of Great Britain, after A. S. Belle, an oval.

Jacques Chereau (called the younger) was born at Blois in the year 1694, and died at Paris in 1759. He became the pupil of his elder brother François, but poſſeſſing no original powers, he could only imitate, which however he did with ſome ſucceſs. Invited hither by Du Boſc, he viſited England, but found, or fancied, that his talents were undervalued, and returned to Paris.

He appears, however, not to have been more ſucceſsful as an artiſt in his native country, for we find that he ſoon afterward

afterward relinquiſhed engraving altogether, and confined his attention to the traffic of a print-ſhop, which had devolved to him by the death of his brother.

We begin our account of the hiſtorical prints of Jacques with thoſe which he engraved after the pictures of Raphael.

"St. John in the Deſart, diſplaying a Burning Croſs." "The Virgin ſeated in a Landſcape, holding the infant Jeſus, and the little St. John kneeling by her Side," for the Crozat collection. This piece, which is known under the name of "La Belle Jardiniere," was likewiſe engraven by Rouſſelet. "The Transfiguration," a large upright, arched at the top. "A Holy Family," in which the Virgin is ſeen with the infant Jeſus on her knees, who is regarding St. Joſeph. Theſe, as well as the remainder of his hiſtorical works, are all of folio dimenſions. "David bearing the Head and Sword of Goliah," after a painting of Dom Feti. "David, from the Top of his Houſe, viewing Bathſheba," after Raoux. "Jeſus waſhing the Feet of his Apoſtles," after Nicolas Bertin. "Iphigenia in Tauride," with the inſcription, "Quantum religio potuit, &c." after the ſame. "Vertumnus and Pomona," after François Marot. "St. Anne," after M. Corneille. "The Deſcent from the Croſs," after Charpentier. "Deſign for a Sarcophagus," after N. N. Coypel. "A Young Female careſſing a Dove," after Carlo Vanloo.

The following are the only portraits inſcribed with the name of J. Chereau as the painter or draftsman. Phillip of Orleans, regent of France, in 8vo. Profile of George I. king of England, engraven at London, in 4to, rare. Jean Marie Vicenti, chancellor of Venice, in 4to., round. Michael de Montagne, engraven in 1715, in 4to. oval. Jacques Auguſte de Thou, in 4to., oval. Jean Baptiſte Joſeph Languet d'Orgy, curé of St. Sulpice.

Portraits after different painters. Jean Soanen, biſhop of Senez, after Raoux, in folio. Charles Joachim Colbert, biſhop of Montpellier, after the ſame in folio; and Jane of Arragon, queen of Sicily, after Raphael in folio.

Louis des Plaus was born at Paris A. D. 1682, and died in the ſame city in the year 1739 or 1740. He ſucceſsfully mingled etching with the work of the graver, and the merit of his beſt works is ſo conſiderable, that Watelet ſcarcely allows him to be inferior to Audran; he was engaged, with the moſt eminent artiſts of his time, in engraving for the Crozat collection. His moſt eſteemed prints are in folio, and their ſubjects as follow: "Danaë receiving the Golden Shower," after Titian. A pair of uprights, after Paul Veroneſe, entitled "Wiſdom the Companion of Hercules," and "Paul Veroneſe between Vice and Virtue." From the ſame painter, he has alſo engraven "Happy Love," and a ſquare plate, entitled "Reſpect." "The waſhing of Feet," after a painting of Mutien in the metropolitan church of Rheims, a grand compoſition. "St. Claire borne on Clouds and ſurrounded by Angels, with the Dragon overthrown at her Feet," from a painting of J. B. Gauli, ſtyled the Bachiche. "The Adoration of the Kings," in which is ſeen on the one ſide St. Longin in his armour, and on the other St. John the evangeliſt with the chalice, after Jul. Romano. "The Triumph of Titus and Veſpaſian," after the ſame, a ſuperb print. "Calvary, or Chriſt between the Thieves," after Caracci, an upright for the Crozat collection. "The Martyrdom of St. Peter," after Calabreſe. "The Purification of the Virgin," after Tintoret. "Diana and Acteon," after Carlo Maratti. "The Rape of Helen," after Guido. "The Birth of Adonis," after Carlo Cignani. "Roman Charity." "Hercules combating the Centaurs." "The Sacrifice of Abraham." "The gathering of Manna," its companion. "The Sacrifice of the Prophet Elias;" and "The Splendour of the neighbouring Powers of France," are all after Ch. le Brun. Among his very beſt engravings may be reckoned the following, after Jouvenet. "Jeſus healing the Sick," a very large plate. "Elevation of the Croſs," and "The Deſcent from the Croſs," a pair of large uprights. "St. Bruno at Prayer." "Aſtyanax torn from the Arms of Andromache." "Venus cauſing Arms to be forged for Æneas."

After the pictures of Ant. Coypel, Des Places has engraven, "Triumph of Venus on the Waters." "Love diſarmed by a fair Nymph," an oval. "Love ſheltered in the Houſe of Anacreon." "Minerva drawing Truth from a Well, and expelling Error and Ignorance," engraven in 1716. "Alcides reſtoring Alceſtes to king Admetus." "Æneas ſaving his Family from the Conflagration of Troy." "Funeral Pomp of Prince Pallas," and "Jupiter tonans." The three latter connect with the ſeries painted from the hiſtory of Æneas, in the Palais Royal, and publiſhed in twelve large plates, engraven by the moſt celebrated engravers of the time.

From the pictures of Ch. Coypel, ſon of Antoine, we find a pair entitled "Sweet and pleaſing Education," and "Dry and repulſive Education," and "The Matron of Epheſus." And from thoſe of Louis de Boulogne "Fire" and "Water," two prints of the ſet of four elements, of which Charles Dupuis engraved "Earth" and "Air;" and "The Annunciation of the Virgin," after a painting in the chapel of Verſailles. "The Servant of Abraham delivering to Rebecca the Preſents ſent by his Maſter," after A. Guy Halle. "Diana and Endymion," after Nic. Fouché. "A young Girl, with a Bird," after Deſormeaux; and "A young Girl playing on a Lute," with the title "Amuſement eſpagnol," after Gil. Allou, are in 4to. "Abraham receiving Hagar," after Carlo Vanloo, "Venus bringing the Dictamnum to cure the Wound of Æneas," after J. B. Nattier. "Leda careſſed by Jupiter in the Form of a Swan," after P. Jac. Cazes. "Repoſe of Galatea," after the ſame. Of a ſet of four prints, called "The Surpriſes of Love," after the ſame painter, Des Places engraved two, namely "Achilles and Deidamia," and "Hercules and Omphale." The four ſeaſons, after the ſame, are engraven by him in conjunction with Beauvais. Two ſubjects after Watteau, "Painting," and "Sculpture." "Rural Repaſt." "The hunting of Lions and Tigers," after Ch. Parocel. "Orpheus obtaining from Pluto the Return of Eurydice," after Rubens.

The beſt portraits of our artiſt are thoſe of Everard Titon du Tillet, inventor of the French Parnaſſus, after N. de Largilliere. Marie Anne Duclos, a celebrated tragic actreſs, in the character of Ariadne, after the ſame. Charles François Silveſtre, youngeſt ſon of Iſrael, after I. Herault; and Pope Pius V. obtaining from heaven the victory of Lepanto, after Fre Jean André, engraven in 1714: and the three following are engraved from ſculpture, namely, "Antique Statue of Hercules killing the Hydra." "Marcus Curtius leaping into the Flaming Gulph," from the equeſtrian ſtatue by Bernini, in the gardens of Verſailles; and a ſtatue of "Leda," after Corneille van Cleve.

Charles Dupuis was born at Paris in 1685, and died in the ſame city in 1742. He was the pupil of Gaſpar Duchange, and afterwards became his ſon-in-law. He viſited England, but the climate not agreeing with his health, he returned to his native country, and was afterwards admitted a member of the Royal Academy.

In moſt of his prints, he employed the aid of aquafortis; he drew with conſiderable ability, and his works in general indicate, that he poſſeſſed a profound knowledge of his art. He engraved with equal ſucceſs portraits and hiſtory. The following are among the moſt eſteemed of his engravings, and are all of the folio claſs.

"St. John preaching in the Deſart," after Carlo Maratti, engraved for the Crozat cabinet. "Ptolemy Philadelphus granting Liberty to the Jews," after Ant. Coypel. "Alexander Severus cauſing Corn to be diſtributed to the Romans," after the ſame, both uprights. The four other ſubjects, which, with the two preceding form a ſet, were engraven by Duchange. Two prints, repreſenting "Air," and "Earth," after L. de Boullogne, in folio. The two others, "Fire," and "Water," (which complete the ſet of four elements) were engraven by Deſplaces. "Cupid triumphing over Pan," after Ant. Coypel. "Diana repoſing, ſurrounded by her Nymphs;" and "Rinaldo and Armida," after the ſame. "The Paſſage of the Rhine," after Le Brun. "The Marriage of Joſeph and Mary," after Carlo Vanloo. "King Charles I. repreſented in Priſon," after Raoux.

Charles Dupuis alſo engraved, after the paintings of Euſtache Le Sueur, in the hotel du Chatelet, from drawings by B. Picart, conjointly with Duchange, Duflos, Deſplaces, and Beauvais, "The Occupations of the preſent Age," after Ant. Watteau. "The Leſſon of Love," after the ſame, and "The philoſophic Huſband," Act V. ſcene laſt, after Nic. Lancret.

His moſt eſteemed portraits are thoſe of Jean Pittard, ſurgeon to king St. Louis. Ch. Dupuis del. et ſc. in 8vo. Henri de Lorraine, duke of Guiſe, termed the Gaſh, after Dumouſtier. Jerome Bignon, librarian to the king, after Coyzevox. Louis Marchand, organiſt to the king, after Robert, all in 8vo. but the following are of the folio ſize; Nicholas Couſtou, ſculptor to the king, painted by Le Gros, and engraven by Dupuis for his reception into the academy in 1730. Nicolas de Largilliere, painter to the king, painted by Gueulain, and engraven by Dupuis for his reception into the academy in 1730. Louis XV. ſitting, after Ranc, and Madame Bouché of Paris, in the coſtume of a veſtal, after Raoux.

Nicolas Gabriel Dupuis, the brother of Charles, was born at Paris about the year 1696, and died in the ſame city in 1770. He was at firſt a dyer, and was a long time occupied in engraving ornamental plates for printing linen. He was ſo extremely modeſt, that he never even dreamt of becoming a member of the academy; but having taken leſſons in engraving from Duchange, and executed ſome plates for the gallery of Verſailles, after Le Brun, from deſigns by Maſſe, he at length became better known, and his own merit, ſeconded by the intereſt of Le Brun, introduced him to the Royal Academy of France.

His merits were little inferior to thoſe of his elder brother; and his ſtyle, in the earlier part of his career, was the ſame; but diſcovering that the ſteams of aquafortis impaired his health, he ever after worked with the graver alone, handling that inſtrument with much freedom and facility.

Like his brother, he engraved both portraits and hiſtorical ſubjects; of which the following are the moſt celebrated:

"The Guardian Angel," after Dom Feti. "Amuſement of paſtoral Life," after Georgione, for the Crozat collection. "The Adoration of the Kings," after Paul Veroneſe, alſo for the Crozat collection. "The Death of Lucretia," after Guido. "St. Sebaſtian," after L. Carracci, engraven in 1770. "The Virgin and the infant Jeſus," after Annibal Caracci. "Æneas reſcuing his Father Anchiſes from the burning of Troy," after Carlo Vanloo. "St. Nicolas, (the patron of mariners,) and St. Francis at Prayer," after Pierre. "A ſleeping Nymph diſcovered by the Fauns," after L. Cheron. All theſe ſubjects are in folio.

Portraits.—Gaſpar Duchange, engraver to the king, painted by Vanloo the ſon, in 4to. Girard Audran, engraver to the king, from a model by Coyzevox. Charles Francis Paul le Normand de Tournehem, director general of the arts, painted by L. Toque, engraven by Dupuis for his reception into the academy in 1754. in folio. Phillip Wouvermans, a Dutch painter, after C. de Viſſcher in folio. Pedeſtrian ſtatue of Louis XV. erected in the city of Rennes, executed by Le Moine, in folio. Equeſtrian ſtatue of Louis XV. erected in the city of Bourdeaux, executed by the ſame, in folio.

Jean Du Vivier, or De Vivier, an engraver chiefly of dies for coins and medals, was born at Liege in 1687, and died at Paris in 1761. He came to Paris, and was admitted a member of the Royal Academy in 1718. He alſo received a penſion from Louis XV. and apartments in the gallery of the Louvre. Among all the artiſts of his time, Vivier ſeized the moſt ſtriking reſemblance of that prince. The moſt remarkable of the great number of medallions engraved by this artiſt are thoſe of the coronation of Louis XV., the equeſtrian ſtatue of this Prince, erected in the Place de Bourdeaux, the buſts of the king at different ages, and that of Peter the Great.

Delicacy and ſpirit characterized all the productions of Vivier; gentleneſs and modeſty were the prominent features of his moral character. He engraved with the ſame ſpirit on copper. His prints are all either inſcribed, Giovan, or G. de Vivier fecit.

The following, among other productions of this artiſt, are very much valued by connoiſſeurs:

The portraits of Bartholet Flamaël, a painter of Liege; and Pierre de Gouges, advocate of the parliament, after R. Tourniere, both in folio. "A Flemiſh Cook drawing a Fowl, and a Woman bringing her ſome Drink," inſcribed Ant. Van Heuvel pinx. G. de Vivier fec. aq. fort. 4to. "The entombing of Chriſt;" in the middle is an angel ready to cover the body with linen, on the right Joſeph of Arimathea holding a torch; inſcribed Anton. Van Heuvel inv. G. de Vivier fecit, in folio. "The Temptation of St. Anthony." In this print the venerable ſaint is ſeen kneeling before his praying deſk, rejecting the ſolicitations of a maquerelle with the wings of a bat, who is pointing to a courteſan richly attired. This is a very rare and curious work.

Nicolas Dauphin de Beauvais was born at Paris in 1687, and died in the ſame city in 1763.

Beauvais was the pupil of Jean Audran, and the ſon-in-law of Gaſpar Duchange.

From the circumſtance of his having engraved one of the ſeries of pictures which ſir James Thornhill painted for the cathedral church of St. Paul, the French writers on art have conjectured that he muſt have reſided for a time in London; but as no man may engrave plates within an Engliſh cathedral, a reduced copy was probably made from the original picture, and this might have been tranſmitted to Paris, with nearly the ſame eaſe, as to an artiſt's chambers in London.

The ſtyle of Beauvais varied at different periods of his life, and in his beſt works bears conſiderable reſemblance to

that of Edelink. Huber ſays that he poſſeſſed greater talents than he enjoyed reputation.

The works of this artiſt which are beſt known, are the following: The Virgin and the infant Jeſus on a Pedeſtal, beneath which are ſeveral Saints, after a celebrated painting by Corregio in the Dreſden gallery, known under the name of "St. George," a large upright. "The penitent St. Jerome," after Vandyke, the original of which is alſo in the Dreſden gallery. "The penitent Magdalen in the Deſart;" after B. Luti, for the Crozat collection. "The Triumph of Bacchus and Ariadne," after Pouſſin. "Cupid ſtealing Thunder from Jupiter," after le Sueur, a circle. "The burning and Metamorphoſis of the Veſſels of Æneas," and "The Death of Pallas," both after Coypel. "The Reſurrection of Chriſt," after P. Jac. Cazes. A ſet of, "The four Seaſons," after the ſame painter, engraven by Beauvais and Deſplaces. "The Pentecoſt, or Deſcent of the Holy Spirit," after Frere Jean André. "Elymas the Sorcerer ſtruck blind," after ſir James Thornhill. "And a Monument in honour of William Earl Cowper," all of the folio claſs.

Charles Nicholas Beauvais, the ſon, was born at Paris in the year 1730, and generally engraved in concert with his father. The only engravings which are known to have been executed by him alone, are the portrait of Juſte Aurele Meiſſonnier, (an architect,) from a drawing by himſelf, and a print after F. Boucher, entitled "Sleep interrupted."

For the family of Le Sueur, who were celebrated engravers on wood, and lived, ſome of them, about this time, ſee WOOD *Engraving*.

Frederic Hortemels was born at Paris ſome time about the year 1688. He always reſided in his native city, and appears to have ſtudied in the ſchool of Audran. Some few of his engravings have very little etching in them, but in his beſt prints he has more equally united the uſe of the point with that of the graver. They reſemble, in ſtyle, the engravings of Benoit Audran, but are ſomewhat more mellow, and many of them poſſeſs conſiderable merit: he has however been cenſured by ſome critics for the too abundant introduction of coarſe dots in his fleſh.

Of his plates, which were principally executed for the Crozat collection, the following will probably be found moſt deſerving the attention of the collector:

The portrait of Philip of Orleans, after J. B. Santerre. "Chriſt bearing his Croſs," after Georgione, and "The Adoration of the Kings," after P. Veroneſe, both engraved for the Crozat collection. "The Marriage of St. Catherine," after the ſame painter. "The Birth of St. John the Baptiſt," after Tintoret. "Chriſt and the Woman of Samaria," after B. Garofalo, engraved for the Crozat collection. "Cain contemplating his murdered Brother," after Andrea Sacchi, engraved for the ſame collection; and "The Pentecoſt, or Holy Ghoſt deſcending on the Apoſtles," after Gaudentio Ferrari, all of the folio claſs, but not very large.

Maria Madeleine Hortemels was born at Paris in the year 1690 or thereabout; according to Watelet ſhe was the daughter of Frederic Hortemels; but if the French writers have given in truly the dates of their reſpective births, this is impoſſible. It is more likely that Baſan is in the right when he calls her the couſin of Frederic; ſhe became the wife of Charles Nicholas Cochin the elder, and author of the following engravings, which are chiefly etchings performed with freedom and ſpirit, and finiſhed with the graver.

"Mercury announcing Peace to the Muſes," engraved (in a circle) from M. Corneille's cieling of the queen's ſaloon at Verſailles: "Penelope ſurrounded by her female attendants," and "Aſpaſia diſputing among the Grecian Philoſophers," are alſo after Michael Corneille.

After N. Bertin ſhe has engraven "St. Philip baptizing the Eunuch of Queen Candace;" and "Iphigenia," with the inſcription "Quantum religio potuit." "The Triumph of Flora" is after Pouſſin; and "Franche-Comté," conquered the ſecond time, after Le Brun. "Don Quixotte with a Beard," deſigned by Cochin junior, and engraven by his mother. "The charming Catin," after the ſame, engraven by the ſame. "The Singer of Canticles," after the ſame, engraven by the ſame. The above are all of the folio claſs. "The grand Lama and the king of Tangut," for a collection of voyages, by the ſame artiſts, in 4to. and the following folio portraits after Hyacinthe Rigaud, namely, Henry de Thiard de Biſſy, cardinal biſhop of Meaux, and Gaſton de Rohan de Soubiſe, cardinal biſhop of Straſbourg.

Charles Nicholas Cochin, the father, was born at Paris in the year 1688, and died in the ſame city in 1754. He was not the firſt of this name known as an engraver, being deſcended from Nicholas Cochin of Troyes, who flouriſhed about the middle of the ſeventeenth century.

The ſubject of our preſent notice cultivated painting till he attained the age of twenty-two years, and afterward devoted himſelf chiefly to engraving. He was an excellent deſigner, and engraved with much taſte and ſpirit, eſpecially when the figures were of the middle ſize. He was not equally ſucceſsful in thoſe of larger dimenſions, not being able, or not willing, to invigorate accordingly his ſtyle of execution. In his ſmaller works, his ſhadows are hatched with a looſe and free hand, and his forms drawn with much of artiſt-like feeling. Cochin publiſhed a great number of prints, of which we ſhall only mention the moſt celebrated.

The two portraits which he engraved for his reception into the Royal Academy in 1731, are thoſe of Jacques Sarazin the elder, ſculptor in ordinary to the king, and Euſtache le Sueur, painter in ordinary to the king, both in folio. "Alexander and Roxana," after Raphael, in folio. The ſame ſubject of the ſame ſize, but differently treated, the figures being without drapery; both of theſe engravings are in the Crozat collection. "Hercule Gaulois, or Eloquence," and "Calumny, painted by Apelles," after drawings by Raphael. It would appear that this pair of engravings on copper were combined with wood-engravings by Nicholas le Sueur, and printed in chiaro-ſcuro. "The Inflexibility of St. Baſil before Moteſt, Prefect of the Eaſt," after Fr. le Moine. "Jacob diſcovering himſelf to Rachael on his Arrival in Meſopotamia," after the ſame. "Jacob before Laban excuſing himſelf for his Artifice," after J. Reſtout; a companion print to the preceding. "The Deſtruction of Armida's Palace," after the ſame. "Jacob purſued by Laban," after N. Bertin. "The Servant of Abraham accoſting Rebecca," after the ſame. "The Trinity," and "The Aſſumption," from two paintings by Noel Coypel. "The Hiſtory of St. Auguſtin," engraven in ſeven plates, after L. Boullongne. The above are all of the folio claſs, but generally ſmall. The four following are in 4to. "Reception of a Biſhop under a Tent," after the ſame. Frontiſpiece for the order of St. Michael, after the ſame. "The Lame cured," after P. Jac. Cazes. A ſeries of fifty-two ſubjects of the hiſtory of Languedoc, after the ſame. "The Generoſity of Harmonia, Daughter of Gelon, King of Syracuſe," with an hiſtorical explanation, after J. B. M. Pierre. "A Converſation Piece in a Garden," after the ſame painter, in ſmall folio. The following are all after Watteau, and in folio. Two plates of "Italian Comedians

on the Stage." Another pair of "Love in the French Theatre," and "Love in the Italian Theatre." "The flying Camp," and "Return from the Campaign." "A Detachment of Soldiers making a Halt." "The Grove of Bacchus," and "The Village Bride," a capital piece both of the painter and engraver.

Charles Nicholas Cochin, the ſon, was born at Paris in 1715, and died in the ſame city in 1788. This celebrated artiſt inherited from nature the moſt happy diſpoſitions and talents for the arts of deſign, and ſeveral circumſtances concurred to haſten the developement of his faculties. He was the ſon of Charles Nicholas Cochin and of Marie Madeleine Hortemels, and received from them inſtructions in art, along with the other branches of his education, which was conducted under the paternal roof. He gave many proofs at a very early age of the rapidity of his progreſs in arts and letters. In 1740 he viſited Italy in company with the marquis of Marigny, and in 1758 publiſhed his "Collection of Obſervations on the Paintings and Sculpture which are to be ſeen in the principal cities of Italy." This work was very well received by the impartial part of the public, but the Italians, though delighted at diſplaying their artiſtic treaſures to the eye of ſtrangers, were nevertheleſs indignant that any one ſhould preſume to criticize them. Some Ciceroni have blamed the author for the ſevere ſtyle in which his criticiſms are delivered. But however this may be, the work in queſtion is, even at preſent, deemed the beſt guide to travellers who wiſh to attain a knowledge of the works of art in Italy. An excellent companion to this work is "Obſervations upon the Antiquities of Herculaneum, &c." by M. M. Cochin and Bellicard, which poſſeſſes the advantage of containing a great number of beautiful ſubjects of antiquities engraved with great ſpirit by the authors.

On his return to his native country this artiſt was created a chevalier of the order of St. Michael, deſigner to the king, and ſecretary to the academy of painting. Equally ſkilful as an engraver, and as a deſigner, his works amounted to above fifteen hundred ſubjects, of which one hundred and twelve are portraits en medallion of the quarto ſize, moſt of which were of his friends, and other diſtinguiſhed artiſts and men of letters.

The mode of art which he employed on his plates was chiefly etching, and his etching might be ſaid to conſiſt almoſt entirely of drawing, performed with taſte and freedom, and combined with a degree of picturesque feeling, which perhaps has never been exceeded. His beſt landſcape, fancy, and hiſtorical productions are as follow:

"The Death of Hypolitus," after J. F. de Troy, in folio. "David playing on the Harp before Saul," after Carlo Vanloo, in folio. "Abraham receiving Hagar by the Advice of Sarah," after the ſame. "Grand Views of the Sea-ports of France," after Vernet, etched by Cochin, and finiſhed by Le Bas, fourteen plates of large folio dimenſions. Sixteen large prints, repreſenting hiſtorical ſubjects of the Chineſe empire, deſigned at China, and ſent to Paris by the emperor, to be engraven.

The direction of this national work was committed to Cochin, who diſtributed them, in order to be engraven under his auſpices, to the following artiſts: J. Aveline, Aug. de St. Aubin, Ch. le Bas, J. P. Choffard, N. de Launay, L. Muſquelier, F. de Né, and B. L. Prevoſt. Theſe ſubjects were deſigned by the Jeſuit miſſionaries, the father Attiret, firſt painter to the emperor of China, Damaſcenus Sikelbar, and Caſtiglione. The prints being ſent to China, as they were engraven and wrought off, proofs of them were not to be obtained by the public. Only a ſmall number were reſerved for the royal family, and the king's library, but Helman the engraver executed a few copies of a ſmaller ſize. Cochin likewiſe engraved the following, which are chiefly after his own deſigns. "The Infant Jeſus holding a ſmall Croſs." "The Virgin in the Attitude of a Magnificat." "The ſmall Crucifix, to which the Convulſionaries attributed Miracles." "Lucius Quintus Cincinnatus," drawn from the antique ſtatue, in 4to. "The Conſecration of Louis XV. at Rheims," for the medallic hiſtory by Godenoche, in 4to. "Decoration for the Illumination and artificial Fire Works in honour of the Dauphin, at Meudon, in 1736." Decoration for the Illumination and artificial Fire Works at Verſailles," 1739. "Perſpective view of the Illumination in the Rue Ferronerie, in 1739," all in folio. "Decoration of the Saloon, conſtructed at Verſailles, for the Repreſentation of "The Princeſs of Navarre," a comic piece, in honour of the nuptials of Louis Dauphin of France, with Maria-Thereſa, Infanta of Spain, on the 20th of February 1745." Executed by Slodtz and Perot, deſigned and engraven by Cochin. "Ceremony of the Marriage of the Dauphin with the Infanta of Spain, in 1745," engraven in 1746. "Funeral Obſequies of the Dauphineſs at St. Denis, in 1746." "Funeral Obſequies of the Dauphineſs in the church of Notre-Dame at Paris, 1746." "Funeral Ceremony of the King of Spain, in the Church of Notre Dame at Paris, 1746." "Funeral Ceremony of Catherine Opalinſka, Queen of Poland, in the Church of Notre Dame at Paris," deſigned and etched by Cochin the ſon, finiſhed with the graver by J. Ouvrier, all in folio; and a ſmall plate of a jeweller with a cluſter of precious ſtones, being the firſt plate which he engraved from his own deſign.

The beſt portraits of Cochin jun. are Franciſcus Benallus Tarviſinus, abbax, engraven in 1751. Louis de Boiſſy, of the French Academy. Edme Bouchardon, ſculptor, 1754. Count de Caylus, amateur. The abbé de Chauvelain, counſellor of the parliament. Charles Duclos, hiſtoriographer. Pierre Jeliot, opera ſinger. The ſame portrait finiſhed by A. de St. Aubin. The marquis de Marigny, etched in 1752, under the title Marquis de Vandieres, and finiſhed in 1757 under that of Marigny. Pierre de la Place, of the Academy. The abbé Pommier, counſellor of the Parliament. Jean Reſtout, painter of the Academy. A. L. Seguier, advocate general. The duke de la Valliere, of the Academy of Sciences. Prince de Turenne, amateur.

Of count de Caylus, who lived at the time now under our obſervation, his various antiquarian purſuits, his love of the arts, the ſimplicity of his manners, and his irreproachable morals, we have already ſpoken, (See the article CAYLUS.) His rank and reputation for fine taſte gave a degree of celebrity to his etchings which they do not intrinſically merit, and time, which is ſure to overcome faſhion, has ſince reduced them to the ſtandard of mediocrity. It muſt now be acknowledged that he could not, even with the aſſiſtance of Bouchardon, draw with ſufficient accuracy to etch from the ſculptured gems of antiquity; though in imitating the ſketches of the old maſters, and the groteſque heads of Leonardo da Vinci, he has been far more ſucceſsful.

His prints are in general ſmall, but very numerous. According to Mariette, they amounted to no fewer than three thouſand two hundred ſubjects, of which we ſhall proceed to name the principal. They are commonly marked either with the letter C. or in ſome inſtances C. de C.

Eighty-five plates of heads, after Leonardo da Vinci. Five large plates, after Della Bella. Upwards of two hundred plates from drawings and ſketches by the old maſters, formerly in the cabinet of the king of France. A collection drawn from antique gems by Bouchardon, etched by C. de C., and finiſhed with the graver by Le Bas, on ten quarto plates. Six large plates of mythological ſubjects, compoſed by Bouchardon, etched by C. de C., and terminated

nated with the graver by Et. Feſſard. A collection of heads (conſiſting of thirty of the quarto ſize) from the drawings of Rubens, or Vandyke, or both theſe maſters, in the Crozat collection; and "The Aſſembly of Brokers," a humorous print, in quarto.

The following portraits are alſo from the etching-needle of Count Caylus, namely, Michael Maſciti, in a medallion, dated 1726. The abbé le Gendre. Camille Falconet, a phyſician of Lyons. Polidore da Caravaggio, and Voltaire in the Baſtile; all of them ſmall plates.

Louis Surrugue, the elder, was born at Paris in 1695, and died in the ſame city in 1769. He learned the principles of deſign and of engraving under P. Picart, whoſe manner he ſucceſsfully imitated. His ſtyle is, on the whole, commendable, and he was one of thoſe artiſts who combined with good effect the etching-needle and the graver. Surrugue furniſhed ſome very good prints to the greateſt number of the collections which appeared during his time.

He was a member of the Royal Academy, and engraved portraits and hiſtory with equal ſucceſs. The following are the ſubjects of his principal works:

"St. Marguerite trampling an enormous Dragon under foot," after Raphael. "St Jerome ſitting in the Deſart, in profound Meditation" after Balthaſar of Sienna, engraven by Nicolas Chateau, and retouched by Louis Surrugue. "Jeſus curing Ten Lepers," after Jerome Genga. "Abraham offering up Iſaac," after the celebrated painting of Andrea del Sarto, in the gallery of Dreſden. Theſe four are in folio. "The Nativity of the Virgin," after P. da Cortona, in quarto. "Moſes breaki g the Tables of the Law," after Pouſſin. "Hagar diſmiſſed by Abraham," after Euſt. le Sueur, engraven in 1711. "Protection granted to the Fine Arts," after Le Brun. "Deſcent of Æneas into Hell," after Ant. Coypel. "Economy," after a painting of Chardin, in the cabinet of the king of Sweden, being a companion to "The Amuſements of Private Life," in the ſame cabinet. "Amuſements of Cytherea," after Watteau. A Pair after the ſame: "A Scene in an Italian Comedy," and "A Concert of Muſic." "The Deſire of Pleaſing," after J. B. Pater. "The Pleaſures of Summer," after the ſame. Two ſubjects from the comic romance of Scarron, entitled "Madame de Bouvillon, in order to tempt Fate, bids him ſeek her a Flea;" and "Ragotin eſcaping from a Cheſt," after the ſame painter, and of the upright form. "Diverſions of the Dutch Peaſantry," after D. Teniers, engraven in 1748. "David Teniers cauſing his Wife's Fortune to be told," after the ſame. "Silvia in expectation of her Lover," after a painting of Santerre from an idea of Rembrandt. "The Philoſopher in Meditation," and "The Philoſopher in Contemplation," two ſubjects after Rembrandt. "Venus nouriſhing the Loves," after Rubens, a compoſition alſo engraven by C. Galle, and by H. Watelet. The above ſubjects are all in folio.

Surrugue alſo engraved two portraits, as appears to have been the cuſtom, for his admiſſion into the Royal Academy, of the following artiſts, Louis de Boullongne, the father, painter to the king, after Mathieu. Joſeph-Chriſtophe Veirier, a Provençal ſculptor, relation and pupil of P. Puget, both in folio.

Pierre-Louis Surrugue, the ſon, was born at Paris in the year 1717. He acquired the elements of his art under the paternal roof. His ſtyle of engraving greatly reſembled that of his father; like him he was a member of the royal academy, and like him alſo he engraved both portraits and hiſtorical ſubjects, of which the following are thoſe of moſt importance. Excepting a pair of quarto landſcapes after Teniers, they are all of the folio claſs.

"The Nativity of our Saviour," after the celebrated painting of Correggio, known under the name of la Nuit de Correge. "The Virgin and Child accompanied by St. Jerome, St. Criſpin, and St. Criſpinian," after Guido. "The Judgment of Paris," after H. Goltzius. "The Converſation," and "The Gypſey in Bed," two Flemiſh ſubjects after Teniers, engraven in 1748. "Two Flemiſh Landſcapes," after the ſame, engraven in 1750, in quarto. "Clytie changed into a Sun-flower," after Ch. Coypel. "Orlando learning the Flight of Angelica from the Shepherds." "Deſign of a Saloon at St Cloud, repreſenting the Apotheoſis of Hercules," both from Ch. Coypel. A pair after B. S. Chardin, entitled "The Monkey Painter," and "The Antiquary (an ape) in the midſt of his Curioſities." "The Blind Man," with ſix French verſes, is from the ſame painter.

His beſt portraits are in folio, and are thoſe of Simon Guillain, ſculptor to the king, after N. Coypel, engraven by P. L Surrugue for his reception into the academy in 1747. René Fremin, director of the academy of painting, after de la Tour, engraven by Surrugue the younger for his reception into the academy in 1747. Madame de * * * in a ball dreſs, after Ant. Coypel. This anonymous portrait was falſely underſtood to be that of Madame de Pompadour, but is that of Madame de Mouchi; and Rembrandt the father, painted by the ſon.

Jacques-Gabriel Huquier, the father, was born at Orleans in 1695, and died at Paris in 1772. In conjunction with his ſon, this artiſt etched a great number of prints after Gillot, Watteau, Boucher, and other French maſters. He was a print merchant, and carried on a conſiderable trade, and at his houſe the artiſts and amateurs of Paris were accuſtomed to meet on certain evenings, and converſe for their mutual pleaſure and improvement.

Huquier was a man of taſte, well informed on ſubjects connected with the fine arts, and at his death left an immenſe collection of prints and drawings of great value, which were ſold by public auction. We begin our ſelection of his beſt works, with thoſe which he has engraven after Watteau, which are all of the folio claſs.

A ſet of five plates entitled "The Senſes." A pair of the gardens of Cytherea and Bacchus. The following are alſo publiſhed in pairs, "The Temple of Bacchus," and "The Temple of Neptune." "Apollo," and "Diana as a Huntreſs." "The Faithful Gardener," and "The Ardent Shepherd." "The Cradle," and "The Theatre." "The Triumph of Galatea," and "The Shepherd overtaken by a Storm." "The Emperor of China," and "The Chineſe Divinity." A ſet of four plates of the ſeaſons, expreſſed by Paſtorals; and another ſet of the four elements.

His beſt prints after Boucher are two books of ſtudies, four plates in each. A book of academical figures. Four ſets of Paſtorals, ſix prints in each. Four plates of Chineſe ſubjects;—but Boucher is always temporary or trifling.

From his own deſigns he has engraven one hundred and eight plates, conſiſting of ſix hundred ornamented vaſes, another book of ornaments, and a grand iconology, or collection of allegorical vignettes, repreſenting arts and ſciences, heathen deities, virtues, vices, &c. on two hundred and ſixteen plates; and a collection of antique figures from drawings by Oppenort, whoſe portrait he has alſo engraved.

Gille Edme Petit was born at Paris in the year 1696, and died in the ſame city in 1760. He was the diſciple of Jac. Chereau, and his ſtyle of engraving greatly reſembled that of his maſter. To him we are indebted for a conſiderable number of portraits, of which the following are the princi-

pal, executed with great neatneſs; and, as is believed, almoſt entirely with the graver.

Prince Charles Edward Stuart, from a picture painted at Rome by Dupré. Philibert Papillon, canon of the chapel of Riche, at Dijon. Pierre Bayle, the celebrated critic. Marie de la Fontaine, of La Boiſſiere, after De la Tour. Louis Phillipe, regent of France, after Liotard. Maria Thereſa, queen of Hungary, after Meytens. René Charles De Maupeou, firſt preſident of the parliament, after Chevalier. Armand Jules, prince de Rohan, archbiſhop of Rheims, after Rigaud. Henri-Charles de Pomponne, abbé of St. Medard, after J. B. Vanloo. Jean-Frederic Philippeaux, count de Maurepas, after L. M. Vanloo. Joachim-François-Bernard Potier, duke de Gueſvres, after the ſame, engraven in 1735. Francis I., king of France, after Titian, engraved for the Crozat collection; and Louis XV., king of France, after Carlo Vanloo.

The following are from the pictures of Frere Jean Andre. "The Pilgrims of Emaus." "The Viſitation." "The Virgin with her Roſary." and "St. Catherine of Sienna." The above ſubjects are all in folio.

Pierre Subleyras was born at Uſez in 1699, and died at Rome in 1749. At the age of fifteen he was ſent to Touloufe, and placed under the care of Antoine Rivalz. At twenty-one he viſited Paris, and obtained the firſt prize of the Academy, of which the ſubject was the brazen ſerpent. In conſequence of this, he was appointed by the French Academy to go to Rome, where he remained for ſome time, and completed his ſtudies. The manner of living in this city being agreeable to his mode of thinking, he finally ſettled in it, and eſpouſed ſignora Maria-Felice Tibaldi, a celebrated minature painter. Subleyras compoſed with great facility, and drew correctly. He poſſeſſed a brilliant reputation, though he died at the age of fifty, and the great number of his pictures, which were to be found both in Rome and the other Italian cities, bears teſtimony to his genius, and the fertility of his imagination.

Subleyras etched ſome ſubjects from his own compoſitions; and is among the number of thoſe painters who have handled the etching-needle with great taſte and ſpirit. His choice of ſubjects is excellent.

We may here mention, as favourable ſpecimens of his talent as an etcher, the following prints:

"The Brazen Serpent," for the prize of the Academy. "The Martyrdom of St. Peter." "Jeſus at Supper in the Houſe of the Phariſee, with Mary Magdalen at his Feet." Four ſubjects taken from La Fontaine's Fables.

Bernard Lepicie was born at Paris in 1699, and died in the ſame city in 1755. At his death he enjoyed the title of perpetual ſecretary and hiſtoriographer to the Royal Academy, and profeſſor of hiſtory to the eſtabliſhment for the inſtruction of pupils.

In engraving he appears to have ſtudied in the ſchool of Jean Audran, whoſe ſtyle he ſucceſsfully imitated. His drawing is not very correct, though it muſt be admitted that many of his prints are not deſtitute of merit. He viſited England, being invited hither by Duboſc, and during his ſtay aſſiſted Dorigny in engraving the Cartoons of Raphael at Hampton Court.

In his capacity of hiſtoriographer to the Academy, he publiſhed two works, having for their titles: "Deſcriptions of the Pictures of the King;" and "The Lives of the firſt Painters to the King, from Charles Le Brun, to François Le Moine."

The prints of this artiſt conſiſt of hiſtorical ſubjects, and portraits of the folio claſs, and are principally as follow:

"The Circumciſion;" "Jupiter and Juno;" and "Jupiter and Io;" after Julio Romano. "St. John preaching in the Wilderneſs," after J. Baptiſte Gauli, ſurnamed the Drunkard. "Vertumnus and Pomona," after Rembrandt. "An old Woman telling a young Girl's Fortune." "The Flemiſh Philoſopher," engraven in 1744; and "The Flemiſh Freemaſons in their Lodge," both after Teniers. A pair entitled, "The Game of Cheſs," after Carlo de Moer, dated 1746; and "The Game of Picquet," after Gaſ. Netſcher. Another pair after the ſame, entitled "Love in a City;" and "Love in a Village." "Thalia expelled by Painting," after Ch. Coypel. "The Loves at their Toilette," after the ſame. "Ceres aſleep," after Fr. Boucher. "The Breakfaſt," after the ſame. "Cupid bird-catching," and "Cupid reaping," two prints after the ſame. "A Baſhaw cauſing his Miſtreſs to be painted," after Carlo Vanloo. "Charles I. taking leave of his Children," after Raoux. "Monument to the Memory of Bayle, Locke, and Sydenham," after Creti, Ferraivoli, and Mirandot, conſtituting one of the nine prints engraven in England by Lepicie, and other French engravers.

The beſt portraits by this artiſt are thoſe of Nicolas Bertin, painter to the king, painted by Lien, and engraven by Lepicie for his reception into the Academy in 1740. Louis de Boullongne, firſt painter to the king, after H. Rigaud. Philibert Orry, miniſter of finance, after the ſame. Pierre Graſſin, director general of the mint, after Largilliere. Claude Capperonnier, librarian to the king, after Aved. Antoine de la Roque, an old military officer, repoſing in a landſcape adorned with nymphs and fawns, after Watteau. Charlotte Deſmares, as Thalia, after C. C. (Charles Coypel). Catherine de Seine, in the character of Cleopatra, after Jac. And. Aved. Frances d'Aubigny, marchioneſs de Maintenon, after Mignard. Jean Baptiſte Moliere, after Charles Coypel.

Renée-Elizabeth Marlie, wife of Bernard Lepicie, was alſo diſtinguiſhed as a French engraver. Her beſt works are, "Youth feigning Decrepitude," engraven in 1751. "Benedicite;" and "The laborious Mother," after S. Chardin, two plates. "The Flemiſh Cook," after D. Teniers, engraven in 1748.

Marie Jean Dubos, the pupil of Charles Dupuis, was born in the year 1700. She ſucceſsfully imitated the ſtyle of her inſtructor, and engraved ſeveral plates in the courtly work, which is entitled "Verſailles Immortaliſé," and which appeared at Paris in the year 1720, in two quarto volumes. The following pair of folio prints are alſo from her hand: "A young Girl careſſing a Rabbit," after S. Baſſeporte; and "A Girl with her favourite Cat," after P. P. A. Robert.

Jean Hauſſart, or Hauſſard, was born at Paris in the beginning of the eighteenth century. The time of his death is not mentioned; neither is it known under what maſter he ſtudied, but he imitated, with much ſucceſs, the ſtyle of Benoit Audran. His drawing was correct, and the greateſt number of his prints executed with conſiderable taſte. The productions which do him moſt honour are thoſe which he engraved for the collection of Crozat, among which are the following:

"Jupiter and Semele," after a cartoon of Julia Romano. "The Creation of Eve," after the ſame painter. "Virtue," an allegorical ſubject, conſiſting of five figures, after Siciolante Sermoneta. "Jeſus expelling the Venders from the Temple," after Barth. Manfredi. "Topers aſſembled round a Table;" and "Moſes ſtriking the Rock," both after Fr. Romanelli. "Dives and Lazarus," after Dom Feti. "The Four Ages," deſigned by Hauſſard himſelf. "The Virgin holding the infant Jeſus ſtanding on her Knees,"

in a border of roſe-trees, with the inſcription "Roſa myſtica," de la Foſſe pinx. "The Metamorphoſis of Syrinx," after Jac. Courtin, all in folio.

Jean Charles Flipart, the elder, was born at Paris A.D. 1700, or thereabout, and died in the ſame city, but the time of his death has not been mentioned. His ſtyle is neat, but deficient in the more important requiſites. The two which immediately follow, and which he engraved after Raphael for the Crozat collection, are probably his beſt performances. "The Virgin and Child;" and Jeſus at Prayer on the Mount of Olives;" both ſmall upright folios.

He alſo engraved, but without any conſiderable ſucceſs, "A Magdalen," after Ch. Le Brun; and "Apollo purſuing Daphne," after René Houaſſe, in 4to.

Jean Jacques Flipart, (the ſon,) was born at Paris in 1723, and died in the ſame city in 1782. Never did any artiſt, according to Baſan, poſſeſs more modeſty and diſintereſtedneſs than the junior Flipart, and with theſe qualities were united a conſiderable portion of profeſſional talent. His earlier prints are executed in a comparatively open ſtyle, with few croſſings, but afterwards, adopting the opinion of Watelet, that the white intervals between the lines of an engraving were more or leſs unfavourable to the repoſe of a print, he changed his principle, and began to advance his plates by means of etching, croſſing his work frequently with ſecond and third courſes of lines, and filling up the interſtices which ſtill remained with dots, ſo that upon the varniſh, and before his plates were bit-in, they had a very finiſhed appearance. Had he corroded theſe etchings to a ſufficient depth, he would have ſpared himſelf much time and labour: inſtead of which he bit them in but lightly, and proceeded to finiſh by re-entering his etched lines with the graver. In this manner, however, he executed ſeveral excellent prints which combine good drawing with effective chiaro-ſcuro, and among which the following, which are moſtly of the folio dimenſions, are juſtly held in eſteem:

"A Holy Family," after Julia Romano. "Adam and Eve in the Preſence of the Eternal after their Fall," after Charles Natoine. "Venus preſenting Arms to Æneas," after the ſame. "The young Corinthian," after J. B. Vien. "The Virtuous Athenian," after the ſame, an upright. "The Paralytic Father, ſurrounded and attended by his Children," after the ſame. "The Village Bride," after J. B. Greuze, engraven in 1770. A beautiful compoſition, and finely executed. "The Cake at the Feaſt of Kings," after the ſame, engraven in 1777; a grand compoſition. "The Tempeſt, or a Shipwreck during the Day," after Vernet. "The Tempeſt, or a Shipwreck during the Night," after the ſame, engraven in 1771. Theſe two large prints are ably executed, and produce a grand effect. "Our Lord curing the Paralytics," after Dietrichy. "Bear-hunting," after Carlo Vanloo. "Tiger-hunting," after Boucher, being a companion print to the preceding. "The Combat of the Centaurs and the Lapithæ," after a painting of L. Boullogne, engraved for the reception of Flipart into the Academy.

His beſt portraits are thoſe of Jeanne du Ronceray, wife of Favart, drawn by Cochin, in quarto. Jean Baptiſte Greuze, drawn by himſelf, and engraven by his friend Flipart, in quarto.

Flipart has likewiſe engraven with much taſte ſeveral vignettes and ornaments for books. He had a younger bother, Charles François, who died in 1773, and who executed ſome ſmall prints after Fragonard. Joſeph Flipart, who is believed to have been of the ſame family, was engraving at Venice in 1740, for Wagner.

The only production of his with which we are acquainted is a concert with four Italian verſes, inſcribed Joſeph Flipart pinx. et ſc. Wagner exc.

Laurent Cars was born at Lyons in 1702, and died at Paris in 1771. He was the ſon and pupil of Jean François Cars, who had engraven a few portraits, &c. and when very young, accompanied his father to Paris. At firſt he applied himſelf to painting, but in a very ſhort time relinquiſhed this art, and ever afterwards dedicated his time to engraving, in which he made great progreſs.

Cars has been regarded by Watelet, and other excellent judges, as one of the beſt engravers of the eighteenth century. He executed his prints in a very different, though perhaps not in a preferable ſtyle to that of the preceding age; but though it might not have been equally ſuitable to the paintings, after which thoſe maſters engraved, yet it was naturally ſuggeſted to the mind of Cars by engraving after Le Moine. The pictures of the great maſters of Italy, particularly Le Seur, Le Brun, Mignard, &c. poſſeſſed a degree of harſhneſs which would have been but ill expreſſed by the faſcinating mellowneſs which Cars introduced even into his ſhadows. In the productions of J. Audran, picquancy predominates in the half tints, while in Cars', it is in the ſhadows. His chef d'œuvres are thoſe which he engraved after Le Moine, and eſpecially Hercules with the diſtaff.

The engravings of this very meritorious artiſt are numerous, and in general large. The following are thoſe more particularly worthy the notice of connoiſſeurs:

"The Adoration of the Shepherds," and "the Flight into Egypt," both after Carlo Vanloo. "The Tranſgreſſion of David," after J. F. de Troy. "The Chaſtity of Suſanna," after the ſame. "The Blind Man duped," after J. B. Greuze. "The Mother with Three Children," after the ſame, etched by L. Cars, and finiſhed with the graver by A. D. Jardinier. "Adam and Eve before their Tranſgreſſion," after Fr. le Moine. "Adam and Eve after their Tranſgreſſion," a companion print to the preceding, after Ch. Natoire. "The Bather," a nymph entering the water, after Le Moine, who was alſo the painter of the following eight ſubjects: "Time carrying away Truth." "Hercules ſpinning before Omphale," a diſtinguiſhed piece. "Perſeus delivering Andromeda." "Iphigenia about to be ſacrificed, is reſcued by Diana." "Hercules victorious over the Robber Cacus," painted by le Moine for his reception into the academy. "Cephalus carried away by Aurora." "Jupiter and Europa." "An allegory on the Fruitfulneſs of the Queen." "Louis XV. taken out of the Hands of Women, and placed under the Care of Men," after Fr. Boucher. "Monument in honour of the Duke of Marlborough," after the ſame. "The Fortune-teller." "A Venetian Feſtival," and "An eſcort of Equipages," all after Watteau.

The moſt diſtinguiſhed portraits from the graver of Cars are thoſe of Michael Anguier, ſculptor to the king, painted by Gab. Revel, and engraven by L. Cars, for his reception into the academy in 1733. Armand Gaſton, cardinal de Rohan, after H. Rigaud. Pierre d'Hozier, genealogiſt of France. Maria, princeſs of Poland, queen of France, after C. Vanloo. Louis viſcount d'Aubuſſon, duke de la Feuillade. Gaſpar de Real, Chevalier. François Boucher, firſt painter to the king. Jean Baptiſte Simeon Chardin, painter. Frances Marguerite Pouget, wife of Chardin. Pierre Perault, librarian. Sebaſtian Antoine Slodts. Paul Ambroiſe Slodts. Michael Angelo Slodts. Jacques Germain Soufflot, and Carlo Vanloo painter, all after the junior Cochin; Mademoiſelle Camargo, after Lancret, and Madame Clairon in a dramatic character.

Jean Daulle was born at Abbeville in the year 1703, and

and died in the city of Paris in 1763. He acquired the rudiments of his art in his native city from an obſcure engraver of the name of Robert Hecquet, and afterwards viſiting Paris for improvement; he there ſo far diſtinguiſhed himſelf, as to be admitted a member of the French academy in the year 1742. Strutt ſays he worked entirely with the graver, and his performances ſufficiently manifeſt the great command he had of that inſtrument. His ſtrokes are laid with much freedom, yet without any affectation. They are very clear, and produce a pleaſing harmonized effect. Had his knowledge in drawing been equal to his management of the mechanical part of his engravings, they would have ranked with the firſt performances the world ever produced; and from the French writers we learn that the fate of Daulle was that of too many of the engravers of our own country; he was obliged, in order to obtain a ſubſiſtence, to practiſe that kind of art for which he was leaſt qualified by nature, and neglect that in which he would probably have attained to higher excellence. Watelet praiſes highly his portrait of the counteſs of Feuquieres, who is repreſented holding the portrait of Mignard the painter; and his moſt eſteemed hiſtorical engravings, which are of the folio claſs, are thoſe which follow:

The celebrated recumbent Magdalen of Corregio, engraved for the Dreſden gallery. "Diogenes with his Lantern," after Eſpagnolet. "The Two Sons of Rubens," ſtanding figures, after that painter. "The Quos Ego, or Neptune allaying the Tempeſt," from Virgil, after Rubens, a large plate. "A Charity with Three Children," after Albano. "The Triumph of Venus," after Boucher. A pair of prints dedicated to Madame Pompadour of "The four Seaſons," after the ſame. "The Vengeance of Latona," after J. Jouvenet, engraven in 1762. "Jupiter and Semele," after P. de Mathieu. "The Myſtery of the Roſary," with the inſcription, "Meditez ces Myſteres," after Frere Jean Andre. "The Turk regarding Fiſhing," after Vernet, and from the ſame painter. "The Grecian leaving the Bath." "Occupations in Port," and "The Pilgrimage." "The Death of Abel," after Dietrich, engraven in 1761. "Villagers on the Banks of a River," a landſcape after the ſame. "Repoſe of Venus and the Graces at the Bath," after J. Raoux. "The Dutch Churner," after the ſame. "The Magic Lantern," after M. Pierre. "Love on Foot," after Ch. Coypel. "Jupiter under the Form of Diana, enamoured of Caliſto," after Pouſſin. "La Favart, in the Character of Baſtienne," after Carlo Vanloo.

The moſt eſteemed portraits by Daulle are thoſe of Catherine Mignard, counteſs de Feuquieres, holding the portrait of her father. P. Mignard pinx. J. Daulle, ſc. 1735. His firſt work of importance, Hyacinthe Rigaud ſeated at his eaſel, painting his own portrait, and that of his wife, engraven by Daulle for his reception at the academy, in 1742. Margaret de Valois, counteſs de Caylus, after Rigaud. Claude Deſhais Gendron, doctor of medicine, after the ſame. Charles Edward Stuart, eldeſt ſon of the Pretender, without his name, the head painted by an anonymous artiſt, and the drapery by Rigaud, engraven in 1744. Clementina, princeſs of Poland, (wife of the Pretender,) after David; this and the preceding are both rare prints. François Febure de Lembriere, biſhop of Soiſſons, engraven 1736. François Patot, abbé of St. Genevieve. F. D. Emanuel Pinto, grand maſter of Malta, engraven in 1744. Gerard Moerman, counſellor and ſyndic of Rotterdam, after Perronneau, engraven in 1753. Portrait of Gauſſecourt of Geneva, (which his friend Rouſſeau cauſed to be engraven at Paris,) painted by Nonnotte, engraven by Daulle 1754. Charles-Alexander de Lorraine, after Meytens. Jean Baptiſte Rouſſeau, after J. Aved. Pierre Louis Moreau de Maupertuis, an hiſtorical portrait, after R. Tourniere. Mademoiſelle Peliſier, an opera actreſs, as Flora, after H. Drouais. Buſt of Frederic-Guſtavus III. king of Poland, painted at Dreſden by Silveſtre, engraven by J. Daulle engraver to the king, and Jean Mariette, engraver, after Peſne, all in folio.

Jacques Philippe le Bas was born at Paris in the year 1708, and died there in 1782. He was the diſciple of N. Tardieu, and diſtinguiſhed himſelf at an early period of life by producing a great number of beautiful prints, conſiſting of landſcapes, and of landſcapes peopled with ſmall paſtoral or domeſtic figures, ſuch as thoſe of Wouvermans and Teniers, which depend, for the intereſt they excite, rather upon an animated and expreſſive touch, than upon the anatomical or academical proweſs diſplayed in their outlines.

Watelet endeavours to account for the early and extenſive reputation of Le Bas, than whom no engraver in Europe was better known, by ſuppoſing it to have been owing to the great number of prints to which he affixed his name, many of which he allows were of inferior merit and the work of his pupils. "Fully perſuaded," (he ſays,) "that a very ſmall number of real connoiſſeurs exiſted, Le Bas conceived, that he would be deemed the beſt artiſt who put his name to the greateſt number of plates; and the great reputation he acquired evinced that he had not been deceived. But his fame would have been more laſting, had he acknowledged only thoſe engravings which were begun by his beſt pupils, and which he himſelf terminated. Le Bas, however, merits a diſtinguiſhed rank among thoſe artiſts who have been deſervedly celebrated for their taſte. His finiſhing touch, and piquant, and ſpirited ſtyle, imparted animation and grace even to thoſe prints, which in other reſpects were but of inferior execution. He was the firſt, after Rembrandt, who made much uſe of the dry point, and his pupils have ſince brought the uſe of that valuable tool to ſtill greater perfection.

There is certainly much truth in theſe obſervations of Watelet; Le Bas was probably the moſt manufacturing engraver that had yet appeared in Europe, employing ſome of his pupils entirely upon the ſkies in his plates, others entirely upon trees, others upon etching figures, and ſo forth, and did more than any of his predeceſſors to bring down his art to the level of a trade; but it is alſo to be remarked that he had under his roof ſome pupils, or rather journeymen, of the very firſt taſte and talent, among whom were Aliamet, Ryland, Laurent, and others who are probably ſtill living.

Poor Laurent was an Engliſhman who died in Paris of a conſumption; almoſt the whole of whoſe works appeared under the name of Le Bas. He was a man whoſe chemical knowledge enabled him to improve the etching varniſhes in uſe at the time, and whoſe profeſſional taſte and feeling were of the moſt exquiſite kind. He etched the large boar hunt and hawking ſubject, after Wouvermans; the witch of Endor, after Salvator Roſa, ſome large and fine plates after Berghem, and ſeveral other of the very beſt plates that appear with the name of Le Bas.

Le Bas was a man of ſocial habits and manners, and good addreſs, yet his profeſſional induſtry was great, and the liſt of his works numerous, from which the following are ſelected.

A book containing eight quarto plates of military figures. A book containing eight quarto plates of faſhions; a pair in 4to. entitled "The Villagers," and The "Vintagers,"

a pair

a pair in 4to. entitled "Time ill employed," and "The Lover beloved," with ſome other ſubjects of trifling importance for his own deſigns.

From thoſe of other artiſts he has engraven the portraits of Robert le Lorrain, ſculptor to the king, painted by Drouais, engraven by Le Bas for his reception into the academy in 1741. Pierre-Jacques Cazes, painter to the king, painted by Aved, engraven by Le Bas for his reception into the academy in 1741. A ſet of four plates of the times of the day, after N. Berghem, very fine prints, at leaſt two of which were etched by Laurent. "The Return to the Farm," and "Embarkation of Stores," after the ſame maſter. "The Flanders Courier," a landſcape, after Andrew Both. "Ancient View of the Rhine at Coblentz," after Berghem and J. Both. "Ancient View of the Canal at Amſterdam," after the ſame artiſts. "Agreeable Solitude," after Boucher. "Firſt and Second Views of Beauvais," after the ſame. "Firſt and Second Views of Charenton," after the ſame. "Fiſhmonger of Chevelingue," after P. F. Bout. "Firſt and Second Views of the Environs of Lerida," after B. Breemberg. Two Swiſs views, "The Caſcade of Piſſevache," and "A Part of the City of Fribourg, with the Houſe of the Jeſuits," after the ſame. "Two Views in the Pays-Bas, the "Three Mills," and "The Road to Flanders," after Breughel. Two military views, "Diſtribution of Dry Forage," and "The Removal of a Camp," after J. Chantreau. Four prints after Chardin, "The Morning Toilette." "Study of Deſign." "Good Education," and "Economy." "The Dutch Menage," after Oſtade, engraven in 1771. "Dutch Amuſements," after the ſame. "Grecian Ruins," after Pannini. "Radera near Sans-Souci," after the ſame. "Departure for the Italian Hunt." "An Italian Dance." "Halt of French Troops." "Halt of Swiſs Guards," and "An Encounter of Cavalry," after Wouvermans.

The four following are after Poelenbourg; namely, "The ancient Baths at Vaucluſe;" "Ancient Aqueduct at Preneſte," and a pair of ruined edifices in Etruria. From Pynaker we find a "Landſcape with Cattle," from Ruyſdael, a "Dutch Mill," engraven in 1747, and a pair which are views of Schevelingen and Haerlem, (the latter engraven in 1753,) from Sal. Roſa. "The Augurs," and from Watteau, "The Gamut of Love;" "The Faſhionable Aſſembly;" and "The enchanted Iſland."

Le Bas' engravings after Teniers exceed an hundred, many of which are treated in a taſte peculiarly characteriſtic of that admired maſter. Judgment in finiſhing was the forte of this engraver, and the addreſs with which he rendered what others had done, ſubſervient to a final purpoſe, has not ceaſed to be the ſurpriſe of profeſſional men, who ſtill talk of the magic of Le Bas' finiſhing touch. We cannot of courſe enumerate all the prints that he has produced after Teniers, and believe the following will be found among the beſt:

"David Teniers and his Family." "The Works of Mercy," a large and very fine plate. "The Prodigal Son," a companion print to the preceding. "Flemiſh Rejoicings," a beautiful landſcape, in which Teniers has painted himſelf and family. Theſe four are of very ſuperior execution, and we may add to them his grand views of Flanders, and his beautiful village fetes.

His large works from Wouvermans are alſo of the firſt order, and the chief of them entitled as follow:

"The Pot of Milk;" "The Italian Chaſe;" "The Boar Hunt," engraven in 1741, beautifully etched by Laurent. "Halt of Cavalry;" "Halt of Officers," engraven in 1740, companion to the former. After N. N. Coypel he has engraven a pair, entitled "The Bath of Diana;" and "The Alliance of Bacchus and Venus." Another pair, "Hermitage, two leagues from Fribourg in Saxony;" and "The Environs of Fribourg;" are after Dietrichy. "The Fine Morning;" and "The Beautiful Afternoon;" two landſcapes after C. Dujardin. "Departure for the Chace," is after Ch. Van Falens, engraven in 1742, as are the following pair: "A Hunting Rendezvous;" and "The Fortunate Hunter." After Lancret he has engraven Grandval, a celebrated comedian, and "Gallant Converſation;" the latter for his reception at the Academy in 1743. A beautiful print, "Mademoiſelle Dangueville, as Thalia, ſurrounded by various comic Figures," after J. B. Pater. "The ancient Port of Meſſina," after A. Lorrain. "The Villager's Reward," a rich Italian landſcape, after the ſame. "An Italian Sea-port," after Joſeph Vernet, painted at Rome. From the ſame maſter are, "Setting out to fiſh;" and a ſeries of French ſea-ports, in ſixteen very large prints, begun in 1760, and finiſhed in 1776. Theſe plates were engraven conjointly by Cochin and le Bas, excepting the two laſt, the port of Dieppe, and that of Havre, which were finiſhed by M. Martini in 1780. Two Flemiſh prints, "The Reapers," and "The Reapers' Repaſt," after Michault. Two Flemiſh ſubjects on one plate, "The Pleaſures of Noblemen;" and "The Pleaſures of Peaſants." "The Preaching of St. John in the Deſart," after P. F. Mola. "View between the Hague and Rotterdam," after A. Vanderneer. "Winter Diverſion on the River Schie, near Delft," after the ſame. "Day-break," after Ad. Vandevelde, engraven in 1773; and "The Royal Hunt," after the ſame maſter.

Quintin Pierre Chedel was born at Chalons, in Champagne, in 1705, and died in that province in 1762. He had been a ſtudent in literature in his youth, but having repaired to Paris, inſtead of continuing his literary ſtudies he delivered himſelf up to his natural taſte for deſign and etching, in which he was ſingularly ſucceſsful. He was much employed by the bookſellers, but having injured his health by his great aſſiduity in his profeſſion, he returned to his native province, in order to ſpend the remainder of his days. His works were extremely numerous, a few of which we ſhall only mention. Portrait, in a medallion, of Claude de l'Iſle, hiſtoriographer to the king. Portrait, in a buſt, of Nicolas de la Brouſſe, count de Verteillac &c. The ſix days of the Creation, ſix ſmall prints in the form of vignettes. Fourteen ſubjects from the Old Teſtament, of the ſame form. Series of battles in the form of vignettes, fifty-nine prints. Six ſmall plates, marked "Obſervations Aſtronom." Six ſmall landſcapes numbered, on the firſt is inſcribed "Sejour paſtoral." Six plates of landſcapes, inſcribed to the marchioneſs of Pompadour. Military fetes, dedicated to count Turpin de Ceiſſe, &c. ſix prints. Six beautiful prints numbered, of military events. Two rural prints, *viz.* "The Village Wedding," and "The Country Feſtival." Two prints of ruined edifices, entitled "Ruines de Cumes." Two ruſtic ſubjects, the one repreſenting "A Repaſt," the other "A Dance by Peaſants." Two incendiary ſubjects, "The taking of Troy;" "The Burning of a City." Two landſcapes, "The Neſt," and "The Caſcade." Two prints entitled "Views of the Works of the Bridge of Orleans." Six prints of rock work, under the title, "New Whims." P. Q. Chedel ſculp. aqua forti. "T. Q. Flaminius giving Peace to Greece."

Various ſubjects after different maſters: Two marine prints, entitled "The Fiſhers," after Adam Willaers. Four military actions, entitled "Various Skirmiſhes of Cavalry,"

valry," after Vandermeulen. Four landſcapes adorned with ruins, grottoes, and huts, after Boucher. Four views drawn from nature, by Boucher. Two landſcapes, "View of the Bridge of Lavandieres, in the Æos Païen;" "View of the Devil's Tower, near Blois." Two landſcapes, "The Watering-place for Birds," and "The Dove-houſe," after the ſame. Two landſcapes, "The Fiſher," and "The Ruſtic Bridge," after the ſame. "The Anchorite," a grand landſcape after Boucher. "Hermits in a Deſert," after Pierre. "A Landſcape, in the middle a chateau, and in the fore-ground two cows and a cow-herd repoſing," after the ſame. "A Landſcape, in the middle a Church, and in the fore-ground ſome Cattle," after the ſame. "A marine Piece, in the middle are ſome ruſtic Houſes, on the fore-ground a Man watering his Horſe, and ſome Mariners in port," after the ſame. Two architectural ſubjects, with figures, after Bibiena. Four landſcapes, after Teniers; "Morning Labour;" "The Hour of Dinner;" "The Afternoon;" "The good Night." "The Dawning of Aurora," a beautiful landſcape after Teniers. "General Quarters, adorned with a number of Figures," after Robert Van Hoek. "Sale of Fiſh at Schevelinghe," after Jean Breughel.

Jean Jacques Balechou was born at Arles in the year 1715, and died at Avignon in 1764. "This extraordinary artiſt worked entirely with the graver, and was perfectly maſter of that inſtrument. The clearneſs of his ſtrokes, and the depth of colour which he produced, are far beyond any productions prior to his own. But he did not draw well:" (thus ſays Strutt,) "and on this account" (and on account alſo, we may add, of his not practiſing the art of etching,) "his prints want that freedom, harmony, and correctneſs," which is eſſential to the perfection of engraving. With all his beautiful clearneſs of manual execution, his fleſh appears metallic, his rocks rather reſemble ice, and the foam of his agitated ſea ſome thick and "lazy-pacing" liquid. His moſt juſtly celebrated work is a large ſtorm and ſhipwreck after Vernet, to which theſe remarks are chiefly applicable: but then here is a tempeſt-torn ſky where the dark clouds are admirably engraved, and here is water in its liquid ſtate, expreſſed with ſo much of the truth of nature, that while it left the predeceſſors of Balechou at an immenſe diſtance, has been the ſchool of Woollett, Byrne, and all thoſe who have ſubſequently attempted to diſtinguiſh themſelves in expreſſing the genuine character and appearance of the ſea when agitated by a tempeſt.

Watelet criticiſes our engraver ſomewhat ſeverely for the ſurreptitious brilliancy of execution which he has been too ſolicitous to diſplay, and which in his "Calm," after Vernet, and "St. Genevieve," after Carlo Vanloo, are certainly miſapplied. Good impreſſions of his engravings are, however, highly valued by collectors.

The moſt numerous part of the engravings of Balechou are his portraits: his hiſtorical works, which are of the folio claſs, are but few in number, and are principally as follow:

"Birth," and "Infancy," a pair, after Dandre Bardon. Three plates, of which the titles are unknown to us, after Etienne Jeaurat, "St. Genevieve," after Carlo Vanloo, a large upright. "The Tempeſt," after Joſeph Vernet. "The Calm," after the ſame. Theſe are all in folio, and the two laſt very large.

His beſt portraits are thoſe of Anne Charlotte Gauchier, wife of the painter. A lady ſpinning. Jacques Gabriel Grillet, after Antreau. Charles Henri Friſo, prince of Orange. Dom Philippe, infant of Spain, after Vialy. Charles Porree, a Jeſuit, after Neibſon. Jean Juillienne, a celebrated amateur, holding the portrait of Watteau, after de Troy. The wife of the preceding, from the ſame. Charles Rollin, rector of the univerſity, after Coypel. Charles Coypel, at the age of forty-eight. Henri, count de Bruhl, firſt miniſter of the king of Poland, after Sylveſtre. This is a beautiful portrait, but the plate happening to be injured, has been re-touched. Auguſtus III. king of Poland, after Hyacinthe Rigaud, a whole-length figure accompanied by a little negro. This a chef-d'œuvre of engraving for boldneſs of execution; but the plate having received ſeveral ſubſequent alterations, the beſt proofs are become extremely ſcarce.

Jaques Aliamet was born at Abbeville A. D. 1727, and died at Paris in 1788. He firſt brought himſelf into notice by engraving ſmall ornamental prints for books, uſually termed vignettes; and his reputation was afterwards increaſed by the beautiful prints which he executed after Vernet. He alſo brought to perfection the method of working with the dry point, which he learned from his maſter Le Bas, and harmoniouſly united it with etching and the work of the graver. His ſtyle is peculiarly ſoft, and his touches juſt and expreſſive. He was an enemy to the ſhadows of prints being carried to blackneſs, and compared ſuch prints to thoſe actors, who, overſtepping the modeſty of nature, make the theatre reſound with their abſurd clamour and geſticulations, in order to gain the applauſe of the multitude.

The greater number of the prints of Aliamet conſiſt of landſcapes and ſea-pieces, with ſome few of a different kind.

The liſt of his beſt works follow: being all of the folio claſs.

A landſcape with various figures of men and animals. A pair, very capital and large, of "The Ancient Port of Genoa," and "Purchaſe of a Slave." "Grand Stag Hunt," a beautiful landſcape. "The Brick Kiln," "The Meeting of the Villagers." "The Rural Watering Place." "Village Pleaſures," all after Berghem.

After Wouvermans he engraved "The Spaniſh Halt," and the "Advanced Guard of Hulans." "Riſing of the Moon," after A. Vanderneer. The companion to this print is the moon overclouded, engraven by Zing. "View of Boom on the Rupel," after the ſame. "Two Views of Pont de l'Arche," after Ph. Hackert. A pair of Views of the "Engliſh Garden of Villette," after Jean Hackert, "Winter Amuſements," after Ad. Van de Velde. After Vernet he engraved ſeveral; the names of the chief are, "Stormy Weather." "Foggy Weather." "Italian Labourers." "Conflagration of a Port during the Night." Two views of the Levant. Two views of Marſeilles. A pair of ſea pieces, "Fiſhing with the Line," and "The Return from Fiſhing." And a ſet of the four parts of the day: "Morning," "Mid-day," "Evening," "Night." "The Birth of Venus," after Et. Jeurat. "The Place Maubert," after the ſame. "The Place des Halles," after the ſame. Two of the ſixteen great Chineſe battles were engraven by Aliamet, under the direction of Cochin.

Of the time and place of the birth of Jean George Wille, the preſent writer is not preciſely informed. He was a native of Germany, and eſtabliſhed himſelf at Paris as an engraver of the higheſt repute, about the middle of the laſt century, where, notwithſtanding the juſtly acquired fame of Mellan, Maſſon, Spierre, Nanteuil, Drevet and other ornaments of the French ſchool, he ſhewed that it was poſſible to tranſcend them all with reſpect to beauty and preciſion of manual execution. Strutt ſays of him, that "he excelled

excelled in works which required great execution with the graver; and no one ever ſurpaſſed him in the clearneſs and beauty of the ſtrokes which he laid with that inſtrument. His ſtyle was particularly adapted to expreſs ſilks, ſattins, and all kinds of ſhining draperies; a proof of which is evident in the print repreſenting the death of Cleopatra; the figure of Cleopatra is habited in white ſattin, which the engraver has ſo ſucceſsfully imitated, that the pencil of the moſt able painter could not exceed it."

Not only ſhining draperies, however, but rough and rich objects alſo, ſuch as the carpets, tiſſues, and dead game of Gerard Douw, and the woollen draperies, and leather of Dietrichy, were equally within the ſcope of his powers. His manual powers were indeed ſurpriſing. The graver was a ſimple and very ancient inſtrument. Centuries had looked on, while thouſands of artiſts had tried their ſkill with it, yet it remained for the accurate eye, and firm, delicate, and ſteady hand of Wille, to render it ſubſervient to the expreſſion of the textures of all the various ſubſtances that nature has produced, or art has interwoven.

From this general deſcription of the perfections of the art of Wille, however, ſome abatement ſhould be made; at leaſt certain exceptions; the concomitant errors of human nature ſhould be pointed out to thoſe who might elſe be in danger of having their taſte led away by indiſcriminate admiration. The mathematical preciſion of Wille was far better adapted to expreſs the poliſh and regularity of art, than the wild and rugged ſurfaces in which nature more frequently delights; and even his fleſh, which it muſt neceſſarily be of cardinal importance to expreſs well in every hiſtorical work, when compared with that which is ſo admirably characterized in the beſt works of Bartolozzi and Strange, will appear deficient in that ſoft firmneſs, and delicacy of texture, which diſtinguiſhes it from all other ſurfaces whatever.

Wille was a member of the French Academy, and engraver to the king, honours which he richly deſerved; he taught ſeveral pupils, of whom the preſent writer was informed by one, (the late Mr. Byrne, who ſtudied under him for a while,) that he uſed, for moſt purpoſes, very ſquare gravers, which is contrary to the opinion that is generally entertained. He died lately at Paris, having ſurvived the troubles of the French revolution, at a very advanced age.

To know his own talent, and to be ſurrounded by ſuch circumſtances of patronage and opportunity as enables him to uſe it moſt effectually for the public advantage, does not often fall to the lot of an engraver. Wille enjoyed theſe benefits, and employed the greater part of his time in diffuſing through Europe, along with his own, the fame of Gerard Douw, Dietrichy, Terbourg, Netſcher, Metzu, and ſuch other maſters as are celebrated for the beauty of their execution, and the charms of their chiaro-ſcuro.

Among his beſt performances may be reckoned "The Death of Cleopatra," after G. Netſcher. A pair of uprights after Gerard Douw, entitled "La Menagerie Hollandoiſe," and "La Liſeuſe." "The Good Friends," after Ad. Oſtade. "Paternal Inſtruction," and "The Dutch Gazette," from Terbourg. "La Cuiſiniere Hollandoiſe," after Metzu, and "La Tricoteuſe Hollandoiſe," after Fr. Mieris. "The Inattentive Obſerver" is from the ſame maſter. "The family Concert," and "The Little Muſician," are both after Schalken, and the above are all of the folio claſs. Of a larger folio ſize, are "Sarah introducing Hagar to Abraham," after Dietrichy. And from the ſame painter, "The Strolling Muſicians," and "The Reciprocal Offer," a pair, the former of which is the moſt celebrated; it is dedicated to Frederic Auguſtus, elector of Saxony, and the firſt impreſſions are known from thoſe ſubſequently taken, by the word "Electorale" being omitted in the dedication.

"Maternal Care," "Maternal Delight," and "The School Miſtreſs," are from the pictures of the junior Wille; and "The Little Scholar," companion to the latter, from J. E. Schenau. Theſe alſo are in folio.

From the younger Wille, he has alſo engraven a large plate, entitled "Le Maréchal des Logis," which repreſents the courage of Louis Gillet in reſcuing a young girl from the power of two robbers; and one of his celebrated, though by no means the beſt of his hiſtorical engravings, is "The Death of Mark Antony," after Pompeo Battoni.

Wille's portrait was engraven after a picture by his ſon, by his pupil P. C. Ingouf, and in his own ſtyle. The portraits from his own graver are numerous, and among the beſt are reckoned thoſe of Madeleine de Scuderie, and Nicholas de Catinat, marſhal of France, both eſteemed chef-d'œuvres of the maſter, and after Eliz. Cheron, in 8vo. Henry Benviſt, a rare print in quarto. Franciſcus Chicogneau, regi a ſanctioribus Conſiliis archiatrorum Comes, after Le Sueur. Bernard Belidor, after Vizé, engraven in 1754. Proſper Cardinalis Columna de Sciarra, after P. Battoni. All in quarto.

The following are all of the folio claſs: C. E. Briſeux, architect, from the life. Marguerite Eliz. de Largilliere, from a picture by her father. Eliz. de Gouy, daughter of H. Rigaud, from a picture by her father. Joſeph Parrocel. Jean de Boullogne, comptroller-general of finance. Charles Louis Auguſtus Fouquet de Belleiſle, and Maurice of Saxony, marſhal of France, all after Joſ. Parrocel. Woldemar de Loevendal, marſhal of France, after de la Tour. J. B. Le Moine, after J. G. Heilmann. Frederic II. king of Pruſſia, after Peſne, a celebrated print. Hieronymus von Erlach, after Ruſca. Franciſcus Queſnay, after J. Chevalier. Jean Battiſte Maſſé, after Tocque. Louis Philippeaux, comte de St. Florentine, ſecretary of ſtate, &c. &c. is eſteemed one of his beſt portraits, and Abel François Poiſſon, marquis de Marigny, after Tocque, was engraved for his reception into the French Academy.

We have now brought down our account of the French School of Engraving to a period, beyond which, if we were to proceed, we muſt ſpeak of the merits and demerits of living artiſts. The critics and literati of France have with reaſon regretted the decline of French engraving, ſince the era when all Europe was gazing at the conſtellation of art which ſhed luſtre over the reign of their fourteenth Louis. A few bright but ſcattered rays in Wille and his diſciples have gleamed over the metropolis, but a diſtinguiſhed member of the National Inſtitute has within theſe few years acknowledged and lamented that England had borne away the palm of engraving; that the era of French glory in this art was no more; that the indifference of the ancient government towards the art, the want of encouragement and patrioiſm, without which the grandeſt conceptions are unavailable; the abſence of emulation, the neceſſity of gaining a livelihood, which renders the ingenious artiſt a ſlave to the caprices or cupidity of the dealer; luxury itſelf which corrupts taſte, and the falſe ſplendour which leaves ſimplicity and beauty in the ſhade, have all concurred, he ſays, to reduce the art of engraving to its preſent woeful ſtate. Along with this plaint, a plan for renovating the art was ſubmitted to the Directory by Monſ. Guyton, which we believe has never been attempted to be put in execution. Other and more efficient plans will doubtleſs ſucceed the preſent war,

if they be not organizing even now, of which let England liberally beware; for among the men of talent whom the revolution has ſpared, Berthaud, Bervic, Denon, and perhaps others of whom future Cyclopedias ſhall ſpeak, remain to their country.

FRENCH *Silk*. See SILK.

FRENCH *Town*, in *Geography*, a town of America, in Cecil county, Maryland, on the E. ſide of Elk river; 1 mile S. of Elkron, from which it is ſeparated by Elk creek. Elk ferry is 6 miles below this.

FRENCH *Verſions of the Bible*. See BIBLE.

FRENCH *Weights*. See WEIGHTS.

FRENCHMAN. See FRANCIGENA and ENGLECERY.

FRENCHMAN'*s Bay*, in *Geography*, a bay of America, which lies on the ſea-coaſt of Lincoln county, in the ſtate of Maine, and is formed by Mount Deſert iſland on the weſt, and the principal of Goldſborough townſhip in the eaſt. It has an inland communication round Deſert bay with Blue-hill bay.—Alſo, a bay on the S. coaſt of the iſland of Jamaica between Great Pedro bay and Starvegut bay.

FRENCHMAN'*s Creek*, a creek of Upper Canada, in the county of Lincoln, which diſcharges itſelf into the river Niagara, in the townſhip of Bertie, a few miles below Fort Erie.

FRENCHMAN'*s Key*, a ſmall iſland on the Spaniſh Main. N. lat. 12° 16'. W. long. 82° 51'.

FRENEASE, LAKE, a large collection of water, through which St. John's river in New Brunſwick paſſes.

FRENICLE DE BESSY, BERNARD, in *Biography*, a mathematician, the intimate friend of Des Cartes, Fermat, and other learned men his contemporaries, flouriſhed in Paris in the 17th century. He was an expert mathematician, and was choſen member of the French academy of ſciences in 1666. The memoirs of that learned body he furniſhed with a number of ſcientific pieces. Among theſe is one entitled "A method of reſolving problems by excluſions:" and alſo "A treatiſe of right-angled triangles in numbers:" "A ſhort treatiſe on combinations:" "Tables of magic ſquares." In the well known work, entitled "Commercium Epiſtolicum de Quæſtionibus quibuſdam Mathematicis," printed at Oxford in 1658, the reader will find ſome of Frenicle's letters. He died in 1695. Moreri.

FRENTANA REGIO, in *Ancient Geography*, Hither Abruzzo, a country of Italy, bounded by the Tiſconus on one ſide, and by the Aternus on the other.

FRENTANI, a people of Italy, N.E. of Samnium, along the Adriatic gulf; their principal towns were Auximum and Larinum.

FRENUM, or FRÆNUM. See FRÆNUM.

FRENZANO, in *Geography*, a town of Italy, in the department of the Mela; 8 miles W.S.W. of Breſcia.

FRENZY, and FRENETIC. See PHRENZY, and PHRENETIC.

FRERE, CAPE, in *Geography*, a cape on the E. coaſt of the iſland of Martinico.

FREREN, or VREREN, a town of Germany, in the county of Lingen; 6 miles S. E. of Lingen.

FRERET, NICHOLAS, in *Biography*, was born at Paris in 1668; he was educated for the profeſſion of the law, and in compliance with the wiſhes of his friends, he entered upon the duties of an advocate, but without intending to devote his talents to the buſineſs. His favourite ſtudies were hiſtory and chronology, which he purſued with ſo much ardour and ſucceſs, that he obtained admiſſion into the Academy of Inſcriptions at the early age of twenty-five, and immediately ſignalized himſelf by a "Diſcourſe on the origin of the French." This diſcourſe was too bold for the times in which he lived, and in conjunction with ſome imprudent language on the miſunderſtanding between the princes of the blood and the regent, cauſed him to be impriſoned in the Baſtile. During his confinement he was a conſtant reader of Bayle, imbibed all his ſceptical principles, and almoſt committed his works to memory. After his liberation he publiſhed ſeveral pieces, which exhibited profound learning, and much curious diſcuſſion. He wrote with perſpicuity and order; his "Letters from Thraſybulus to Leucippus," and the "Examination of the Apologiſts of Chriſtianity," are deeply tinged with ſceptical tenets. Many of his pieces were of a lighter deſcription, as the preface, notes, and part of a tranſlation of the Spaniſh Romance entitled "Tirante the White." He died in 1749.

FRERON, ELIE CATHERINE, was born at Quimper in 1719. He entered very young among the Jeſuits, with whom his literary taſte was formed, but in 1739 he quitted them, and became a coadjutor of the abbé Fontaines in his periodical publications. (See FONTAINES.) He then publiſhed a ſmall critical journal of his own under the title of "Lettres de Mad. la Compteſſe," 1746, in which he treated with freedom the literary reputation of ſome contemporary authors who had ſufficient influence to procure the ſuppreſſion of his work. It re-appeared in a few years under a different title, *viz.* "Lettres ſur quelques Ecrits de ce Tems," and was well received and liberally ſupported. Thirteen volumes being publiſhed, it was dropped, and a new one began, entitled "L'Année Litteraire," which he continued till his death. Freron had the misfortune of uniting againſt him ſome of the principal writers of the day, among whom was Voltaire. Freron had long carried on a warfare againſt this popular author without provoking his diſpleaſure. A ſevere criticiſm upon his comedy of "La Femme qui a Raiſon," excited the wrath of the dramatiſt, and never after this did he omit an opportunity of throwing odium and contempt on Freron and his works. He was willing however to do homage to his talents and to his taſte as a writer. He died in 1776. Beſides his periodical works he publiſhed "Opuſcules," in three volumes 12mo. conſiſting of pieces in proſe and verſe. He wrote likewiſe, "Les vraies Plaiſirs, ou les Amours de Venus et Adonis," tranſlated from the Italian. He began a tranſlation of Lucretius. Freron was pleaſant and eaſy in his manners, fond of ſociety, and given to diſſipation.

FRESCA, CAPE DEL, in *Geography*, a cape on the W. coaſt of Solfara. N. lat. 39° 45'. E. long. 8° 28'.

FRESCATI. See FRASCATI.

FRESCO PAINTING is a peculiar mode of practice in that art, and is performed by employing colours mixed and ground with water upon a ſtucco, or plaſter, ſufficiently freſh and wet to imbibe and embody the colours with itſelf. The term freſco, as applied to painting, is ſaid to have been adopted becauſe the practice of it is uſed in the open air; "Andare al Freſco," ſignifying "to take the air," or "walk abroad in the air:" but it ſeems more probable that another meaning of the word freſco has given riſe to this particular adoption of it, *viz.* new or freſh, relative to the ſtate of the plaſter in which it is wrought. Vitruvius (l. vii. cap. 4.) calls it "Udo tectorio." It is very ancient, having been practiſed in the earlieſt ages of Greece and Rome.

The theory of the art of painting extends its principles to all modes of execution, becauſe theoretic rules are drawn from nature, which is the object of all imitation, and are independent of the means employed in producing the intended

intended effect. We ſhall therefore only treat in this place of the mode of execution, and materials adopted in freſco paintings.

Previouſly to their being executed in any place, a careful examination ſhould be made of its fitneſs to receive them. It is neceſſary that the artiſt ſhould be aſſured of the perfect conſtruction of the walls, or cielings, on which he intends to employ his genius, and intruſt his reputation; above all, he muſt be careful to make it ſecure from damp.

Satisfied with the conſtruction of the wall, it is then neceſſary the artiſt ſhould ſee to the proper management of the firſt layer of plaſter with which it is covered. The materials employed for building in different countries will vary according to the nature of thoſe moſt eaſy to be obtained: of courſe, it will be neceſſary to adopt means for rendering thoſe not perfectly proper in themſelves to receive freſco painting, more ſo by artificial means. The one beſt calculated to hold the plaſter perfectly is brick; both on account of its abſorbing quality, and from the ſmallneſs of the ſize of the bricks cauſing a number of interſtices between them; which irregularity in the ſurface greatly aſſiſts in retaining it in adherence. A wall built of rough ſtones full of holes may alſo be relied upon as a good foundation for freſco; but if, inſtead of that, it be conſtructed of ſmooth or poliſhed ſtones, it will then be neceſſary to render it uneven by making holes in it, faſtening nails, and ſmall wedges of wood which will hold the plaſter together, and prevent its falling off. Theſe precautions are of the utmoſt conſequence to prevent the danger of its bending or cracking, which the leaſt alteration that happens to the materials, or even the change of weather, producing alternately wet or dry, may occaſion.

The firſt layer of plaſter may be compoſed of well-waſhed chalk made into a cement with pounded brick, or river ſand; which laſt is better, being rather the coarſeſt, and producing thereby a roughneſs of ſurface which will better retain the ſecond coat.

Perhaps the tarras now in uſe, which is compoſed of pounded ſea ſand and chalk or lime, would be better ſtill. The ancients had certainly a better compoſt for this purpoſe than is at preſent known; witneſs that which ſtill covers various of their buildings; particularly the aqueduct they conſtructed near Naples, and the walls of the ruins of Herculaneum.

Before the ſecond layer is given, it is proper to wait till the firſt be perfectly dry, on account of a diſagreeable and noxious vapour which iſſues from the lime in drying; but where it is ſo, and you proceed to give it the ſecond coating upon which the painting is done, it muſt be wetted with water, that the two may more completely incorporate. This layer, which requires to be more carefully prepared than the firſt, is made by mixing river ſand of an even and fine grain with chalk, which has been burnt a twelvemonth before, and expoſed to the air, as by that means the artiſt may be more ſure of its general decompoſition and freedom from ſtony parts.

It requires conſiderable ſkill in the perſon who prepares this ground to lay it perfectly even, and be careful in judging the quantity proper to be laid on at once, which ought not to be more than the painter can cover and completely finiſh in a day; and it requires great ſkill and activity to ſpread, to clean it from lumps, and to poliſh it evenly, ſo as to receive the painting with the promptitude requiſite to leave the artiſt as much time as poſſible, or as he may have occaſion for. The painter however ſhould himſelf ſuperintend this part of the proceſs, for he alone can judge properly as to the rapidity with which he can labour, or the advantages he may make of accidental occurrences.

The operation of laying on the ground is performed with a trowel; and in doing it, care muſt be taken to clean it properly, that the ſurface may be even, particularly in thoſe parts moſt expoſed to view. The concluſion of the maſon's labour is poliſhing to receive the painting. This is done by applying a piece of paper on the ſurface, and paſſing the trowel over it; it is very neceſſary that this ſhould be well done, for ſmall inequalities in the ſurface might, in certain views, produce great irregularities in the drawing of the work.

When the ſecond ground is thus prepared, cleaned, and poliſhed, in the quantity, and on the part of the wall which the artiſt requires, he begins to trace his deſign upon it, and proceeds to the colouring of it; completely covering the quantity prepared, and finiſhing ſo much of the picture in the courſe of the day, in ſuch a manner that he may not have occaſion to re-touch it when the ground is dry. This peculiarity is the characteriſtic diſtinction of painting in freſco, which, by this mode of operation, is incorporated with the mortar, and drying along with it, becomes extremely durable, and brightens in its tones and colour as it dries.

From the neceſſity there is in the progreſs of this ſtyle of art, that it ſhould be executed with rapidity, and from the impoſſibility of retouching it without injuring the purity of the work; the artiſt, unleſs he be endowed with very extraordinary powers of imagination and execution indeed, is obliged to prepare a finiſhed ſketch of the ſubject, wrought to its proper hue and tone of colour, and ſo well digeſted, that there may be no neceſſity for making any eſſential alterations in the deſign. This, which is a very uſeful mode of proceeding in all hiſtoric works of painting, is abſolutely indiſpenſible in freſco, to thoſe who are not determined to give the rein to their ideas, and leave as perfect whatever may firſt preſent itſelf. There is no beginning in this, by drawing in the whole of the parts at one time, and correcting them at leiſure, as is the cuſtom with oil painters, who may therefore proceed to work without a ſketch; here all that is begun in the morning muſt be completed by the evening; and that almoſt without ceſſation of labour, while the plaſter is wet; and not only completed in form, but alſo, a difficult, nay almoſt impoſſible taſk, without a well prepared ſketch, muſt be performed, *viz.* the part done in this ſhort time muſt have ſo perfect an accordance with what follows, or has preceded of the work, that when the whole is finiſhed, it may appear as if it had been executed at once, or in the uſual mode, with ſufficient time to harmonize the various forms and tones of colour. Inſtead of proceeding by ſlow degrees to illuminate the objects, and increaſe the vividneſs of the colours, in a manner ſomewhat ſimilar to the progreſs of nature in the riſing day, till at laſt it ſhines with all its intended effect, which is the courſe of painting in oil; the artiſt working in freſco muſt at once ruſh into broad daylight, at once give all the force in light and ſhade and colour, which the nature of his ſubject requires, and this without the aſſiſtance (at leaſt in the commencement) of contraſt to regulate his eye; ſo that here, as has been ſaid, a well digeſted and finiſhed ſketch ſeems indiſpenſibly requiſite.

The ſketch being completed, the next proceſs is to prepare a cartoon or drawing of the deſign on paper paſted together to the ſize of the intended freſco. This cartoon ſhould be perfected in the out-line to ſave time, and the artiſt has then nothing to do but to trace the line of the figures or other objects which the deſign may be compoſed of, on to the plaſter, by either pricking with a pin through the paper, or by paſſing a hard point over the lines of the

cartoon. By this means he ſaves himſelf the trouble of drawing the figures, and alſo the time which would be required for doing it, and proceeds at once to the painting, to facilitate the execution and enſure the ſucceſs of which ſeveral precautions are requiſite.

The colours being ground fine in water, and the teints moſt likely to be employed largely compoſed, they ſhould be arranged in pots or baſons, and ſeveral pallettes with raiſed edges ſhould be ready at hand to work from, and aſſiſt in compounding the varieties of hues neceſſary for producing brilliancy and harmony. A few pieces of tile or brick, or of any abſorbent ſtone, ſhould alſo be provided to prove the teints upon, becauſe all colours ground in water become much lighter when dry, than they appear when wet. To be certain therefore of their hue, before he begins to uſe them on the picture, and to avoid the trouble and neceſſity of much changing or labouring them, (as the painters term the blending of colours,) the artiſt ſhould apply ſome of each teint with his bruſh to the dry brick, &c. which, abſorbing the water, the colours immediately appear very nearly of the ſame hue they will be of when the freſco is dry. Hence he may proceed with great ſecurity in his work, and is ſure to have it much more freſh and vigorous in effect, than it would be if much labour had been employed to obtain the tone on the wall.

It will be requiſite alſo to have at hand a vaſe or baſon of water, or a wet ſponge, and to take care not to begin to paint till the layer of mortar is hard enough to reſiſt the impreſſion of the finger: otherwiſe the colours would ſpread upon it, and prevent all poſſibility of neatneſs or clearneſs in the execution, which ſhould be effected with great rapidity and lightneſs of hand.

With reſpect to the colours employed *in freſco*, they are fewer in number than thoſe which may be uſed in oil painting, on account of the combined action of the lime, and the air upon the component parts of many of the latter. Thoſe moſt generally in uſe are the following, *viz.*

Lime White.—This, when made of well waſhed burnt chalk or lime, is the beſt and moſt ſimple white that can be uſed; it mixes freely with all the other colours, and works in itſelf with a full body. The preparation of it requires, that the chalk ſhould be ſlacked a twelvemonth before it is uſed, or at leaſt ſix months. It ſhould then be diſſolved in common water and poured carefully off, (after letting it fall ſome ſhort time,) into a veſſel to ſettle.

Another white is made by mixing one third of white marble powder with two thirds of chalk; but it muſt be uſed with caution, as it is apt to change. If the proportion of marble duſt be too ſtrong for the chalk, it will become black. The artiſt would therefore do well to confine himſelf to chalk white, provided it has been well prepared and kept a long time. As this however has frequently been uſed, we deemed it proper to be mentioned that artiſts may, if they chooſe, make experiments upon its nature, and endeavour, if they find any peculiarly valuable quality in it, to inſure its continuance in clearneſs and perfection.

Egg-ſhell White.—There is alſo a third white made of egg-ſhells, which, though it has not the full texture of the chalk, is yet very clear and good for uſe in freſco. It is made by boiling egg-ſhells in water with a little quick lime. They are then put into a pot and waſhed with pure water, then pounded fine, waſhed again till no teint is given to the water, and then ground by the muller and ſtone to the degree fit for uſe; it is afterwards formed into little cakes which are dried in the ſun. Care muſt be taken not to let the powder of the ſhells remain too long in the ſame water, as it will exhale a fœtid vapour almoſt inſupportable, which cannot be diſſipated but by roaſting it in a cloſe veſſel well luted.

Red—produced by burnt vitriol, in colour approaching to Indian red, and ground in ſpirits of wine, acts well with the lime, reſiſts the action of the air, and mixes cleanly with the other colours. This forms an excellent preparation to receive the bright red of cinnabar or vermilion, when the whole wall is covered.

Colours of earthy textures, ſuch as the ochres, when burnt or not burnt, umber, both raw and burnt, Spaniſh red, verd de Verona, Venice black, and blue black, made by bruiſing vine ſtalks, or ſhells of peach-nuts, are all excellent for the purpoſes of freſco painting.

Of Blues,—the beſt is the ultramarine, as it never ſuffers any change. Smalt or enamel blue is good as to preſerving its tone, and, if uſed early in the work, will adhere; but if the ground ſhould become too dry before it is uſed, it is apt not to incorporate ſtrongly with it, but to come off on the leaſt friction.

White lead, lake, verdigreaſe, maſticott, Naples yellow, the orpiments and bone black, are all unfit for this purpoſe, being liable to change.

This kind of painting, when carefully executed, is of all others the moſt durable, and therefore the moſt proper to be employed in adorning public buildings. The uſe of it for this purpoſe appears to be very ancient. Norden ſpeaks of paintings in Egyptian palaces 80 feet high, which Winkelman quoting, concludes they were in freſco, from the deſcription given of the prepared grounds, and of the manner in which the colours appear to have been uſed. And all the paintings found at Herculaneum, at Portici, and at Rome, of ancient date, are of the ſame materials. No other kind of painting would ſo effectually have reſiſted the action of the air for ſo great a length of time, and more particularly the exceſſive aridity thoſe of Herculaneum muſt have endured, being ſhut up entirely from the light, and amidſt glowing embers from Veſuvius, which of courſe muſt at firſt have cauſed an intenſe heat around them. That however, in one point of view, was favourable to the preſervation of thoſe that eſcaped its immediate action; for damp is the moſt powerful deſtroyer of them, againſt which no caution taken can make them too ſecure. In this caſe of Herculaneum, it muſt have been effectually excluded, firſt by the heat of the aſhes, and afterwards as the ſtratum of thoſe aſhes was ſo thick, water from above could not penetrate ſo low as to the pictures, particularly after the upper part was covered with the cloſe cake formed by the decompoſed parts on and near the ſurface.

In ordinary ſituations, the choice of materials is the moſt important part; that the durability of the work may be ſecured, particularly the preparation of the ground, and of the wall, to cauſe it to adhere.

Freſco painting is, or rather has been, chiefly employed in palaces, temples, and other public edifices. For large and important places no other kind of painting is ſo good. As the artiſt is obliged, from its nature, to proceed with rapidity in its production, it has neceſſarily more ſpirit and vigour in the execution, than paintings in oil, which may be repeated, and re-touched, as often as the artiſt fancies he can improve, or heighten, their effect. In freſco there is not time to meddle and diſturb the freſhneſs of the colour, or the fullneſs and freedom of the touch. But there can be no minute detail of forms, or extenſive variety, in the gradation of teints; the beauties of neatneſs, and delicacy of finiſhing, make no part of the excellencies of this branch of the art; it will not bear the cloſe examination which well finiſhed pictures in oil do; there is ſomething dry and rough

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in its appearance, unpleaſing to the common obſerver, on too cloſe an inſpection. It lacks the full rich ſweetneſs of hue and texture which oil paintings poſſeſs; and though it has more freſhneſs, and retains it; yet from the confined number of colours which can be employed in it, it is not equal to oil in the perfection of the imitation of nature.

Whoever ſeeks to be pleaſed with freſco painting, muſt learn juſtly to eſtimate the beſt, and not the moſt agreeable qualities of the art. Character, contour, expreſſion, are within its powers; and are the points which the great artiſts who practiſe it, knowing its limits, will endeavour moſt to exhibit in their productions. Harmony of colouring, chiaroſcuro, and the minute graces of execution, have never yet been rendered in it; or but very partially in compariſon with works in oil.

In the early part of the reſtoration of painting, a ſpecies of freſco was the only mode of practiſing the art in uſe. A ground of chalk was prepared on tablets of wood, and the colours laid on it, ground and mixed in water only, or with ſome gluten ſoluble in it. The ſurface of the picture was afterwards covered with a varniſh, to ſecure it from rubbing, and to give the teints more force and luſtre.

The principal works that have been produced in freſco, are the ſeries of biblical and evangelical hiſtoric pictures which adorn the walls and cieling of the chapel of Sixtus V. at Rome, by M. A. Buonarotti. The chambers of the Vatican, known by the name of the Stanze of Raphael; which conſiſt principally of religious hiſtories, interſperſed with ſome legendary tales relative to the popes; and the cupola of the duomo of Parma, or church of St. Giovanni in that city, by A. Corregio. It repreſents the aſcenſion of the Virgin amidſt a choir of angels, and with a number of figures of ſaints below regarding it. One beautiful and grand work, by Daniel Ricciarelli, commonly called Da Votterra, at the altar of the church of Trinita da Monte, the ſubject of which is taking Chriſt down from the croſs, is ſaid to have been deſtroyed by the French, in their endeavours to move it to France. They had ſucceeded in ſeparating it from the wall on a perpendicular ſcaffold; but in doing it, they ſo weakened the wall, that in the night the roof fell in upon the picture, and broke it to pieces. Such at leaſt is the report of its fate, which in the preſent unſettled ſtate of the continent, there are no means of decidedly aſcertaining the exact truth of. Dorigny has engraved a large print of the deſign: and the picture has been thought ſo well worthy of attention, that an infinite multitude of copies have been made of it, either for improvement, amuſement, or profit.

Painting in freſco is not much practiſed now. The want of experience neceſſarily produces a want of ſkill. None but thoſe poſſeſſed of large fortunes can be expected to call for it, and without being ſpecially employed in it, no artiſt can be expected to practiſe it. The uſe of it would perhaps not be ſo ſecure here as in Italy, as the ſeverity of froſt, and the dampneſs of the air, might prove injurious to its exiſtence.

Vaſari, however, gives the moſt powerful reaſon for its diſuſe: he ſays, "many of our painters excel in oil and water colours, and yet fail in freſco; becauſe, of all kinds of painting, this requires the greateſt ſtrength of genius to execute; great reſolution and great knowledge to give every ſtroke its juſt character, and to employ them with expreſſion and propriety." If in the period wherein he lived, and he died not till 1578; if in that period, when ſo many great men of ſuperlative genius flouriſhed in the art of painting, few could be found either ſkilful or hardy enough to undertake works in freſco, we cannot be ſurprized that it is not now practiſed largely, when the taſte of the time, delighting in prettineſſes and trifles, does not call for ſuch repreſentations of ſublime conceptions, nor the grandeur of ſtyle in art ſought for and practiſed when Vaſari wrote. See Watelet, Vaſari, Encyclopedie François, Vitruvius.

FRESCOBALDI, GIROLAMO, in *Biography*, the greateſt performer on the organ and harpſichord, and the beſt compoſer for thoſe inſtruments that Italy could boaſt during the ſeventeenth century, was a native of Ferrara, but went early in his life to Rome with his maſter Milleville, where he was elected organiſt of St. Peter's church. All the muſical writers of Italy have celebrated his talents; and his works, which ſtill remain, are indiſputable vouchers of the truth of their encomiums. Quadrio ſays, that early in his youth, as a ſinger, he delighted every ear, and was praiſed by every tongue in the principal cities of Italy. But his chief excellence conſiſted in compoſing and playing on the organ and harpſichord, for which he became ſo renowned, that his works, both printed and manuſcript, were in the hands of all profeſſors, and collectors of muſical compoſitions. The emperor Ferdinand III. ſent Froberger, a young German of promiſing genius, to Rome, on purpoſe to receive inſtructions from Freſcobaldi; by which he profited ſo well, that he was appointed imperial organiſt on his return. According to Della Valle, Freſcobaldi was living in 1641. His firſt work, entitled "Ricercari e Canzoni Franceſe, fatte ſopra diverſi oblighi in Partitura, libro primo, 1615," contains the firſt compoſitions we have ſeen printed in ſcore, and with bars. They are likewiſe the firſt regular fugues that we have found upon one ſubject, or of two ſubjects carried on at the ſame time, from the beginning of a movement to the end. Ricercari and fantaſie preceded ſonatas and concertos, and were the firſt compoſitions expreſsly made for inſtruments, after the invention of counterpoint. The fugues of Freſcobaldi have great merit, if we conſider the ſtate of inſtrumental muſic at the time they were produced: the ſubjects are marked, the harmony pure, and the ſtyle chaſte and clear. Freſcobaldi's maſterly and pleaſing fugues added new dignity and attractions to the organ; they were ſoon imitated all over Europe, and wherever there was an organ and an organiſt poſſeſſed of hand and head capable of emulating a ſtyle ſo ſuitable to the genius of that inſtrument. It is not ſaid in the title page for what inſtruments the ſeveral parts were deſigned; but as the author was a great organ player, we make no doubt but that they were firſt produced by and for that inſtrument, as all the four parts are ſo compact and cloſely connected, that they are ſtill within the graſp of the two hands. Notwithſtanding many of theſe fugues are upon two, three, and even four ſubjects, and every learned artifice of inverſion, augmentation, diminution, and moto contrario, is uſed, he has had the dexterity to avoid confuſion. But as he is ſaid to have produced many motets and maſſes for the church, the ſimplicity of the ſubjects of the fugues of his ricercari and canzoni were probably thoſe of his vocal fugues. The "Sonate d'intavolatura di cimbalo ed organo partite di diverſe arie e corrente, Ballati, Ciaccone, Paſſacagli di Freſcobaldi," publiſhed at Rome in 1637, upon ſix lines for the right hand, and eight for the left, are very full, and of difficult execution. Theſe pieces being embelliſhed with the faſhionable diviſions and graces of the times, have ſuffered more by age than the ricercari, which have all the ſimplicity of vocal fugues in the church ſtyle. But even in his toccate and variations on old airs, we find more taſte and paſſages which have ſtood their ground, than in any other harpſichord muſic of the ſame period.

Our

Our Bird, Dr. Bull, and Giles Fornaby ſeem to have been the greateſt organ players in Europe during the ſixteenth century, and the beginning of the next, till Freſcobaldi introduced a ſuperior ſtyle of treating the organ, diveſted of rapid and frivolous diviſions which diſgrace that moſt noble and comprehenſive of all inſtruments. Indeed the fugues in the ricercari of Freſcobaldi are worked with ſuch genius and learning as have never been ſurpaſſed, unleſs by thoſe of Sebaſtian Bach, and Handel, which ſeem to include every perfection of which this ingenious and elaborate ſpecies of compoſition is capable. Indeed, if we except theſe fugues, all inſtrumental muſic, particularly that for keyed inſtruments, ſeems to have been in a very rude ſtate at this time throughout Europe. It was dry, difficult, unaccented and inſipid.

FRESH denotes the riſe of water in a river, or a ſmall flood. See FRESHES.

FRESH-*doors*, a ſort of ſluices to let go water, ſo that it may run in freſhes, or in ſluſhes.

FRESH *Diſſeiſin*, in *Law*, (*friſca diſſeiſina*, from the French *frais*, i. e. *recens & diſſeiſir*, viz. *poſſeſſione ejicere*,) ſignifies that diſſeiſin which a man might formerly ſeek to defeat of himſelf and by his own power, without reſorting to the king or the law; as where it was not above fifteen days old, or ſome other ſhort continuance. Britton cap. 5. Of this Bracton writes at large, concluding it to be arbitrary. Lib. iv. cap. 5. See DISSEISIN.

FRESH *Fine*, is that which was levied within a year paſt. Weſtm. 2. 13 Ed. I. ſt. 2. cap. 45. See FINE.

FRESH *Force*, *friſca fortia*, denotes a force done within forty days.

If a man be diſſeiſed of lands or tenements within any city or borough; or deforced from them after the death of his anceſtors, to whom he is heir; or after the death of his tenant for life, or in tail, in dower, &c. he may, within forty days after his title accrued, have his remedy by an aſſize, or bill of freſh force. This aſſize or bill is ſued out without any writ from the chancery; but after the forty days, there is to be a writ out of chancery, directed to the mayor, &c. But this writ is obſolete ſince ejectments have come in uſe for recovering the poſſeſſion of lands, &c.

FRESH *the Hawſe*, on board a *Ship*. See HAWSE.

FRESH *Shot*, in the *Sea-phraſe*, ſignifies the falling down of any great river into the ſea; by means whereof the ſea hath freſh water a good way from the mouth of the river. As this is more or leſs, they call it a great, or ſmall freſh ſhot.

FRESH *Spell*, in the *Sea Language*, a freſh gang, to relieve the rowers in the long boat.

FRESH *Suit*, *recens inſecutio*, in *Law*, is ſuch a preſent and active proſecution of an offender, where a robbery is committed, as never ceaſes from the time of the offence committed, or diſcovered, till he be apprehended.

The benefit of ſuch purſuit of a felon is, that the party purſuing ſhall have his goods reſtored to him; whereas otherwiſe they are forfeited to the king. When an offender is thus apprehended and indicted, upon which he is convicted, the party robbed ſhall have reſtitution of his goods; and though the party robbed doth not apprehend the thief immediately, but ſome time after the robbery, provided he uſed his utmoſt endeavours to take him; or though he happens to be apprehended by ſome other perſon, yet it ſhall be adjudged freſh purſuit. Terms de Ley. See WAIFS.

Where a gaoler immediately purſues a felon, or other priſoner eſcaping from priſon, it is "freſh ſuit," to excuſe the gaoler; and if a lord follow his diſtreſs into another's ground, on its being driven off the premiſes, this is called "freſh ſuit:" ſo where a tenant purſues his cattle that eſcape or ſtray into another man's lands, &c.

Freſh ſuit is either within the view, or without. Manwood ſays, that upon freſh ſuit within the view, treſpaſſers in the foreſt may be attached by the officers purſuing them, though without the limits of the foreſt.

It has been ſaid that freſh ſuit may continue for ſeven years. See HUE *and Cry*.

FRESH *Water*, is that not tinctured or impregnated with ſalt, or ſaline particles, enough to be diſcoverable by the ſenſe.

Such generally is that of ſprings, rains, wells, lakes, &c. Dr. Liſter is of opinion, that the natural and original ſtate of water is to be ſalt: the freſhneſs he ſuppoſes to be accidental, and to be owing to the vapours of plants, and the breath of animals therein; and to the exhalations raiſed by the ſun.

Others will have all water originally freſh, and take its ſaltneſs to be accidental; to account for which, a great number of hypotheſes have been framed.

The ſaltneſs of water is a foreign, and in moſt caſes a hurtful quality. It renders it not only nauſeous to the taſte, but greatly prejudicial to the body; and it is generally agreed that thoſe waters, *cæteris paribus*, are beſt, not only for drinking, but alſo for economical uſes, as waſhing, boiling, and brewing, which are the freeſt from ſaltneſs.

Hence, various methods have been contrived for examining the freſhneſs of waters, and for dulcifying or making ſalt water freſh.

Mr. Boyle gives us a method of examining the freſhneſs of water, by means of a precipitate, which caſts down any ſaline particles before floating therein.

Into one thouſand grains of diſtilled water he puts one grain of ſalt; and into the ſolution lets fall a few drops of a ſtrong well filtrated ſolution of a well refined ſilver, diſſolved in clear aquafortis; upon which there immediately appears a whitiſh cloud, which, though but ſlowly, deſcends to the bottom, and there ſettles in a white precipitate, in which is the ſaline matter of the fluid.

This method, if it were required, would examine water to a greater nicety than that here ſpecified. It has diſcovered ſalt in water where there was but one grain of ſalt in two thouſand, nay in three thouſand times the weight of water.

The experiment was tried before the Royal Society in 1692, by ſir Hans Sloane; where it was likewiſe found that a drop or two, even of ſpirit of ſalt, mixed with common water, would be diſcovered by the ſame method. Phil. Tranſ. Abr. vol. ii. p. 298.

Dr. Hook, in the ſame year, read a lecture before the Royal Society, on a method of his own, for diſcovering the ſmalleſt quantity of ſalt contained in water, on a principle of hydroſtatics. The operation was performed by means of a large poiſe of glaſs, of the ſhape of a bolt-head; the ball thereof was three inches in diameter, and the neck $\frac{1}{24}$th of an inch. This being ſo poiſed, with red lead put in it, as to make it very little heavier than freſh water; and then ſuſpended by the ſmall ſtem which was graduated, to the end of a nice beam of a balance; and the degree or diviſion of the neck, contiguous to the ſurface of the water, noted; upon infuſing a quantity of ſalt, only equal to the two thouſandth part of the weight of the waters, the neck of the poiſe ſunk near half an inch

inch lower in the water. Phil. Tranſ. Abr. vol. ii. p. 304.

The dulcifying, or making of ſalt water freſh, is a ſecret that has been long ſought with great attention. For an account of the principal attempts that have been made with this view, ſee *Sea*-WATER.

FRESH *Wind*, ſignifies ſtrong, but not violent; hence when the gale increaſes, it is ſaid to freſhen.

FRESHES, in *Sea-language*, denote the impetuoſity of an ebb-tide, increaſed by heavy rains, and flowing out into the ſea, often diſcolouring it to a conſiderable diſtance, and forming a line that ſeparates the two colours, and which may be diſtinctly perceived for a great length along the coaſt.

FRESHFORD, in *Geography*, a ſmall poſt-town of the county of Kilkenny, Ireland, which is 7 miles from Kilkenny on the road to Urlingford, and 64½ miles S.W. from Dublin.

FRESHWATER BAY, a bay in the ſtraits of Magellan. N. lat. 53° 27'. W. long. 72° 13'.—Alſo, a bay on the S.W. coaſt of the Iſle of Wight. N. lat. 50° 37'. W. long. 1° 31'.—Alſo, a bay on the E. coaſt of Newfoundland. N. lat. 49° 10'. W. long. 53° 30'.

FRESHWATER *Iſland*, a ſmall iſland in the Atlantic, near the coaſt of South Carolina. N. lat. 33° 5'. W. long. 79° 15'.

FRESHWATER *Key*, a ſmall iſland in the Spaniſh Main, near the Moſquito ſhore. N. lat. 14° 23'. W. long. 82° 25'.

FRESNAY, a town of France, in the department of the Sarthe, and chief place of a canton in the diſtrict of Mamers; 18 miles N. of Le Mans. The place contains 1921, and the canton 13,810 inhabitants, on a territory of 207½ kiliometres, in 12 communes. N. lat. 48° 17'. E. long. 0° 6'.

FRESNAYE, LA, a town of France, in the department of the Sarthe, and chief place of a canton in the diſtrict of Mamers, 6 miles E. of Alençon. The place contains 1,555, and the canton 6,875 inhabitants, on a territory of 145 kiliometres, in 14 communes.

FRESNE-EN-WŒVRE, a town of France, in the department of the Meuſe, and chief place of a canton in the diſtrict of Verdun, 10 miles S.E. of Verdun. The place contains 823, and the canton 12,715 inhabitants, on a territory of 257½ kiliometres, in 38 communes.

FRESNE-ET SAINT-MAMEZ, a town of France, in the department of the Upper Saône, and chief place of a canton in the diſtrict of Gray, 12 miles N.E. of Gray. The place contains 558, and the canton 9,311 inhabitants, on a territory of 200 kiliometres, in 23 communes.

FRESNEDA, LA, a town of Spain, in the province of Arragon, once ſtrongly fortified, but burned and diſmantled in the year 1706 by the troops of Philip V.; 12 miles S.S.E. of Alcaniz.

FRESNILLO, a town of Mexico, in the province of Zacatcras; 40 miles N. of Zacatcras.

FRESNO, a town of Spain, in Old Caſtile; 5 miles S. of Borgo d'Oſma.—Alſo, a town of Spain, in Andaluſia, 20 miles N. of Cordova.

FRESNOY, CHARLES ALPHONSE DU, in *Biography*, a poet and a painter, deſervedly regarded with more eſtimation in the former than the latter character; although painting was the object of his moſt anxious deſires and labours, and poetry but the amuſement of his leiſure hours.

He was born in Paris in the year 1611, and deſtined by his father, who was an apothecary, to the profeſſion of phyſic. He therefore received a good education, and early in life evinced a taſte for poetry, and carried away all the prizes in it which were propoſed in the college where he was educated, to excite the emulation of his fellow ſtudents. His inclination for it increaſed with exerciſe, and the pleaſure he took in that, and its ſiſter art of painting, which poſſeſſed equal power over him, diverted him ſo much from the ſtudies requiſite for the practice of the profeſſion he was intended for, that he at laſt, notwithſtanding the oppoſition and remonſtrances of his parents, gave over the purſuit of it, declaring himſelf decidedly for painting; which he took every opportunity of cultivating with great aſſiduity.

At the age of nineteen or twenty he began to learn deſign under F. Perier; after two years ſpent with that artiſt and Simon Vouet, he went to Italy in the year 1633, or beginning of 1634.

At firſt he employed himſelf in painting landſcapes, buildings, and ancient ruins; with great reſolution perſevering in his deſire to be a painter, although abandoned by his parents through reſentment for his rejection of a profeſſion they had choſen for him. In Rome he was deſtitute of friends and acquaintance for the firſt two years of his reſidence there, and for the greateſt part of that time he ſubſiſted on bread and cheeſe, diverting uneaſy reflections by an indefatigable purſuit of painting.

The arrival of Peter Mignard, afterwards ſo celebrated, who had been his friend and fellow ſtudent under Vouet, ſet him more at eaſe. They united in the ſtricteſt ties of friendſhip, lived together in the ſame houſe, and were commonly known in Rome by the name of the *Inſeparables*.

They principally ſtudied the works of Raphael, and the antiques: but other artiſts of great celebrity had alſo a ſhare of their attention, particularly Titian and Carracci: the former of whom Du Freſnoy had great eſteem for, and copied ſeveral of his works; endeavouring to imitate him in his colouring, as he did Carracci in his deſign. In the progreſs of their ſtudies, Mignard appeared to poſſeſs ſuperior talents in practice, while Freſnoy, who was perhaps more of a reaſoner, entered more into the rules, the theory, and hiſtory of the art. Each communicated to the other his ſentiments and obſervations; Du Freſnoy furniſhing his friend with noble and excellent ideas, and receiving in return advice and inſtructions in the beſt mode to realize his inventions with expedition and effect.

Whilſt he lived in Rome, he painted ſeveral pictures of the ruins of the Campo Vaccino. One of a young Athenian woman going to ſee the monument of her lover. Æneas carrying his father, &c. &c. But poetry ſhared with painting his time and thoughts too much to allow him ever to make a ſhining figure in the practice of the latter profeſſion. As he, by a ſtudious examination of good works, penetrated into the ſecrets of the art, he wrote down his obſervations; and having ſatisfied himſelf with the knowledge he had acquired of its theory, he formed the deſign of writing a poem upon it, which he employed many years upon, conſulting the beſt writers, and examining the beſt pictures, to perfect his information, and render his labours truly uſeful.

About the year 1653 he travelled in company with Mignard (according to Felibien) through Lombardy to Venice, and there painted ſome pictures, imitating the ſtyle and colour of Titian with conſiderable ſucceſs. Here the two friends ſeparated, Mignard returning to Rome, and Du Freſnoy to France. He read his poem to the beſt painters in all places through which he paſſed, and particularly to Albano, and Guercino, then at Bologna; and he conſulted ſeveral men famed for their ſkill in polite literature.

Returned to Paris in 1656, he met with conſiderable ſuc-

cefs in painting; it being then the faſhion to paint the walls and cielings of rooms, he was much engaged in that degrading application of the art. He painted both figures and landſcapes, and ſometimes alſo gave deſigns for architecture. But his works in both theſe arts are diſregarded when compared with the excellencies of other artiſts. His reputation for genius and talent reſts upon his poem, which, after many years of reviſion and correction, he proceeded to prepare for publication.

Though he had finiſhed this didactic labour before he left Italy, and communicated it to the beſt judges of that country; yet after his return to France, he continued to revife it, with a view to treat more at length ſome things which did not ſeem to him ſufficiently explained. And though he was deſirous to ſee his work in print, yet having written it in Latin, he thought it improper to publiſh it without a French tranſlation, which he deferred undertaking from time to time, out of diffidence of his ſkill in his own native language, which he had in ſome meaſure loſt by his long reſidence in Italy. Monſ. du Piles was therefore at laſt induced, at his deſire, and by the merit of the poem, to tranſlate it into French: his verſion being reviſed by Du Freſnoy himſelf, who had begun a commentary upon it, when he was ſeized with a palſy, and after languiſhing four or five months under it, he died at the houſe of one of his brothers at Villiers-le-bel, four leagues from Paris, in 1665, at the age of 54, and was interred in the pariſh church. He had quitted his lodgings at Monſ. Potel's, in the ſtreet Beautreilly, on Mignard's return from Italy in 1658, and the two friends lived together from that time till the death of Du Freſnoy.

His poem was not publiſhed till three years after his death; when it was printed in Paris, in duodecimo, with the French verſion, and remarks of Monſ. Du Piles, and has been juſtly admired for its elegance, perſpicuity, and the utility of the inſtruction it contains. In 1694, Dryden was induced to make a proſe tranſlation of it into Engliſh, which he accompanied with his ingenious parallel between poetry and painting. It was again tranſlated into Engliſh by Mr. Wills, a painter, who gave it in metre without rhyme. He attempted to produce the ſenſe of his author in an equal number of lines, and thus cramped his own ſkill; and produced a work unequal in itſelf, in which, however well he appears to have underſtood the original text, he fails to impreſs it on his reader. It is now almoſt totally forgotten.

More ample juſtice has been done in our language to the talents of Du Freſnoy, by our late ſkilful poet William Maſon, M. A.; by whom, in 1782, he was firſt clothed in an Engliſh dreſs ſuited to his elevated pretenſions. And ſtill greater honour was done to him by the hand of that extraordinary genius of our iſle in the art of painting, ſir Joſhua Reynolds, for whoſe more valuable remarks upon the moſt important points in the poem, Mr. Maſon was induced to diſcard thoſe of Monſ. Du Piles. This tranſlation is written in heroic verſe, and is accompanied by fifty-nine notes from the pen of ſir Joſhua Reynolds.

By the union of the talents of two men ſo renowned in the arts of poetry and painting, Du Freſnoy is rendered for ever dear to the Engliſh reader; and the thorough knowledge he has exhibited of the beſt principles of the art of painting, become more agreeably and more extenſively diffuſed. See Life of Du Freſnoy by Wills and Maſon.

FRESTA, in *Geography*, a town of Sweden, in the province of Upland; 21 miles S.E. of Upſal.

FRET, in *Architecture*, a Grecian decoration, conſiſting of ſtraight grooves or fillets, running at right angles in the manner of a ſpiral, or turning round in various directions, repeating the ſame turns or forms in compartments, or at various intervals. The fret is one of the moſt ancient ornaments, (ſee Stewart's Antiquities of Athens,) in which a great variety of the moſt beautiful will be ſeen in various parts of that work.

The appellation is ſaid to have been derived from this circumſtance, that the French word *frette* literally ſignified the timber-work of a roof, which conſiſts chiefly of beams, rafters, &c. laid acroſs each other, and, as it were, fretted.

FRET, or *Frette*, in *Heraldry*, is a bearing conſiſting of ſix bars, croſſed, and interlaced, fret-wiſe.

Guillim derives the word from the French *rets*, net: but the reader will eaſily furniſh himſelf with a better etymology from the word fret, in architecture.

He bears diamond, a fret topaz; the coat armour formerly of the lord Maltravers, and now quartered by the duke of Norfolk. When it conſiſts of more than ſix pieces, the number muſt be ſpecified.

Some call this the "true lover's knot;" others "Harrington's knot," becauſe it is their arms; and "nodo firmo," the motto. Gibbon is for calling it "heraldorum nodus amatorius."

FRET, in *Muſic*, is a ſtring tied round the neck of ſome inſtrument, ſuch as the viol de gamba, and lute, to aſcertain the preciſe part of the finger-board, where the fingers of the left hand are to be placed.

FRET-*work*, an enrichment of frets, or a place adorned with ſomething in the manner thereof. See FRET.

Fret-work is ſometimes uſed among us to fill up and enrich flat, empty ſpaces; but it is principally practiſed in roofs, which are fretted over with plaſter-work.

The Italians alſo apply it to the mantlings of chimneys with great figures: a cheap piece of magnificence, and as durable almoſt within doors, as harder matters in the weather.

*FRETTS, in *Mineralogy*, a term uſed by our miners to expreſs the worn ſide of the banks of the rivers in mine-countries, where they ſearch for the ſhoad ſtones, or grewts, waſhed down from the hills, in order from thence to trace out the running of the ſhoad up to the mine. Phil. Tranſ. N° 69.

FRETTY, or FRETTE, in *Heraldry*, is where there are divers bars laid acroſs each other.

Fretty is of ſix, eight, or more pieces. Azure, fretty of eight pieces, or, the coat of the lord Willoughby.

Columbiere obſerves, that fretty, abſolutely uſed, without any addition, is ſuppoſed to be of ſix pieces; that is, ſo many bars or pieces croſſing each other, which, therefore, need not be expreſſed; but if there be more, as much muſt be mentioned. And yet Guillim has azure, fretty of ſix, argent; the coat of the ancient lords Elthingham, of Suſſex.

FRETUM, STREIGHT, or *Straight*, in *Geography*. See STRAIGHT.

FRETUM *Britannicum*, or *Gallicum*, in *Ancient Geography*, denotes the ſtreights between Dover and Calais.

FRETUM *Gaditanum*, the *Straights of Gibraltar*, denotes the ſtreights between Spain and Africa, connecting the Mediterranean ſea with the ocean; called alſo *Fretum Herculaneum*.

FRETZENDORF, in *Geography*, a town of Germany, in the biſhopric of Bamberg; ſeven miles N.W. of Burg Eberach.

FREUDAH, a town of Algiers; 10 miles S. of Maſcar.

FREUDENBERG, a town of Pruſſia, in Natangen.—Alſo, a town of Germany, in the principality of Naſſau-Siegen.—Alſo, a town of Bavaria.—Alſo, a town of Ger-

many, in the county of Wertheim on the Mayn.—Alſo, a town of Pruſſia, in Ermeland.

FREUDENSTADT, a town of Wurtemburg, founded in 1600, as an aſylum for the Proteſtants who were perſecuted in Germany; ſituated in the Black foreſt, fortified in the modern manner, and defended by a citadel. In 1796 it was taken by the French; 24 miles E.S.E. of Straſburg. N. lat. 48 28′. E. long. 8° 25′.

FREUDENTHAL, or BRUNTHAL, a town and lordſhip of Sileſia, in the principality of Troppau; celebrated for its breed of horſes and manufacture of fine linen; 17 miles W. of Troppau. N. lat. 49° 50′. E. long. 17° 21′.

FREUDENTHAL, a town of Germany, in the principality of Wurzburg; five miles W.N.W. of Volckack.

FREVENSTEIN, a town of the duchy of Stiria.

FREVENT, a town of France, in the department of the ſtraits of Calais; ſix miles W. of Arras.

FREVILLE, a town of France, in the department of the Lower Seine; five miles N.E. of Caudebec.

FREUNDSHEIM, a town of Germany, in the Tyrol; 24 miles W. of Inſpruck.

FREUSBURG, a town of Germany, in the county of Sayn; ſeven miles S.E. of Siegen.

FREYBERG, or PRZIBOR, a town of Moravia, in the circle of Prerau; 36 miles E. of Olmutz. N. lat. 49° 34′. E. long. 18° 15′.

FREYBERG, or *Friedberg*, a town of Germany, and capital of the circle of Erzgeburg, ſeated on a branch of the Moldaw, near mountains which ſeparate the country from Bohemia. It contains ſix churches, 2000 houſes, and 60,000 inhabitants. In its environs are mines of copper, tin, lead, and ſilver, which produce about 10,000 rix-dollars annually. The adjacent ſoil, though mountainous, is fertile; 19 miles W.S.W. of Dreſden. N. lat. 50° 53′. E. long. 13° 18′.

FREYBERG, mountains of Switzerland, in the canton of Glarus, which divide the valley, forming a principal part of this canton, about a league S. of the burgh of Glarus, at the point where the two rivers, Linth and Sernft, unite.

FREYBERG, or *Freyburg*, a town of Sileſia, in the principality of Schweidnitz, near the river Polonitz; ſeven miles W. of Schweidnitz. N. lat. 50° 42′. E. long. 16° 16′.

FREYBURG, a town of Germany, in Thuringia, on the Unſtrutt; 16 miles S. of Halle. N. lat. 51° 14′. E. long. 11° 54′.

FREYDENBACH, a town of Germany, in the principality of Anſpach.

FREYE-AEMTER, a country of Switzerland, encompaſſed by the cantons of Zurich, Berne, Lucerne, and Zug, and the county of Baden; anciently called the "county of Rori, or Waggenthal;" belonging to the counts of Hapſburg, and gained in conqueſt by the Swiſs in the year 1415. The inhabitants, amounting in number to about 20,000, are Roman Catholics, and they are chiefly employed in the cultivation of their fields and vineyards. The country is about ſeven or eight leagues in length, and three or four in breadth.

FREYEN, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 63° 42′.

FREYENSEEN, a town of Germany, in the principality of Solms; formerly an imperial town.

FREYENSTADT, a town of Germany, in the lordſhip of Breiteneck, ſituated on the Schwarzach; 20 miles S.E. of Nuremberg. N. lat. 49° 9′. E. long 11° 15′.

FREYENTHURN, a town of Middle Carniola, on the Kulp; ſeven miles E. of Rudolfswerth.

FREYENWALDE, a town of Germany, in the Middle Mark of Brandenburg, on the Oder. The trade of the inhabitants, which is conſiderable, is carried on in fiſh, corn, lace, linen, medicinal waters, and alum; 32 miles N.E. of Berlin. N. lat. 52° 51′. E. long. 14° 5′.

FREYHAN, a town and lordſhip of Sileſia, in the principality of Oels, on the borders of Pruſſia; 24 miles N. of Oels. N. lat. 38° 12′. E. long. 17° 20′.

FREYHEIL, a town of Bohemia, in the circle of Konigingratz, near which are warm baths.

FREYHOFF, a town of Carniola, on the Kulp; ſeven miles S.W. of Landſtrap.

FREYHUNG, a town of Germany, in the principality of Sulzbach; 10 miles N.E. of Sulzbach.

FREYLA, a town of Spain, in the country of Grenada; 18 miles N.N.E. of Guadix.

FREYLING, a town of Auſtria; four miles E.S.E. of Efferding.

FREYSINGEN, or FRISINGEN, *Biſhopric of*, an eccleſiaſtical principality of Germany, in the circle of Bavaria, ſituated between the cities of Munich and Landſhut, founded by St. Corbinien, who was created biſhop by pope Conſtantius III. about the year 710. It includes within its territories the town of Freyſingen, the county of Iſmaning, the lordſhip of Burgkrain, and the county of Werdenfeils. In 1801 this biſhopric was ſecularized, and granted to the elector (now king) of Bavaria. The town of Freyſingen is ſituated on the Moſach, not far from the Iſer, partly at the foot of a mountain, and partly on its ſummit. The epiſcopal palace and cathedral church, which are beautiful edifices, are ſituated in the upper part of the town; taken by the French in 1796; 17 miles N.N.E. of Munich. N. lat. 48° 20′. E. long. 11° 44′.

FREYSTADT, a town of Pruſſia, in the province of Oberland; 80 miles S.W. of Konigſberg.—Alſo, a town of Sileſia, in the principality of Glogau, containing a Roman catholic church, a convent, and a Lutheran church and ſchool. Good cloth is manufactured in this town; 12 miles N.E. of Sagan. N. lat. 51° 44′. E. long. 15° 25′.

FREYSTADTEL, a town of Sileſia, in the principality of Teſchen; ſeven miles W.N.W. of Teſchen. N. lat. 49° 49′. E. long. 18° 34′.

FREYSTATT, or FREUSTADT, a town of Auſtria; 82 miles W. of Vienna. N. lat. 48° 30′. E. long. 14° 25′.

FREYSTATTEL, a town of Moravia, in the circle of Hradiſch; 20 miles N.E. of Hradiſch.

FREYSTATTL, a caſtellated town of Hungary, on the Waag.

FREYSTETT, or FREYSTAETT, a town of Germany, in the county of Catzenelnbogen, on the Mayn; where Roman Catholics, Lutherans, and Calviniſts, are allowed the free exerciſe of their religion; 12 miles N.W. of Darmſtadt.

FREYUNG, a town of the biſhopric of Paſſau; 14 miles N. of Paſſau.

FREYWALDE, a town of Sileſia, in the principality of Neiſſe; 15 miles S. of Neiſſe. N. lat. 50° 5′. E. long. 17° 5′.—Alſo, a town of Sileſia, in the principality of Sagan; 12 miles S.W. of Sagan.

FREZIER, AMEDEE-FRANCIS, in *Biography*, was born at Chamberry in 1682, and was intended by his parents for the profeſſion of the law, but his own inclination led him to devote the ſtrength of his talents to mathematics. He ſoon qualified himſelf for the engineer ſervice of his country, and was employed, in 1711, by the court, in a ſurvey of the Spaniſh colonies of Peru and Chili; and on his return from thoſe countries he publiſhed a "Voyage to the South Sea," which obtained him a high degree of credit. After this

this he was entrusted with the superintendence of several important fortifications, and for the great ability exhibited on this, and other occasions, in the service of government, he was rewarded with the cross of St. Lewis, and made lieutenant-colonel in the army. In 1740 he was appointed director of all the fortified places in Britanny. He died at Brest in the year 1773. He was author of "Traité des Feux d'Artifice." "Elemens de Stereotomie," in two volumes 8vo. This last was enlarged under the title of "Theorie et Pratique de la Coupe des Pierres et des Bois," in three volumes 4to. He is highly esteemed as an author, particularly for his last work.

FREZIERA, in *Botany*, in memory of Amadeus Francis Frezier, an engineer in the service of Louis XIV., who published a Voyage to Chili and Peru, and died in 1773, at the age of 91. He made some botanical observations, and introduced the Chili Strawberry into Europe; see FRAGARIA CHILOENSIS. He was greatly at variance with Father Feuillée, who attacked him in the preface of his own Voyage, and was answered by Frezier in a subsequent edition of his publication; see FEUILLÉE.—Swartz. Ind. Occ. v. 2. 971. Willd. Sp. Pl. v. 1179. (Eroteum; Swartz. Prod. 85. Schreb. 807. See EROTEUM.)—Class and order, *Polyandria Monogynia*. Nat. Ord. *Aurantia*, Juss.

Gen. Char. *Cal.* Perianth of five ovate, concave, incumbent, permanent leaves. *Cor.* Petals five, roundish, inclining to ovate, concave, undivided, spreading. *Stam.* Filaments numerous (30), inserted into the receptacle, shorter than the petals, erect, thread-shaped; anthers roundish, minute. *Pist.* Germen superior, ovate, downy; style solitary, erect, rather longer than the stamens, awl-shaped, three or five-cleft at the summit, permanent; stigmas blunt, simple, reflexed. *Peric.* Berry roundish, dry, smooth, pointed with the permanent style, of three to five cells. *Seeds* three or four in each cell, oblong, slightly compressed.

Ess. Ch. Calyx of five leaves. Petals five. Style three to five-cleft. Berry dry, of three to five cells, with many seeds.

Obs. The inflorescence, flower and habit are those of *Thea*, but the fruit is different. *Swartz.*

1. F. *theoides*. Sw. Ind. Occ. v. 2. 972.—"Leaves lanceolate, somewhat ovate, bluntly serrated, smooth. Flowers axillary, solitary."—Native of lofty mountains in the southern part of Jamaica. A *tree* from 20 to 40 feet high, with a smooth greyish bark, and upright sub-divided branches. *Leaves* alternate, stalked, pointed, ribbed, smooth, shining on the upper side, rather rigid. *Flowers* few, stalked, drooping, whitish, resembling those of the tea shrub, but only half their size. They appear in June and July, and the berries ripen in October. The leaves are said by Swartz to be astringent, and to have precisely the taste of green tea. They might perhaps prove a better substitute for the Chinese plant than the leaves of ash, sloe, or whatever else serves to adulterate that valuable article of commerce in Europe.

2. F. *undulata*. Sw. Ind. Occ. v. 2. 974. (Eroteum undulatum; Vahl. Symb. v. 2. 61.)—"Leaves elliptic-lanceolate, pointed, serrated, smooth. Flowers axillary, clustered."—Native of woods on the highest mountains of the West Indies. An elegant *tree*, often rising to the height of 50 feet, the *branches* nearly erect, brown, with elevated white spots. *Leaves* about four inches long, serrated and undulated, finely veined, smooth, palest beneath; their stalks about an inch long, reddish, channelled above, smooth. *Flower-stalks* somewhat umbellate, rarely solitary. *Flowers* whitish. *Swartz.*

3. F. *reticulata*. Humboldt and Bonpland Plant. Æquinoct. v. 1. 22. t. 5.—"Leaves ovato-lanceolate, serrated, downy and reticulated beneath. Flowers axillary, two or three together, stalked."—Native of Peru, on the Andes, near the town of Almagner. *Stem* about 18 feet high, bearing many downy, reddish, leafy, warty *branches*. *Leaves* about three inches long, serrated; smooth above; finely downy and reticulated beneath. *Footstalks* an inch or more in length, downy. *Flower-stalks* two or three together, downy, as well as the *calyx*. *Petals* white, scarcely longer than the calyx. *Fruit* of four cells.

4. F. *hirsuta*. Leaves elliptic-lanceolate, bluntly serrated, smoothish with a hairy rib; unequal at their base. Flowers axillary, two or three together, stalked. Branches hairy.—Native of high cool mountains, where the atmosphere is always damp, in the island of St. Vincent, from whence it was sent by Dr. Alexander Anderson to A.B. Lambert, esq. from whose rich herbarium we have been favoured with a specimen. It seems very nearly akin to the last, but the young *branches* are extremely hairy, the *leaves* smaller, scarcely rough beneath except the rib, and remarkably unequal at their base. The *flowers* moreover are scarcely half so large as in F. *reticulata*, with very hairy stalks and calyx.

5. F. *canescens*. Humb. and Bonpl. Pl. Æquinoct. v. 1. 25. t. 6.—Leaves elliptical, tapering at each end, minutely serrated, hoary beneath. Flowers solitary or in pairs, stalked.—Native of the Andes of Peru, between the towns of Quito and Ybarra. A *tree* 18 feet high. *Branches* spreading, smooth, except at their extremities, where they are finely downy. *Leaves* three or four inches long, somewhat revolute, very finely serrated, hoary and downy at the back. *Flowers* rather large, mostly solitary, white, with downy stalks and calyx. *Petals* externally downy, twice as long as the calyx. *Fruit* of three cells.

6. F. *chrysophylla*. Humb. and Bonpl. Pl. Æquinoct. v. 1. 27. t. 7.—Leaves elliptic-lanceolate, pointed, entire; downy beneath. Flowers two or three together, stalked.—Native of cold parts of the Andes of Peru, near the town of Popayan. Remarkable for its entire *leaves*, which are smooth above, and of a fine golden hue at the back, with an appearance of two parallel lines on each side of the rib, but this is only caused by the arrangement of the hairs. *Petals* whitish, pointed, more than twice as long as the calyx.

7. F. *fericea*. Humb. and Bonpl. Pl. Æquinoct. v. 1. 29. t. 8.—Leaves ovate, pointed, finely serrated, silvery beneath, on short stalks. Flowers sessile.—Very frequent in cold parts of the province of Pasto in Peru, between the towns of Quito and Popayan. A *tree* 30 feet high, with angular smooth *branches*. *Leaves* nearly sessile, four inches long, broad at the base, smooth above, clothed beneath with white silky hairs, slightly veined. *Flowers* two or three together, sessile, small. *Calyx* smooth. *Petals* twice as long as the calyx, white, obtuse. *Berry* of from three to five cells.

8. F. *nervosa*. Humb. and Bonpl. Pl. Æquinoct. v. 1. 31. t. 9.—Leaves elliptic-ovate, pointed, serrated; veiny and somewhat hairy beneath. Flowers many together, stalked.—Native of cold situations in the province of Pasto in Peru. A *tree* above thirty feet high, with nearly smooth *branches*. *Leaves* marked with numerous transverse veins, and slightly hairy, beneath. *Flowers* small, white. The wood is valuable, and much used in building.

FRIABLE SOIL, in *Agriculture*, is such as has the particles readily broken down, and reduced into a powdery state. See SOIL.

FRIANGOMBI, in *Geography*, a town of Africa, in Congo, on the Zaine, near Lembo.

FRIAR, or FRIER, by the Latins called *frater*, the Italians *fra*, and the French *frere*, that is, *brother*, is a term common to the monks of all orders; founded on this, that there is a kind of fraternity, or brotherhood, preſumed between the ſeveral religious perſons of the ſame convent or monaſtery.

The kinds of friars are very numerous: Auguſtine friars; Dominican, or black, or preaching friars; Franciſcan, or grey, or begging friars; and Carmelites, or white friars.

FRIAR, in a more peculiar ſenſe, is reſtrained to ſuch monks as are not prieſts; for thoſe in orders are uſually digniſied with the appellation of *father*.

FRIARS, or FRIERS, *obſervant*, *fratres obſervantes*, were a branch of the Franciſcans; thus called, becauſe not combined together in any cloyſter, convent, or corporation, as the conventuals are, but only agreed among themſelves to obſerve the rules of their order, and that more ſtrictly than the conventuals did, from whom they ſeparated themſelves out of a ſingularity of zeal, living in certain places of their own chuſing.

FRIAR'S *Cowl*, in *Botany*. See ARUM.

FRIAR'S *Head*, in *Geography*, a cape on the E. coaſt of Antigua. N. lat. 17° 11'. W. long. 61° 22'.

FRIAR'S *Hood*, a mountain of Ceylon, near the coaſt; 68 miles E. of Candy.

FRIARY *of the Holy Trinity*. See TRINITY.

FRIAS, in *Geography*, a town of Spain, in Old Caſtile, ſituated on an eminence, near the Ebro; 20 miles N. N. E. of Burgos. N. lat. 42° 40'. W. long. 3° 2'.

FRIBURGH, FRIDBURGH, or *Fritheborg*, among our Anglo-Saxon anceſtors, denoted the ſame as frank-pledge did after the time of the conqueſt.

"Præterea eſt quædam ſumma et maxima ſecuritas, per quam omnes ſtatu firmiſſimo ſuſtinentur, *viz.* ut unuſquiſque ſtabilitat ſe ſub fidejuſſionis ſecuritate, quam Angli vocant *freoborghes*; ſoli tamen Eboracenſes dicunt eandem *tienmannatale*, quod ſonat Latine decem hominum numerum." LL. Edw. II. ap Lamb.

Every man in this kingdom was anciently aſſociated in ſome *decennary*, (which ſee,) or company of ten families, who were pledged, or bound for each other, to keep the peace, and obſerve the law. (See TITHING.) If any offence was done by one, the other nine were to anſwer it; that is, if the criminal fled from juſtice, they had thirty days allowed to apprehend him; if he was not taken in that time, he who was the friburgh, *i. e.* the principal pledge of the ten, ſhould take two of his own number, and the chief pledges of three neighbouring friburghs, with two others out of each of the ſaid friburghs, who were to purge themſelves, and their friburgh, of the forfeiture and flight of the criminal. If they could not do this, the principal pledge, with the other eight, were to make ſatisfaction.

Great men were not combined in any ordinary decenna, or dozen, as being deemed a ſufficient aſſurance for themſelves and their menial ſervants.

FRIBURG, or FREYBURG, in *Geography*, a town of Germany, in the circle of Swabia, and capital of the Auſtrian Briſgaw, (ceded to the duke of Modena by the treaty of Campo Formio in 1797, and that of Luneville in 1801,) ſituated at the foot of a ſtony mountain on the river Traiſam. This town was founded, in 1118, by Berchtold III. duke of Zæringen, from whom it came to the counts of Furſtenberg, with whom it had many diſputes on account of its privileges; but at laſt it purchaſed its freedom for 20,000 marks of ſilver. This ſum was advanced by the houſe of Auſtria, ſo that the town became ſubject to that family. The French took and diſmantled it in 1744. It was again taken by the French in 1796, and ſoon ſurrendered to the archduke. The ſtreets are broad and well paved; the principal church is a ſuperb edifice. Here is an univerſity, founded in 1457, by Albert IV. duke of Auſtria, with an academy, and five colleges dependent upon it; it has 10 convents, a commandery of the Teutonic order, and 13 churches. The principal buſineſs of the town is that of poliſhing cryſtals and precious ſtones; 34 miles S. S. E. of Straſburg. N. lat. 48° 2'. E. long. 7° 54'.

FRIBURG, or FREYBURG, called *Friburg* in *Uckland*, by way of diſtinction from *Friburg in the Briſgaw*, a town of Switzerland and capital of a canton, to which it gives name. This town was built, in 1179, by Berchtold IV., duke of Zæringen, and endowed by him with conſiderable privileges. In 1218, the ſovereignty of it deſcended to Ulric of Kyburgh, in right of his wife Anne, ſiſter of the laſt duke Berchtold V. By marriage it came into the poſſeſſion of Eberhard, count of Hapſburg-Lauffenburg, who ſold it to his couſin Rhodolph of Hapſburgh, afterwards emperor. During this period a continual rivalſhip ſubſiſted between Bern and Friburg; but at length all differences were compoſed, and in 1403 the two cities concluded a perpetual alliance. Friburgh continued under the dominion of Auſtria until the middle of the 15th century, when it put itſelf under the protection of the duke of Savoy. From this era it occaſionally aſſiſted the cantons againſt the houſe of Auſtria; but ſoon after the battle of Morat, in which its troops had a ſhare in the victory then obtained, it became a free and independent republic, and, in 1481, it was admitted a member of the Helvetic confederacy. The ſituation of Friburgh is one of the moſt pictureſque and wild in Switzerland; as it ſtands partly in a ſmall plain, partly on bold acclivities, on a ridge of rugged rocks, half encircled by the river Sane; and is ſo entirely concealed by the circumjacent hills, that the traveller ſcarcely catches the ſmalleſt glimpſe, until he burſts upon a view of the whole town from the overhanging eminence. The fortifications, conſiſting of high walls and towers, incloſe a circumference of about four miles; within which ſpace the eye comprehends a ſingular mixture of houſes, rocks, thickets, and meadows, varying inſtantly from wild to agreeable, from the buſtle of a town to the ſolitude of the deepeſt retirement. The Sane flows in a ſerpentine courſe, ſo as to form, within the ſpace of two miles, five angles, between which the different parts of the current are nearly parallel to each other. On all ſides the deſcent to the town is extremely ſteep, and in one place the ſtreets even paſs above the roofs of the houſes. Many of the edifices are raiſed in regular gradation like the ſeats of an amphitheatre. The moſt extraordinary point of view is from the Pont-neuf. The houſes, conſtructed with a grey ſandſtone, brought from a neighbouring quarry, are neat and well-built; but the whole town has a dull and inanimate appearance. Among the few objects worthy of particular notice are, the cathedral, an elegant Gothic edifice, erected in the latter end of the 14th century, and remarkable for the height and ſolidity of the tower. The town-houſe, an ancient building, and a lime-tree planted in the middle of the principal ſquare by a ſoldier, as tradition reports, June 22d 1477, on his return from the battle of Morat, and regarded as an emblem of Swiſs liberty. The ſociety of Friburgh is very agreeable; the gentry are frank and hoſpitable, and blend French politeneſs with great ſimplicity of manners. The biſhop of Lauſanne, called here the biſhop of Friburgh, reſides in this city. Under the old eſtabliſhment, he was appointed by the pope, uſually at the recom-

mendation of the French court; and his revenues commonly amounted to about 400*l.* per annum. His dioceſe extends over the whole canton, and part of that of Soleure. This canton is entirely Catholic, and its population, in 1785, was eſtimated at 57,589 perſons, the town containing 5,011. According to the ſtatement of Mr. Planta in his "Hiſtory of the Helvetic Confederacy," the canton of Friburgh, before the revolution, conſiſted of 467 ſquare miles, and contained 73,000 inhabitants. This canton contains a ſmall portion of arable land, but abounds in paſtures; accordingly, its principal articles of exportation conſiſt in horned cattle, cheeſe, butter, and hides. Its cheeſe is famous under the name of Gruyeres, derived from that of the diſtrict in which it is made. (See GRUYERES.) It may be eſtimated upon an average, that the whole canton annually ſupplies paſture for 37,000 cows and oxen. It the year 1798, the town ſurrendered to the French army, under the command of general Pigeon; and as ſoon as the French took poſſeſſion of it, a proviſional government, elected by the diſtricts of Friburgh, ſuperſeded the former magiſtracy, conſiſting of a council of 200. According to the conſtitution of 1801 it formed, with the addition of the bailliages of Morat and Schwartzenburgh, one of the 17 departments or cantons of Switzerland, deputing four repreſentatives to the general diet. By the conſtitution of 1803, the force which this canton is required to ſupply conſiſts of 620 men. Friburgh is diſtant 16 miles S. W. from Berne, and 27 N. E. from Lauſanne. N. lat. 46° 50′. E. long. 6° 48′.

FRIBURG, a town of Bavaria; 15 miles S. S. E. of Brannau.

FRIBUS, a town of Bohemia, in the circle of Einbogen; nine miles W. of Joachimſtel.

FRICALA, a town of European Turkey, in Theſſaly; 35 miles W. of Lariſſa.

FRICASSEE, a diſh, or meſs, haſtily dreſſed in a frying-pan, and ſeaſoned with butter, oil, or the like.

The word is French, formed of the Latin *frixatura*, frying. Others will have fricaſſee formed in imitation of the noiſe made by butter, or other fat, when melted in the pan.

We ſay a fricaſſee of pullets, or rabbits, of tench, of tripe, of frogs, of eggs, of peas, &c.

FRICCIUS, MELCHIOR, in *Biography*, a phyſician, who practiſed his profeſſion at Ulm in the latter part of the ſeventeenth century. Reſpecting the particular circumſtances of his life, little has been recorded; but he left ſeveral intereſting works on medical ſubjects, of which his treatiſe on the medicinal properties of poiſons deſerves particular mention. He was one of the firſt to demonſtrate to the profeſſion, from reaſon, experience, and authority, that poiſonous ſubſtances may be employed without danger, both internally and externally; and that, deleterious as they are in certain quantities and on certain occaſions, the prudent phyſician may derive from them the moſt efficacious remedies againſt the moſt obſtinate diſeaſes. The poiſons, which Friccius arranged in the claſs of remedies, are principally arſenic, corroſive muriate of mercury, euphorbium, aconite, cicuta, bella donna, hyoſciamus, &c. Although the fears and prejudices of his contemporaries led them to diſcredit his facts, and to look upon his reaſoning as viſionary, his poſterity have realized his ſtatements, in conſequence of the experiments of Van Swieten, Storck, Fowler, &c.; and theſe ſubſtances are now reſorted to, as ſome of the moſt active agents of the materia medica. The following are the titles of the publications of Friccius. 1. "Diſſertatio Medica de Peſte, ſeu, nova Methodus cognoſcendi et curandi Peſtem," Ulm, 1684.—2. "Icon Podagræ, repreſentans morbi podagrici hiſtoriam, cauſas, prognoſin, et curationem," Ibid. 1693.—3. "Tractatus Medicus de Virtute Venenorum Medicâ,". Ibid. 1693, 1701.—4. "De Colica ſcorbutica," Ibid. 1696.—5. "Paradoxa Medica in quibus plurima curioſa et utilia contra communes Medicorum Opiniones pertractantur," Ibid. 1699.—Eloy. Dict.

FRICENTI, in *Geography*, a town of Naples, in Principato Citra, the ſee of a biſhop, united with Avellino; 18 miles S.E. of Benevento. N. lat. 40° 59′. E. long. 15° 2′.

FRICHE, or FRISCHE, JAMES DU, in *Biography*, a learned French Benedictine monk, was born in Normandy in the year 1641. He embraced the eccleſiaſtical life, and purſued his ſtudies with ſo much diligence and ardour, that he was ſelected by his ſuperiors as a proper perſon for ſuperintending ſome of the noble editions of the fathers which they ſent into the world. He was fixed on to publiſh the works of St. Ambroſe, which appeared at Paris, in two volumes folio, in 1686, and, in 1690, enriched with notes, various readings, remarks, &c. Friche was afterwards employed to prepare for the preſs a new edition of the works of St. Gregory Nazianzen, but he died before he could complete his plan, which happened at Paris in 1693, when he was about fifty-two years of age. Friche was likewiſe author of the "Life of St. Auguſtine," prefixed to the Benedictine edition of the works of that father. He had likewiſe filled the profeſſorſhip of rhetoric at Thiron with much reputation. Moreri.

FRICIUM, of *frico*, *I rub*, in *Pharmacy*, a name given to ſuch medicines as are intended to be rubbed into the ſeveral parts of the body. The ancients had three kinds of fricia, the dry, the ſoft, and the liquid; the firſt was uſed in the way of fumigation, the ſecond was bound on the part with cloths, and the laſt was uſed by way of embrocation.

FRICKTHAL, in *Geography*, a diſtrict on the left bank of the Rhine, which the emperor of Germany agreed to cede to the French republic by the treaty of Campo Formio and that of Luneville.

FRICTION, in a general ſenſe, the act of rubbing or grating the ſurface of one body againſt that of another, called alſo *attrition*.

The phenomena ariſing upon the friction of divers bodies under different circumſtances, are very numerous and conſiderable.

Mr. Hawkſbee gives us a number of experiments of this kind; particularly of the attrition, or friction of glaſs, under various circumſtances, the reſult of which was, that it yielded light, and became electrical.

All bodies by friction are brought to conceive heat; many of them to emit light; particularly a cat's back, ſugar, beaten ſulphur, mercury, ſea-water, gold, copper, &c. but, above all, diamonds, which, when briſkly rubbed againſt glaſs, gold, or the like, yield a light equal to that of a live coal when blowed by the bellows. See ELECTRICS and ELECTRICITY.

FRICTION, in *Mechanics*, denotes the reſiſtance a moving body meets with from the ſurface on which it moves.

Friction ariſes from the roughneſs or aſperity of the ſurface of the body moved on, and that of the body moving; for ſuch ſurfaces conſiſting alternately of eminences and cavities, either the eminences of the one muſt be raiſed over thoſe of the other, or they muſt be both broke and worn off; but neither can happen without motion, nor can motion be produced without a force impreſſed. Hence, the force applied to move the body is either wholly, or partly, ſpent on this effect; and conſequently there ariſes a reſiſtance, or friction, which will be greater, *cæteris paribus*, as the eminences

nences are the greater, and the ſubſtance the harder: and as the body, by continual friction, becomes more and more poliſhed, the friction diminiſhes.

Hence it follows, that the ſurfaces of the parts of machines that touch each other ſhould be as ſmooth and poliſhed as poſſible. However, it is found by experience, that the flat ſurfaces of metals, or other bodies, may be ſo far poliſhed as to increaſe friction; becauſe the attraction of coheſion becomes ſenſible, as we bring the ſurfaces of bodies nearer and nearer to contact. But, as no body can be ſo much poliſhed, as quite to take away all inequality; witneſs thoſe numerous ridges diſcovered by the microſcope on the ſmootheſt ſurfaces; hence ariſes the neceſſity of anointing the parts that touch with oil, or ſome other fatty matter.

FRICTION, *Laws of.* 1. As the weight of a body moving on another is increaſed, ſo is the friction.

This we ſee experimentally in a balance, which, when only charged with a ſmall weight, eaſily turns; but with a greater, a greater force is required.

Hence, if the line of direction of a moving body be oblique to the ſurface moved on, the friction is the greater; this having the ſame effect as an increaſe of weight.

And hence, again, as a perpendicular ſtroke or impreſſion is to an oblique one, as the whole ſine to the ſine of the angle of incidence; and the ſine of a greater angle is greater, and that of a leſſer leſs; the friction is the greater, as the line of direction approaches nearer to a perpendicular.

This is eaſily obſervable, and eſpecially in the teeth of wheels, which are frequently broke on this very account. The friction, therefore, is taken away, if the line of direction of the moving body be parallel to the ſurface. The truth of this principle, that the friction is proportioned to the weight of the moving body, has been diſputed; and ſome objections have been urged againſt it, an account of which will be given in the ſequel of the article.

2. The friction is leſs in a body that rolls than it would be if the ſame body were to ſlide, as is eaſily demonſtrated. For ſuppoſe a dented ruler, A B, *Plate* XXIX. *Mechanics*, *fig.* 1. and ſuppoſe a wheel D E to move along with it, with its teeth perpendicular to the circumference; if now the body were to ſlide, the tooth F, when it touched the ruler, would deſcribe a right line on its ſurface, and, as the tooth of the ruler H reſiſts the ſame, it could not proceed without removing or breaking either the tooth H, or that at F. And the ſame will hold in the ſliding of any rough ſurface upon another, where the whole friction will take place that can any way ariſe from the roughneſs of the ſurface. But if the wheel E D roll along the ruler, then the tooth H will no longer reſiſt its motion, only as it is to be hoiſted out of the cavity F over the eminence of the tooth H; and the ſame holds in the rubbing of any rough body over the ſurface of another.

Hence, in machines, leſt the friction ſhould employ a great part of the power, care is to be taken, that no part of the machine ſlide along another, if it can be avoided; but rather that they roll, or turn upon each other. With this view it may be proper to lay the axes of cylinders, not as is uſually done, in a groove, or concave matrix, but between little wheels, A B C D, *fig.* 2. moveable on their reſpective axes; for by this contrivance, the friction is tranſferred from the circumference of thoſe wheels to their pivots; and the friction may be ſtill diminiſhed farther, by making the axles of thoſe wheels reſt upon other friction-wheels that turn round with them. This was long ago recommended by P. Caſatus; and experience confirms, that we ſave much power by it. Hence alſo it is, that a pulley moveable on its axis reſiſts leſs than if it were fixed. And the ſame may be obſerved of the wheels of coaches, and other carriages.

From theſe principles, with a little farther help from the higher geometry, Olaus Roemer determined the figure of the teeth of wheels, that ſhould make the leaſt reſiſtance poſſible, and which ſhould be epicycloidal. And the ſame was afterwards demonſtrated by De la Hire. See WHEELS and WHEEL-CARRIAGES.

Hence in ſawing mills, the ſides of the wooden rectangle the ſaws are fitted into ſhould be furniſhed with rotulæ, or little wheels, which would greatly leſſen the friction; and the like in other caſes.

FRICTION, *Calculation of the Quantity of.* The friction is a point of the utmoſt importance in machines; and by all means to be conſidered in calculating their force: yet it is generally overlooked in ſuch calculations: but this is principally becauſe its preciſe value is not known. It is not yet reduced to certain and infallible rules; ſince it depends upon the ſtructure of bodies, the form of their prominent parts and cavities, and upon their rigidity, their elaſticity, their coherence, and other circumſtances. The common method is, barely to compute the advantage which a moving power has from the machine; either on account of its diſtance from a fixed point; or of the direction in which it acts. And in all the demonſtrations it is ſuppoſed, that the ſurfaces of bodies are perfectly ſmooth and poliſhed. Indeed the engineers expect, that in the practice they ſhould loſe part of the advantage of their force by the friction; but how much, it is ſuppoſed, nothing but the practice can determine. M. Amontons, indeed, (Mem. de l'Acad. Royale des Sciences 1699), has made an attempt to ſettle, by experiment, a foundation for the preciſe calculation of the quantity of friction, and Mr. Parent has confirmed it from reaſoning and geometry; but their theory, however warranted, is not generally and fully received.

M. Amontons' principle is, that the friction of two bodies, or the reſiſtance oppoſed to the motion of a body upon an horizontal ſurface, depends on the weight, or force, with which they bear on each other; and only increaſes as the bodies are more ſtrongly preſſed, or applied, againſt each other, or are charged with a greater weight; and that it is a vulgar error, that the quantity of friction has any dependence on the extent of the ſurfaces rubbed againſt each other; or that the friction increaſes as the ſurfaces do. Thus if a piece of wood four inches wide and one inch thick be ground, and thereby made as exactly fit to the ſurface of another fixed piece of the ſame wood, it will acquire the ſame weight to draw it along on the ſame, whether it be laid on its broad or narrow ſide: for though on the broad ſide there be four times the number of touching particles (*cæteris paribus*), yet each particle is preſſed with but $\frac{1}{4}$ of the weight bearing on thoſe of the narrow ſide; and ſince four times the number multiplied by $\frac{1}{4}$ of the weight is equal to $\frac{1}{4}$ of the number multiplied by four times the weight, it is plain that the effect, that is, the reſiſtance, is equal in both caſes, and therefore requires the ſame force to overcome it.

Upon the firſt propoſal of this paradox, M. de la Hire had recourſe to experiments, which ſucceeded much in favour of the new ſyſtem. He laid ſeveral pieces of rough wood on a rough table; their ſizes were unequal; but he laid weights on them, ſo as to render them all equally heavy: and he found, that the ſame preciſe force, or weight, applied to them by a little pulley, was required to put each in motion, notwithſtanding all the inequality of the ſurfaces. The experiment ſucceeded in the ſame manner in pieces of marble, laid on a marble table. Upon this M. de

la Hire

la Hire betook himſelf to the rationale of the thing; and has given us a phyſical ſolution of the effect. And M. Amontons has ſettled a calculus of the value of friction; and the loſs ſuſtained by it in machines, on the foundation of the new principle.

In wood, iron, lead, and braſs, which are the principal materials uſed in machines, he finds the reſiſtance, cauſed by friction, to be nearly the ſame, when thoſe materials are anointed with oil, or other fatty matter; (but this fact has been diſputed by Muſchenbroek, and experiments urged in proof of the contrary:) and this reſiſtance, independent of the quantity of ſurface, he makes to be nearly equal to a third part of the force with which the bodies are preſſed againſt each other. Others have obſerved, that if the ſurfaces be hard and well poliſhed, the friction will be leſs than a third part of the weight; but if the parts be ſoft or rugged, it will be much greater. Let a very ſmooth cylinder of wood AB, *fig.* 3. be laid on two well-poliſhed and oiled or greaſed ſupporters C and D, and be charged with the weight of two pounds in the two equal balls G, H; it will require an additional weight x (equal to about a third part of the two pounds) to give motion to, or overcome the friction of the ſaid cylinder. But this additional weight, as it cauſes a greater preſſure of the cylinder, will increaſe the friction, and require the addition of another weight y, equal to a third part of its own; for the ſame reaſon the weight y will require another z a third part of two pounds, and ſo on *ad infinitum*.

Therefore, if the friction is preciſely equal to a third of the weight, the firſt weight, with all the additional ones, *viz.* 2, $\frac{2}{3}$, $\frac{2}{9}$, $\frac{2}{27}$, &c. will be a ſeries of numbers in geometrical progreſſion decreaſing: and the ſum of all theſe terms, omitting the firſt, *i. e.* the ſum of the infinite number of additional weights $x + y + z$, &c. equal to one pound: ſo that if the weight of the cylinder be inconſiderable, the way to overcome the friction will be to double the power G or H at once.

But if the cylinder moved on the two ſmall gudgeons E and F, or on a ſmall axis, the friction would be abated in the ſame proportion as the diameter of theſe gudgeons is leſs than the diameter of the cylinder, becauſe in this caſe the parts on which the cylinder moves and rubs will have leſs velocity than the power which moves it in the ſame proportion. See WHEEL *Carriages*.

Beſide the preſſion, the magnitude whereof determines that of the friction, there is another circumſtance to be conſidered, *viz.* the velocity. The friction is the greater, and the more difficult to ſurmount, as the parts are rubbed againſt each other with the greater ſwiftneſs; ſo that this velocity muſt be compared with that of the power neceſſary to move the machine, and overcome the friction. If the velocity of the power be double that of the parts rubbed, it acquires by that means an advantage that makes it double; or, which amounts to the ſame, it diminiſhes the contrary force of friction by one half; and reduces it to a ſixth part of the weight or preſſion. But this velocity M. Amontons only conſiders as a circumſtance that augments or diminiſhes the effect of the preſſion, *i. e.* the difficulty of the motion: ſo that the friction ſtill follows the proportion of the weight. Only, we are hereby directed to diſpoſe the parts of machines that rub againſt each other in ſuch a manner, as that they may have the leaſt velocity poſſible: and thus the diameter of the axis of a wheel ſhould be as ſmall as poſſible, with regard to that of the wheel; in that the leſſer the axis, the ſlower will be the motion of the ſurfaces rubbing againſt each other; ſince the velocity of a circular motion always goes diminiſhing from the circumference to the centre: and, for the ſame reaſon, the teeth of dented wheels ſhould be as ſmall and thin as poſſible; for a tooth catching on a notch, &c. rubs one of its ſides againſt a ſurface equal to its own; and is to diſengage itſelf, in a certain time, by paſſing over a ſpace equal to the ſurface; conſequently, the leſſer the ſurface, the leſs ſpace it has to move; the ſmallneſs of the ſurface diminiſhing the reſiſtance of the friction; not as it is a leſs ſurface that rubs, but as there is a leſs ſpace to move. The following general propoſition may be deduced from the preceding remarks, *viz.* That the reſiſtances ariſing from friction are to one another in a ratio compounded of the preſſures of the rubbing parts, and the times or velocities of their motions. The experiments of M. Amontons were confirmed by Boſſut and Belidor. (Archit. Hydraul. v. i. c. 2.) And thoſe of M. Bulfinger (Comment. Petropol. tom. ii.) furniſhed concluſions ſimilar to thoſe of Amontons, with this difference, that the reſiſtance of motion was equal to one-fourth of the force with which the rubbing ſurfaces were preſſed together. M. Parent, ſuggeſting that friction is occaſioned by ſmall ſpherical eminences in one ſurface being dragged out of correſponding ſpherical cavities in the other, propoſed to determine its quantity by finding the force which would move a ſphere ſtanding upon three equal ſpheres. Accordingly this force was found to be to the weight of the ſphere as ſeven to twenty, or nearly one-third of the ſphere's weight. (Recherches de Mathem. et Phyſ. 1713. tom. ii.) In inveſtigating the phenomena of friction, M. Parent placed the body upon an inclined plane, and augmented or diminiſhed the angle of inclination till the body had a tendency to move, and the angle at which the motion commenced, he called the angle of equilibrium. The weight of the body, therefore, will be to its friction upon the inclined plane as radius to the ſine of the angle of equilibrium, and its weight will be to the friction on an horizontal plane, as radius to the tangent of the angle of equilibrium. (Mem. de l'Academ. 1704.) The celebrated Euler ſeems to have adopted the hypotheſis of Bulfinger reſpecting the ratio of friction to the force of preſſion; and in two curious diſſertations, publiſhed by him on this ſubject, he has ſuggeſted many important obſervations, which have engaged the attention of profeſſor Vince. (Sur le Frottement des Corps Solides; and Sur la Diminution de la Reſiſtance du Frottement, publiſhed in the Memoires de l'Acad. Roy. des Sec. à Berlin. ann. 1748.) He obſerves, that when a body is in motion, the effect of friction will be only one-half of what it is when the body has begun to move; and he ſhews, that if the angle of an inclined plane be gradually increaſed till the body which is placed upon it begins to deſcend, the friction of the body at the commencement of its motion will be to its weight or preſſure upon the plane, as the ſine of the plane's elevation is to its coſine, or as the tangent of the ſame angle is to radius, or as the height of the plane is to its length. But when the body is in motion, the friction is diminiſhed, and may be found by the following equation, $\mu = \text{tang. } a \frac{m}{15623\, n\, n \text{ cof. } a}$; in which μ is the quantity of friction, the weight or preſſure of the body being $= 1$, a is the angle of the plane's inclination, m is the length of the plane in 1000dth parts of a Rhinland foot, and n the time of the body's deſcent. As to the cauſe of friction, Euler nearly agrees with Parent; with this difference, that inſtead of regarding the eminences and correſponding depreſſions as ſpherical, he ſuppoſes them to be angular, and imagines the friction to ariſe from the body's aſcending a perpetual ſucceſſion of inclined planes.

Notwithſtanding all the confirmations and illuſtrations of the

the theory of friction propoſed by Amontons, neither the public, nor even the academy itſelf where it was propoſed, could be brought fully to acquieſce in it. Muſchenbroek and the abbé Nollet have concluded from experiments that the friction of bodies depends on the quantity of their ſurface as well as their weight. (Introd. ad Phil. Nat. vol. i. cap. 9. and Lect. Phyſ. Exp. tom. i. p. 241.) Nollet (Leçons de Phyſique, tom. iii.) and Boſſut (Traité Elementaire de Mecanique, § 3067.) have diſtinguiſhed friction into two kinds, that which ariſes from one ſurface being dragged over another, and that which is occaſioned by one body rolling over another. The reſiſtance in the firſt caſe is greater than that in the ſecond; and it appears from the experiments of Muſchenbroek and others, that when a body is carried along with an uniformly accelerated motion, and retarded by the firſt kind of friction, the ſpaces are ſtill proportional to the ſquares of the times; but when the motion is effected by the ſame kind of friction, this proportionality between the ſpaces and the times of their deſcription does not obtain.

The above recited hypotheſis of M. Amontons has been adopted and confirmed by M. Camus, Deſaguliers, Ferguſon and others. Mr. Ferguſon found that the quantity of friction was always proportionable to the weight of the rubbing body, and not to the quantity of ſurface; and that it increaſed with an increaſe of velocity, but was not proportioned to the augmentation of celerity. He found alſo that the friction of ſmooth ſoft wood, moving upon ſmooth ſoft wood, was equal to $\frac{1}{3}$ of the weight; of rough wood upon rough wood $\frac{1}{2}$ of the weight; of ſoft wood upon hard, or hard upon ſoft, $\frac{1}{5}$ of the weight; of poliſhed ſteel upon poliſhed ſteel or pewter, $\frac{1}{4}$ of the weight; of poliſhed ſteel upon copper, $\frac{1}{5}$, and of poliſhed ſteel upon braſs $\frac{1}{6}$ of the weight. (See Ferguſon's Tables and Tracts.)

Mr. Emerſon, in his Principles of Mechanics, deduces from experiments the following remarks relating to the quantity of friction: when a cubic piece of ſoft wood of eight pounds weight moves upon a ſmooth plane of ſoft wood, at the rate of three feet per ſecond, its friction is about one third of the weight; but if it be rough, the friction is little leſs than half the weight: on the ſame ſuppoſition, when both the pieces of wood are very ſmooth, the friction is about one-fourth of the weight; the friction of ſoft wood on hard, or of hard wood upon ſoft, is one-fifth or one half of the weight; of hard wood upon hard wood one-ſeventh or one-eighth; of poliſhed ſteel moving on ſteel or pewter, one-fourth; moving on copper or lead, one-fifth of the weight. He obſerves in general, that metals of the ſame ſort have more friction than thoſe of different ſorts; that lead makes much reſiſtance; that iron or ſteel running in braſs makes the leaſt friction of any; and that metals oiled make the friction leſs than when poliſhed, and twice as little as when unpoliſhed. Deſaguliers obſerves that, in Monſ. Camus's experiments on ſmall models of ſledges in actual motion, there are more caſes wherein the friction is leſs than where it is more than one-third of the weight. See a table, exhibiting the friction between various ſubſtances, formed from his experiments in Deſ. Exp. Phil. vol. i. p. 193. See alſo his Account of the Friction of Engines, Carriages, &c. p. 133—138. p. 154—182. p. 458—460.

In order to eſtimate the quantity of friction in any engine, begin at the power and conſider the velocity and the weight at the firſt rubbing part, and determine the quantity of friction by the foregoing principles; then proceed to the next rubbing part, finding the friction there, &c.

There is ſcarcely any ſubject or experiment, with regard to which different perſons have formed ſuch various concluſions, ſo that the nature and laws of friction are not yet ſufficiently clear and deciſive. It is granted that the preſſion has a great effect, and is, in many caſes, the only thing to be conſidered in friction; but it will be hard to perſuade us abſolutely to exclude the conſideration of the ſurface.

If two bodies, with plain ſurfaces, ſuppoſed infinitely hard, and poliſhed, be moved along each other, the friction will be none, or infinitely ſmall; but if, in lieu of ſuch ſuppoſition, which has no place in nature, we ſuppoſe two bodies, with rough, uneven ſurfaces, the difficulty of moving one of them on the other muſt either ariſe from this; that the firſt is to be raiſed, in order to diſengage the parts catched or locked in the ſecond; or that the parts muſt be broken, and worn off; or both.

In the firſt caſe, the difficulty of raiſing one of the bodies makes that of the motion; and of conſequence the friction ariſes wholly from the weight, or preſſion; and the ſurface has nothing to do in it.

In the ſecond caſe, the magnitude of the ſurface would be all; were it poſſible this ſecond caſe could be abſolutely abſtracted from the firſt, *i. e.* could the parts of one body be rubbed and worn againſt thoſe of the other, without raiſing one of them; it being viſible, that a greater number of parts to be broken would make a greater reſiſtance than a leſs: but as in practice we never rub, or grind, without raiſing the body, the reſiſtance ariſing from the greatneſs of the ſurface in the ſecond caſe, is always combined with that from the preſſion; whereas, in the former caſe, that ariſing from the preſſion may be alone and uncompounded.

Add, that what is worn off a body is ordinarily very little, with regard to the great number of times the body muſt have been raiſed during the friction, and all the little heights added together, which the body muſt have been raiſed to.

Hence, as the reſiſtance from preſſion may be ſingle; and as the ſame always accompanies that ariſing from the magnitude of the ſurfaces, and is uſually much the more conſiderable of the two, when it does accompany it; for theſe reaſons, in moſt of the experiments that are made, it is the only one perceived, and the only one that needs to be conſidered.

But then, as it is poſſible, in certain caſes, for the preſſion to be very ſlender, and the number of parts to be rubbed very great, it muſt be owned there are caſes wherein the friction follows, very ſenſibly, the proportion of the ſurfaces.

The ſubject of friction is of ſuch importance in its relation to the conſtruction and uſe of various machines, that we think it needleſs to make any apology for extending this article, ſo as to comprehend ſome more recent facts and obſervations, which may enable thoſe whom it more immediately concerns to form a juſt eſtimate of its quantity, and to obviate its effects. The ingenious Mr. Vince of Cambridge has lately directed his attention to this intereſting ſubject; and communicated to the Royal Society an elaborate paper, containing a great number of experiments and of concluſions that are deduced from them, which merit particular notice. A minute detail would far exceed our limits; and, therefore referring our readers to the 75th volume of the Philoſophical Tranſactions, we muſt content ourſelves with briefly ſtating the general reſult of the whole. Mr. Vince found, by deduction from his experiments, that the friction of hard bodies in motion is an uniformly retarding force; and that the quantity of it is conſidered as *equivalent*

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to a weight drawing the body backwards on the horizontal plane, or acting contrary to the moving force, is equal to $M - \frac{M \times W \times S}{r t^2}$; where M is the moving force expreſſed by its weight, W the weight of the body upon the horizontal plane, S the ſpace through which the moving force or weight deſcended in the time t expreſſed in ſeconds, and $r = 16\frac{1}{2}$ feet, the meaſure of the force of gravity. He alſo found that the quantity of friction increaſes in a leſs ratio than the quantity of matter or weight of the body; and that the friction of a body does not continue the ſame when it has different ſurfaces applied to the plane on which it moves, but that the ſmalleſt ſurfaces will have the leaſt friction. To the experiments inſtituted by Mr. Ferguſon and others, from which concluſions have been drawn ſo different from theſe, Mr. Vince makes the following objections; it was their object to determine what moving force would *juſt* put a body at reſt in motion; and having, as they thought, found it, they thence concluded, that the accelerative force was then equal to the friction. But it is manifeſt, as Mr. Vince obſerves, that any force which will put a body in motion muſt be *greater* than the force which oppoſes its motion, otherwiſe it would not overcome it; and hence, if there were no other objection but this, it is evident that the friction could not be very accurately obtained. Beſides, there is another objection which totally deſtroys the experiment ſo far as it tends to ſhew the quantity of friction, which is the ſtrong coheſion of the body to the plane when it lies at reſt; and this is confirmed by the following experiments: 1ſt, a body of $12\frac{3}{4}$ oz. was laid upon an horizontal plane, and then loaded with a weight of 8lb. and ſuch a moving force was applied as would, when the body was *juſt put* in motion, continue that motion without any acceleration; in which caſe the friction muſt be juſt equal to the accelerative force. The body was then ſtopped, when it appeared that the ſame moving force which had *kept* the body in motion before, would not *put* it in motion, and it was found neceſſary to take off, $4\frac{1}{2}$ oz. from the body before the ſame moving force *would put* it in motion: whence it appears that this body when laid upon the plane, at reſt, acquired a very ſtrong adheſion to it. 2dly. A body whoſe weight was 16 oz. was laid at reſt upon the horizontal plane, and it was found that a moving force of 6 oz. would juſt *put* it in motion, but that a moving force of 4 oz. *would*, when it was juſt put in motion, *continue* that motion without any acceleration, and therefore the accelerative force muſt *then* have been equal to the friction, and not when the moving force of 6 oz. was applied. From theſe experiments it appears, how very conſiderable the coheſion was in proportion to the friction when the body was in motion: it being, in the latter caſe, almoſt one-third, and in the former it was found to be very nearly equal to the whole friction. All the concluſions, therefore, deduced from the experiments which have been inſtituted to determine the friction from the force neceſſary to *put* a body in motion, have manifeſtly been totally falſe; as ſuch experiments only ſhew the reſiſtance which ariſes from the coheſion and friction jointly.

After all theſe details we muſt recur to the experiments and reaſoning of M. Coulomb for an accurate and ſatisfactory view of this complicated part of mechanical philoſophy. His experiments were conducted on a large ſcale, with large bodies and heavy weights, ſo that he was thus enabled not only to correct the errors which unavoidably aroſe from the limited experiments of preceding writers, but to diſcover new phenomena, while he confirmed other concluſions, which had before been partially eſtabliſhed. We ſhall here avail ourſelves of the reſults of his experiments, as they are preſented in an abridged form to the reader by Dr. Brewſter in his edition of Ferguſon's Mechanics, vol. ii. and refer for a fuller account to the "Journal de Phyſique" for Sept. and Oct. 1785, vol. xxvii. p. 206—282, &c.

1. The friction of homogeneous bodies, or bodies of the ſame kind moving upon one another, is generally ſuppoſed to be greater than that of heterogeneous bodies. This was the opinion of Muſchenbroek, Krafft, Camus, and Boſſut. But Coulomb has ſhewn that there are exceptions to this rule. He found, for example, that the friction of oak upon oak was equal to $\frac{1}{2 \cdot 34}$ of the force of preſſion; the friction of pine againſt pine was $\frac{1}{1 \cdot 78}$, and of oak againſt pine $\frac{1}{1 \cdot 5}$. The friction of oak againſt copper was $\frac{1}{5 \cdot 5}$, and that of oak againſt iron nearly the ſame.

2. It was generally ſuppoſed, that in the caſe of wood, the friction is greateſt when the bodies are dragged contrary to the courſe of their fibres. Muſchenbroek, Introductio ad Philoſoph. Nat. § 513, &c. But Coulomb has ſhewn that the friction is in this caſe ſometimes the ſmalleſt. When the bodies moved in the direction of their fibres the friction was $\frac{1}{2 \cdot 34}$ of the fibres with which they were preſſed together; but when the motion was contrary to the courſe of the fibres, the friction was only $\frac{1}{3 \cdot 76}$.

3. The longer the rubbing ſurfaces remain in contact, the greater is their friction. This is mentioned by Boſſut, Traite de Mecanique, § 310; but Coulomb has the merit of having eſtabliſhed the fact.—When wood was moved upon wood, according to the direction of the fibres, the friction was increaſed by keeping the ſurfaces in contact for a few ſeconds; and when the time was prolonged to a minute, the friction ſeemed to have reached its fartheſt limit. But when the motion was performed contrary to the courſe of the fibres, a greater time was neceſſary before the friction arrived at its maximum. When wood was moved upon metal, the friction did not attain its maximum till the ſurfaces continued in contact for five or ſix days; and it is very remarkable, that when wooden ſurfaces were anointed with tallow, the time requiſite for producing the greateſt quantity of friction is increaſed. The increaſe of friction which is generated by prolonging the time of contact is ſo great, that a body weighing 1650 pounds was moved with a force of 64 pounds when firſt laid upon its correſponding ſurface. After having remained in contact for the ſpace of three ſeconds, it required 160 pounds to put it in motion, and when the time was prolonged to ſix days, it could ſcarcely be moved with a force of 622 pounds. When the ſurfaces of metallic bodies were moved upon one another, the time of producing a maximum of friction was not changed by the interpoſition of olive oil; it was increaſed, however, by employing ſwines greaſe as an unguent, and was prolonged to five or ſix days by beſmearing the ſurfaces with tallow.

4. Friction is in general proportional to the force with which the rubbing ſurfaces are preſſed together; and is, for the moſt part, equal to between $\frac{1}{2}$ and $\frac{1}{4}$ of that force.—In order to prove the firſt part of this propoſition, Coulomb employed a large piece of wood, whoſe ſurface contained three ſquare feet, and loaded it ſucceſſively with 74 pounds, 874 pounds, and 2474 pounds. In theſe caſes the friction was ſucceſſively $\frac{1}{2 \cdot 46}$, $\frac{1}{2 \cdot 16}$, $\frac{1}{2 \cdot 21}$ of the force of preſſion;

preſſion; and when a leſs ſurface and other weights were uſed, the friction was $\frac{1}{2.36}$, $\frac{1}{2.42}$, $\frac{1}{2.40}$. Similar reſults were obtained in all Coulomb's experiments, even when metallic ſurfaces were employed. The ſecond part of the propoſition has alſo been eſtabliſhed by Coulomb. He found that the greateſt friction is engendered when oak moves upon pine, and that it amounts to $\frac{1}{1.78}$ of the force of preſſion; on the contrary, when iron moves upon braſs, the leaſt friction is produced, and it amounts to $\frac{1}{4}$ of the force of preſſion.

5. Friction is in general not increaſed by augmenting the rubbing ſurfaces. Muſchenbroek and Nollet entertained the oppoſite opinion. The experiments of Krafft coincide with thoſe of Coulomb. See Commentarii Petropolitanæ, tom. xii. p. 266, § 19, 20, &c.—When a ſuperficies of three feet ſquare was employed, the friction, with different weights, was $\frac{1}{2.28}$ at a medium; but when a ſmaller ſurface was uſed, the friction, inſtead of being greater, as might have been expected, was only $\frac{1}{2.39}$.

6. Friction for the moſt part is not augmented by an increaſe of velocity. In ſome caſes, however, it is diminiſhed by an augmentation of celerity.—M. Coulomb found, that when wood moved upon wood in the direction of the fibres, the friction was a conſtant quantity, however much the velocity was varied; but that when the ſurfaces were very ſmall in reſpect to the force with which they were preſſed, *the friction was diminiſhed by augmenting the rapidity:* the friction, on the contrary, was increaſed when the ſurfaces were very large when compared with the force of preſſion. When the wood was moved contrary to the direction of its fibres, the friction in every caſe remained the ſame. If wood is moved upon metals, the friction is greatly increaſed by an increaſe of velocity; and when metals move upon wood beſmeared with tallow, the friction is ſtill augmented by adding to the velocity. When metals move upon metals, the friction is always a conſtant quantity; but when heterogeneous ſubſtances are employed which are not bedaubed with tallow, the friction is ſo increaſed with the velocity, as to form an arithmetical progreſſion when the velocities form a geometrical one.

7. The friction of loaded cylinders rolling upon a horizontal plane is in the direct ratio of their weights, and the inverſe ratio of their diameters. In Coulomb's experiments, the friction of cylinders of guaiacum wood, which were two inches in diameter, and were loaded with 1000 pounds, was 18 pounds or $\frac{1}{56}$ of the force of preſſion. In cylinders of elm, the friction was greater by $\frac{2}{5}$, and was ſcarcely diminiſhed by the interpoſition of tallow.

From a variety of experiments on the friction of the axes of pullies, Coulomb obtained the following reſults.—When an iron axle moved in a braſs buſh or bed, the friction was $\frac{1}{5}$ of the preſſion; but when the buſh was beſmeared with very clean tallow, the friction was only $\frac{1}{11}$, when ſwine's greaſe was interpoſed, the friction amounted to $\frac{1}{8.5}$, and when olive oil was employed as an unguent, the friction was never leſs than $\frac{1}{9}$ or $\frac{1}{7.5}$. When the axis was of green oak, and the buſh of guaiacum wood, the friction was $\frac{1}{26}$ when tallow was interpoſed; but when the tallow was removed ſo that a ſmall quantity of greaſe only covered the ſurface, the friction was increaſed to $\frac{1}{17}$. When the buſh was made of elm, the friction was in ſimilar circumſtances $\frac{1}{31}$ and $\frac{1}{20}$ which is the leaſt of all. If the axis be made of box, and the buſh of guaiacum wood, the friction was $\frac{1}{21}$ and $\frac{1}{14}$, circumſtances being the ſame as before. If the axle be of boxwood, and the buſh of elm, the friction will be $\frac{1}{29}$ and $\frac{1}{25}$; and if the axle be of iron and the buſh of elm, the friction will be $\frac{1}{26}$ of the force of preſſion.

The cauſe of friction is well illuſtrated by Mr. John Leſlie, profeſſor of mathematics in the univerſity of Edinburgh. (See his valuable work on the nature and propagation of heat, chap. xv. p. 299, &c.) "If the two ſurfaces," ſays this ingenious writer, "which rub againſt each other are rough and uneven, there is a neceſſary waſte of force, occaſioned by the grinding and abraſion of their prominences. But friction ſubſiſts after the contiguous ſurfaces are worked down as regular and ſmooth as poſſible. In fact, the moſt elaborate poliſh can operate no other change than to diminiſh the ſize of the natural aſperities. The ſurface of a body, being moulded by its internal ſtructure, muſt evidently be furrowed, or toothed, or ſerrated. Friction is, therefore, commonly explained on the principle of the inclined plane, from the effort required to make the incumbent weight mount over a ſucceſſion of eminences. But this explication, however currently repeated, is quite inſufficient. The maſs which is drawn along is not continually aſcending; it muſt alternately riſe and fall: for each ſuperficial prominence will have a correſponding cavity; and ſince the boundary of contact is ſuppoſed to be horizontal, the total elevations will be equalled by their collateral depreſſions. Conſequently, if the lateral force might ſuffer a perpetual diminution in lifting up the weight, it would, the next moment, receive an equal increaſe by letting it down again; and thoſe oppoſite effects, deſtroying each other, could have no influence whatever on the general motion.

"Adheſion ſeems ſtill leſs capable of accounting for the origin of friction. A perpendicular force acting on a ſolid can evidently have no effect to impede its progreſs; and though this lateral force, owing to the unavoidable inequalities of contact, may be ſubject to a certain irregular obliquity, the balance of chances muſt, on the whole, have the ſame tendency to accelerate, as to retard, the motion. If the conterminous ſurfaces were, therefore, to remain abſolutely paſſive, no friction could ever ariſe. Its exiſtence demonſtrates an unceaſing mutual change of figure, the oppoſite planes, during the paſſage, continually ſeeking to accommodate themſelves to all the minute and accidental varieties of contact. The one ſurface, being preſſed againſt the other, becomes, as it were, compactly indented, by protruding ſome points and retracting others. This adaptation is not accompliſhed inſtantaneouſly, but requires very different periods to attain its *maximum*, according to the nature and relation of the ſubſtances concerned. In ſome caſes a few ſeconds are ſufficient, in others, the full effect is not produced till after the lapſe of ſeveral days. While the incumbent maſs is drawn along, at every ſtage of its advance, it changes its external configuration, and approaches more or leſs towards a ſtrict contiguity with the under ſurface. Hence the effort required to put it firſt in motion, and hence too, the decreaſed meaſure of friction, which, if not deranged by adventitious cauſes, attends generally an augmented rapidity. This appears clearly eſtabliſhed by the curious experiments of Coulomb, the moſt original and valuable which have been made on that intereſting ſubject. Friction conſiſts in the force expended to raiſe continually the ſurface of preſſure by an oblique action. The upper ſurface travels over a perpetual ſyſtem of inclined planes;

but that ſyſtem is ever changing, with alternate inverſion. In this act, the incumbent weight makes inceſſant, yet unavailing efforts to aſcend: for the moment it has gained the ſummits of the ſuperficial prominences, theſe ſink down beneath it, and the adjoining cavities ſtart up into elevations, preſenting a new ſeries of obſtacles which are again to be ſurmounted; and thus the labours of Siſiphus are realized in the phenomena of friction.

"The degree of friction muſt evidently depend on the angles of the natural protuberances, and which are determined by the elementary ſtructure or the mutual relation of the two approximate ſubſtances. The effect of poliſhing is only to abridge thoſe aſperities and increaſe their number, without altering in any reſpect their curvature or inflexions. The conſtant or ſucceſſive acclivity produced by the ever-varying adaptation of the contiguous ſurfaces remains, therefore, the ſame, and conſequently the expenſe of force will ſtill amount to the ſame proportion of the preſſure. The intervention of a coat of oil, ſoap, or tallow, by readily accommodating itſelf to the variations of contact, muſt tend to equalize it, and therefore muſt leſſen the angles, or ſoften the contour, of the ſucceſſively emerging prominences, and thus diminiſh likewiſe the friction which thence reſults."

In order to diminiſh the reſiſtance which friction occaſions in machines, that ſpecies of friction which ariſes from one body being dragged over another has been converted into that which is occaſioned by one body rolling upon another. This may be eaſily effected in the manner already mentioned in the beginning of this article, by applying wheels or rollers to the ſockets or buſhes which ſuſtain the gudgeons of large wheels, and the axles of wheel-carriages. This apparatus ſeems to have been firſt recommended by Caſatus (Mechan. l. ii. cap. 1.); and it was afterwards mentioned by Sturmius (Miſcell. Berol. tom. i. p. 306.) and Wolfius (Op. Mathem. tom. ii. p. 680.); but it was not uſed in practice till Sully applied it to clocks in the year 1716, and Mondran to cranes in 1725. However, friction-wheels were not much regarded till the celebrated Euler accurately explained their nature and advantages. (See Mem. de l'Acad. de Berlin 1743.)

The diameter of the gudgeons and pivots ſhould be made as ſmall as the weight of the wheel and the impelling force will permit. The gudgeons ſhould reſt upon two wheels as large as circumſtances will allow, having their axes as near each other as poſſible, but no thicker than what is abſolutely neceſſary to ſuſtain the ſuperincumbent weight. When theſe precautions are properly attended to, the reſiſtance which ariſes from the friction of the gudgeons, &c. will be extremely trifling. The effects of friction may likewiſe in ſome meaſure be removed by a judicious application of the impelling power, and by proportioning the ſize of the friction-wheels to the preſſure which they ſeverally ſuſtain. If we ſuppoſe, for example, that the weight of a wheel, whoſe iron gudgeons move in buſhes of braſs, is 100 pounds; then the friction ariſing from both its gudgeons will be equivalent to 25 pounds. If we ſuppoſe alſo that a force equal to 40 pounds is employed to impel the wheel, and acts in the direction of gravity, as in the caſe of overſhot wheels, the preſſure of the gudgeons upon their ſupports will thus be 140 pounds and the friction 35 pounds. But if the force of 40 pounds could be applied in ſuch a manner as to act in direct oppoſition to the wheel's weight, the preſſure of the gudgeons upon their ſupports would be 100—40, or 60 pounds, and the friction only 15 pounds. It is impoſſible indeed to make the moving force act in direct oppoſition to the gravity of the wheel, in the caſe of water-mills; and it is often impracticable for the engineer to apply the impelling power but in a given way; but there are many caſes in which the moving force may be ſo exerted, as at leaſt not to increaſe the friction which ariſes from the wheel's weight.

When the moving force is not exerted in a perpendicular direction, but obliquely, as in underſhot wheels, the gudgeon will preſs with greater force on one part of the ſocket than on any other part. This point will evidently be on the ſide of the buſh oppoſite to that where the power is applied, and its diſtance from the loweſt point of the ſocket, which is ſuppoſed circular and concentric with the gudgeon, being called x, we ſhall have tang. $x = \frac{H}{V}$, that is, the tangent of the arc contained between the point of greateſt preſſure and the loweſt point of the buſh, is equal to the ſum of all the horizontal forces, divided by the ſum of all the vertical forces and the weight of the wheel, H repreſenting the former, and V the latter quantities. The point of greateſt preſſure being thus determined, the gudgeon muſt be ſupported at that part by the largeſt friction-wheel, in order to equalize the friction upon their axles.

In the two following caſes friction-wheels have been ſucceſsfully employed. Mr. Gottlieb, the conſtructor of a new crane, has received a patent for what he calls an anti-attrition axle-tree, the beneficial effects of which he has aſcertained by a variety of trials. It conſiſts of a ſteel roller about four or ſix inches long, which turns within a groove cut in the inferior part of the axle. When wheel-carriages are at reſt, Mr. Gottlieb has given the friction-wheel its proper poſition; but it is evident that the point of greateſt preſſure will change when they are put in motion, and will be nearer the front of the carriage. This point, however, will vary with the weight of the load; but it is ſufficiently obvious that the friction-roller ſhould be at a little diſtance from the loweſt point of the axle-tree.

Mr. Gamett of Briſtol has applied friction-rollers in a different manner, which does not, like the preceding method, weaken the axle-tree. Inſtead of fixing the rollers in the iron part of the axle, he leaves a ſpace between the nave and the axis to be filled with equal rollers almoſt touching each other. The axes of theſe rollers are inſerted in a circular ring at each end of the nave, and theſe rings, and conſequently the rollers, are kept ſeparate and parallel by means of ſmall bolts paſſing between the rollers from one ſide of the nave to the other.

In wheel-carriages conſtructed in the common manner, with conical rims, there is a great degree of reſiſtance occaſioned by the friction of the linch pins on the external part of the nave, which the ingenious mechanic may eaſily remove by a judicious application of the preceding principles.

As it appears from the experiments of Ferguſon and Coulomb, that the leaſt friction is generated when poliſhed iron moves upon braſs, the gudgeons and pivots of wheels, and the axles of friction-rollers, ſhould all be made of poliſhed iron, and the buſhes in which theſe gudgeons move, and the friction-wheels, ſhould be formed of poliſhed braſs. M. de la Hire recommends the ſockets or buſhes to be made ſquare and not concave.

When every mechanical contrivance has been adopted for diminiſhing the obſtruction which ariſes from the attrition of the communicating parts, it may be ſtill farther removed by the judicious application of unguents. The moſt proper for this purpoſe are ſwine's greaſe and tallow, when the ſurfaces are made of wood, and oil when they are of metal. When the force with which the ſurfaces are preſſed together is very great, tallow will diminiſh the friction more than ſwine's greaſe. When the wooden ſurfaces are very ſmall, unguents will leſſen their friction a little, but it will be greatly

greatly diminiſhed if wood moves upon metal greaſed with tallow. If the velocities, however, are increaſed, or the unguent not often enough renewed, in both theſe caſes, but particularly in the laſt, the unguent will be more injurious than uſeful. The beſt mode of applying it, is to cover the rubbing ſurfaces with as thin a ſtratum as poſſible, for the friction will then be a conſtant quantity, and will not be increaſed by an augmentation of velocity.

In ſmall works of wood, the interpoſition of the powder of black lead has been found very uſeful in relieving the motion. The ropes of pulleys ſhould be rubbed with tallow, and whenever the ſcrew is uſed, the ſquare threads ſhould be preferred. (Ferguſon's Lectures by Brewſter, vol. ii.)

FRICTION-*wheels*. See the preceding article and WHEELS.

FRICTION *of the parts of Fluids*. See RESISTANCE and RETARDATION *of fluids*.

FRICTION *of Ropes*. See CORDAGE and ROPES.

FRICTION *of Wheel-carriages*. See WHEEL-*carriages*.

FRICTION, in *Medicine* and *Surgery*, the act of rubbing the ſurface of the body, whether with the hand only, with the fleſh-bruſh, flannel, or other ſubſtances, or with oils, ointments, or other medicinal matters, with a view to the preſervation of health, or to the removal of particular diſeaſes.

Friction appears to have been much employed by the ancients as a ſort of gentle exerciſe for the purpoſe of preſerving the health and ſtrength of the body; and many directions have been left us by the phyſicians with reſpect to the times and modes of employing it, adapted to particular circumſtances. But, on the whole, theſe directions appear to be fanciful, and of little practical utility. (See Oribaſius, Medicin. Collect. lib. vi. cap. 13. 16—20.) Friction is conſidered by this author as chiefly efficacious in removing languor and laſſitude, and ſtrengthening the digeſtive powers, and the animal ſolids in general. It is recommended to be employed previous to any active exerciſe, with a view of ſoftening the muſcular parts and the ſkin, that they may not be ruptured or torn during the exertions (loc. cit. cap. 13, de frictione præparante); and again at the concluſion of active exerciſe, in order to remove the ſenſations of laſſitude, and to purge off all excrementitious matters. (Loc. cit. cap. 16. de apotherapia frictione.) We are told likewiſe that by hard rubbing the body is rendered firm; by gentle friction it is ſoftened; by frequent and long continued friction it is extenuated; and by a moderate degree the bulk is encreaſed. (Cap. 17.)

It cannot be queſtioned, that friction on the ſurface of the body produces an effect ſimilar to that of gentle exerciſe: it tends to excite the circulation through the veſſels of the ſkin, and conſequently through the reſt of the vaſcular ſyſtem; whence all the functions are more perfectly performed; the ſecretions are more freely elaborated; the appetite, therefore, is augmented; the digeſtion more completely effected, and the excretions, eſpecially that of perſpiration, more perfectly thrown off. (See EXERCISE.) In delicate habits the uſe of the fleſh-bruſh, or gentle rubbing with the hand, until ſome degree of glow is produced on the ſurface, may contribute, therefore, like riding or other ſpecies of geſtation, to ſupport or improve the health. The wholeſome effects of friction are well illuſtrated by the advantages of currying horſes: the benefits derived from it in theſe animals are generally conſidered as equivalent to half the feeding.

In this country, however, the principal employment of friction is directed to the cure rather than to the prevention of diſeaſes; and is generally accompanied by the uſe of ſome ſpecies of medicated oil, ointment, or lotion. Theſe auxiliaries are ſometimes poſſeſſed of medicinal qualities, which add to the efficacy of the friction; ſuch as the volatile or other ſtimulating liniments by which the vaſcular action of the part affected is more ſpeedily excited; but frequently they are of no eſſential ſervice, and are preſcribed partly to facilitate the proceſs of rubbing, by lubricating the parts, and partly to induce the patient and his attendants to perſevere in the practice of friction, who are too apt to ſuppoſe that the friction itſelf is uſeleſs, and to attribute the remedial effects to the lotion or liniment employed.

Friction is an efficacious remedy in ſeveral conditions of diſeaſe; particularly in chronic rheumatiſms of long ſtanding; in muſcular contractions, ſucceeding to rheumatiſm, &c. and connected often with effuſions of lymph; in ſome ſtates of paralyſis; in certain indolent tumours, &c. In theſe caſes, a variety of unguents and liniments is recommended; but the friction itſelf is the principal ſource of relief. In this manner a reſpectable practitioner in Oxfordſhire, Mr. Groſvenor, is ſaid to ſucceed in removing a number of diſeaſes, of the nature of thoſe juſt mentioned, by means of long continued friction with the hand alone: and an empiric of the name of Greatrakes, or Greatrix, formerly effected ſome cures that were deemed marvellous by this method of manual friction, which he called *ſtroaking*. (See Phil. Tranſ. No. 256.)

Friction is likewiſe employed with the view of introducing certain medicinal ſubſtances into the ſyſtem, through the medium of the abſorbent veſſels of the ſkin. Through theſe veſſels, which open upon the ſkin, but under the cuticle, the animal economy may be influenced by the peculiar properties of medicines; but friction is required to impel them through the inorganic pores of the ſcarf-ſkin, without which they are not abſorbed. In this way practitioners have been for a long time in the habit of employing one of the moſt active agents in the materia medica, *viz. mercury*, for the cure of the venereal diſeaſe. The advantages of this mode of impregnating the ſyſtem with mercury are very great in ſome conſtitutions; eſpecially in thoſe in which the ſmalleſt portion of mercury, conveyed into the inteſtines, acts as a purgative, and therefore cannot be thrown into the ſyſtem in ſufficient quantity to eradicate the diſeaſe, or without producing exceſſive miſchief by its cathartic operation. When the medicine is conveyed into the circulation, by means of the cutaneous abſorbents, this effect upon the alimentary canal is avoided.

Another active and uſeful drug has alſo been advantageouſly conveyed into the ſyſtem by means of external friction; we mean *opium*. The attention of the profeſſion has been lately called to this mode of adminiſtering opium by Mr. Ward of Mancheſter; from whoſe experience, ſupported by that of the late Dr. Percival of the ſame place, it appears, that the principal untoward conſequences which occaſionally reſult from the internal adminiſtration of this narcotic drug, in particular conſtitutions, and in certain ſtates of diſeaſe, eſpecially its diſagreeable effects on the head and the ſtomach, are avoided by introducing it through the abſorbents of the ſkin. In ſome caſes, too, as in that of locked jaw, whether from tetanus or hyſteria, when the mouth is ſo firmly cloſed, that nothing can be made to paſs to the throat, the external friction with opium is the only practicable mode of adminiſtering this important remedy. Dr. Percival found that opium, thus uſed, gave relief to patients afflicted with ſome chronic and painful diſorders, without occaſioning the head-ache, giddineſs, and coſtiveneſs which the internal uſe of laudanum had previouſly produced. In ſeveral caſes of the delirium of typhous fever, and of mania, opium thus employed was very efficacious. It was ſuppoſed by ſome Italian phyſicians, who firſt reſorted to the uſe of opium by

external friction, that a mixture with ſome animal fluid, ſuch as the ſaliva or gaſtric juice, was requiſite for the abſorption of the drug. (See Duncan's Annals of Medicine for 1798.) But Mr. Ward found that the tincture of opium alone, or formed into a liniment by means of the yolk of eggs, &c. was well adapted for abſorption; and that from three to ſix drachms of the tincture of opium, according to the age of the patient and the ſeverity of the diſeaſe, may be rubbed upon the inſides of the arms, until the whole is abſorbed. Sometimes he uſed an ointment, conſiſting of one part of finely powdered opium, with four or five parts of hogs' lard, and one or two of olive oil; and he obſerved, that the ſmaller the quantity of unguent the better, provided the whole be made ſo ſmooth and ſoft, as not to occaſion any uneaſineſs by its tenacity in applying the neceſſary degree of friction. (See Ward on the Efficay of Opiate Friction in Spaſmodic and Febrile Diſeaſes, 1809.)

FRIDAU, in *Geography*, a town of Auſtria; 4 miles S. of St. Polten.

FRIDAW, a town of the duchy of Stiria; 104 miles S. of Vienna. N. lat. 46° 27'. E. long. 16° 10'.

FRIDAY, the ſixth day of the week, ſo called from Friga, a goddeſs worſhipped by the Saxons on this day. It is a faſt-day in the church of England, in memory of our Saviour's crucifixion, unleſs Chriſtmas-day happens to fall on Friday, which is always a feſtival.

FRIDAY, *Good*, See PASSION-*Week*.

FRIDBERG, in *Geography*, a town of the duchy of Stiria; 43 miles S. of Vienna. N. lat. 47° 27'. E. long. 15° 53'.—Alſo, a town of Bavaria; 4 miles S. E. of Augſburg. N. lat. 48° 17'. E. long. 10° 58'.—Alſo, a town of Germany, in the Wetheraw, on the Erbach; formerly an Imperial town, till, in 1802, it was given to the landgrave of Heſſe-Darmſtadt; 12 miles N. of Frankfort on the Mayn. N. lat. 52° 20'. E. long. 8° 41'.

FRIDEK, or FRIEDEK, a town and lordſhip of Sileſia, in the principality of Teſchen; 10 miles S. W. of Teſchen. N. lat. 49° 52'. E. long. 18° 28'.

FRIDERICKSBERG, a fort and ſettlement on the coaſt of Guinea; 70 miles from Cape Coaſt caſtle.

FRIDEWALDE, a town of Germany, in the county of Sayn, a fief of Heſſe-Darmſtadt; 9 miles S. of Siegen.—Alſo, a town of Germany, in the principality of Heſſe-Caſſel; 35 miles S. S. E. of Caſſel.

FRIDINGEN, a town of Auſtrian Swabia, on the Danube; 20 miles S. E. of Tubingen.

FRIDLAND, or FRIEDLAND, a town of Pruſſia, in the province of Natangen, on the left bank of the Alle; 28 miles S. E. of Konigſberg. N. lat. 54° 24'. E. long. 21° 10'.

FRIDMAN, a town of Hungary; 17 miles N. N. W. of Palotza.

FRIDO, a town of Naples, in the Baſilicata; 7 miles E.S.E. of Potenza.

FRIDSTOLL, or FRITHSTOW, of the Saxon *frid*, peace, and *ſtol*, ſeat, in our *Ancient Writers*, ſignifies a ſeat, chair, or place of peace, where criminals might find ſafety and protection.

In the charter of immunities confirmed to the church of St. Peter in York, Ann. 5 H. VII. it is explained by "Cathedra quietudinis & pacis."

Of theſe there were many in England: but the moſt famous was at Beverley, which had this inſcription, "Hæc ſedes lapidea *Freedſtol* dicitur, *i. e.* Pacis Cathedra ad quam reus fugiendo perveniens, omnimodam habet ſecuritatem." Camden.

FRIEDBERG, in *Geography*, a town of Sileſia, in the principality of Neiſſe, on the Neiſſe; 14 miles S.S.W. of Neiſſe, N. lat. 50° 5'. E. long. 16° 15'.—Alſo, a town of Sileſia, in the principality of Jauer, on the Queis; 30 miles W. of Jauer. N. lat. 50° 52'. E. long. 15° 27'.—Alſo, a town of Sileſia, in the principality of Schweidnitz; 10 miles N:W. of Schweidnitz.—Alſo, a Moravian ſettlement in America, ſituated in Wachovia, or Surry county, N. Carolina.

FRIEDEBERG, a town of Germany, in the New Mark of Brandenburg; 45 miles N.E. of Francfort on the Oder. N. lat. 52° 56'. E. long. 15° 40'.—Alſo, a town of Eaſt Frieſland; 22 miles E.N.E. of Emden. N. lat. 53° 36'. E. long. 7° 48'.

FRIEDELAND, or BRILAN, a town of Lower Luſatia, on the Spree; 12 miles N.W. of Guben. N. lat. 52° 7'. E. long. 14° 12'.

FRIEDELSHAUSEN, a town of Germany, in the county of Henneberg; 7 miles N.W. of Meinungen.

FRIEDENSHUTTEN, a Moravian ſettlement in America, whoſe name ſignifies "tents of peace," ſeated on Suſquehanna river in Pennſylvania, about 24 miles below Tioga point, eſtabliſhed in 1765.

FRIEDERICK's FIORD, a bay of Weſt Greenland. N. lat. 62° 12'. W. long. 48° 20'.

FRIEDERICKSTADT, a town on the W. coaſt of the iſland of Santa Cruz. N. lat. 17° 48'. W. long. 93° 25'.

FRIEDLAND, a town of Sileſia, in the principality of Schweidnitz; 16 miles S.W. of Schweidnitz. N. lat. 50° 27'. E. long. 16° 3'.—Alſo, a Moravian ſettlement of America, in Wachovia.

FRIEDLAND, a town of Moravia, in the circle of Olmutz; 18 miles N.N.E. of Olmutz.—Alſo, a town of Bohemia, in the circle of Boleſlaw; 9 miles N.E. of Krottau.—Alſo, a town of the duchy of Meeklenburg; 14 miles N.E. of New Brandenburg. N. lat. 53° 39'. E. long. 13° 30'.—Alſo, a town of Sileſia, in the principality of Oppeln, on the Steinau; 20 miles S.W. of Oppeln. N. lat. 50° 25'. E. long. 17° 30.

FRIEDLINGEN, or FRIDLINGEN, a town and fort of Germany, in the circle of Swabia, near the Rhine, between Huningue and Bâle.

FRIELED, a town of Sweden, in the province of Smaland; 33 miles N.W. of Wexio.

FRIENDLESS MAN, was the old Saxon name for him whom we call an outlaw.

The reaſon is, becauſe he was, upon his excluſion from the king's peace and protection, denied all help of friends, after certain days. "Nam foris fecit amicos."

FRIENDLY COVE, in *Geography*, a harbour in Nootka ſound, on the N.W. coaſt of America, where a ſettlement was formed, in 1788, by Mr. Meares, and ſome other Engliſhmen, for the purpoſe of carrying on the fur trade. As this ſettlement occaſioned a ſerious diſpute between Spain and England, and very nearly terminated in a war between the two countries; we ſhall here ſtate ſome particulars relating to it, as they were communicated to us both by Capt. Vancouver, in the year 1792, and by Mr. Duffin, ſupercargo on board one of Mr. Meares's veſſels. Towards the cloſe of the year 1787, two veſſels were equipped for the fur trade, by John Henry Cox and Company, merchants at Canton. The conduct of the expedition was committed to Mr. Meares, who was alſo a joint proprietor. Theſe veſſels ſailed, with a view of avoiding certain heavy dues, under Portugueſe colours, and under the firm of John Cavallo, eſq., a Portugueſe merchant at Macao; but the veſſels and their cargoes were wholly Britiſh property, and navigated by ſubjects of his Britannic majeſty. In May 1788, Mr. Meares

Meares arrived in one of theſe veſſels at Nootka, and going on ſhore he purchaſed of the two chiefs, Maquilla and Calicum, the whole of the land that forms Friendly Cove, Nootka ſound, in his Britannic majeſty's name, for eight or ten ſheets of copper, and ſome triſling articles. The natives were perfectly ſatisfied, and did homage to Mr. Meares, as their ſovereign, according to the cuſtom of their country; the Britiſh, and not the Portugueſe, flags being diſplayed on ſhore during theſe ſolemn tranſactions. In conſequence of this compact, Mr. Meares ſelected a convenient ſpot on which he erected a houſe and adjoining buildings, and at his departure committed the care of it to Maquilla till his return. Mr. Duffin, on his return in July 1789, found the Cove occupied by the ſubjects of his Catholic majeſty, and could perceive no veſtiges of Mr. Meares's houſe. On the ſpot where it had ſtood were tents and houſes belonging to ſome people of the Columbia, commanded by Mr. J. Kendrick, under the flag and protection of the United States of America; his Catholic majeſty's ſhips, Princeſſa and San Carlos were at anchor in Friendly Cove, together with the Columbia and Waſhington, American traders: on the ſecond day after their arrival they were captured by Don Martinez; and the Americans were ſuffered to carry on their commerce with the natives, without moleſtation. Such is the ſubſtance of Mr. Duffin's declaration, atteſted by oath. In 1791 captain Vancouver was ſent out by the court of Great Britain to take poſſeſſion of Nootka ſound, according to an agreement with the court of Spain, and he arrived at Friendly Cove in Auguſt 1792. Signor Quadra, the commander of Nootka ſound, was willing to ſurrender Friendly Cove, but not the whole of the ſettlement, thus imagining verbally to fulfil the agreement between the two crowns. Vancouver demurred and would not allow, that the ceſſion propoſed by Signor Quadra was that intended in his commiſſion; but that at leaſt the whole port of Nootka, of which his Majeſty's ſubjects had been forcibly diſpoſſeſſed, and at which they themſelves, their veſſels, and cargoes, had been captured, muſt have been the propoſed object of reſtitution. Under theſe impreſſions Vancouver declined acceding to the propoſals of Quadra, conceiving that if he did he ſhould betray the truſt with which he was honoured. He was afterwards confirmed in the opinion, that he thus purſued the conduct, which, however it might terminate, was not incompatible with the truſt committed to his charge and execution. N. lat. 49° 35'. E. long. 233° 30'. See NOOTKA *Sound*.

FRIENDLY *Iſlands*, a group of iſlands, forming a kind of Archipelago of very conſiderable extent, and conſiſting of more than 150 in number; ſituated in the Southern Pacific Ocean, between 19° 40' and 21° 30' S. lat. and between 184° 46' and 185° 45 E. long. Some of theſe iſlands were diſcovered by Taſman in January 1642—3; and two of them in particular were called by him Amſterdam and Middleburg; but the former is called by the natives Tongatabu, and the latter Ea-oo-wee. Theſe two iſlands are ſituated between the latitude of 21° 29' and 21° 3' S. and between the longitude of 174° 40' and 175° 15' W. They were viſited by captain Cook, in April 1773, and again in October 1777. (See AMSTERDAM and MIDDLEBURG.)

To this cluſter of iſlands Cook gave the name of the Friendly Iſlands, or Archipelago, from the firm alliance and friendſhip which ſeemed to ſubſiſt among their inhabitants, and from their courteous behaviour to ſtrangers. The ſtay which captain Cook made at the Friendly Iſlands on his ſecond viſit was between two and three months; during which time, ſome accidental differences excepted, the utmoſt cordiality ſubſiſted between the Engliſh and the natives. Theſe differences were never attended with any fatal conſequences; which happy circumſtance was principally owing to the unremitting attention of the captain, who directed all his meaſures with a view to the prevention of ſuch quarrels as would be injurious either to the inhabitants or to his own people. Whilſt our navigators continued at theſe iſlands, they expended very little of their ſea proviſions, ſubſiſting, in general, upon the produce of the country, and carrying away with them a quantity of refreſhments ſufficient to laſt till their arrival at another ſtation, where they could depend upon a freſh ſupply. The captain left with theſe hoſpitable Indians ſeveral animals that would be uſeful to them. Many advantages obviouſly reſulted from this viſit; beſides the immediate benefits which both the natives and the Engliſh derived from their mutual intercourſe, ſuch a large acceſſion was made to the geographical knowledge of this part of the Pacific ocean, as cannot fail to be of ſervice to future navigators.

Under the denomination of the Friendly Iſlands muſt be included not only the group at *Hapaee* (which ſee), but all thoſe iſlands that have been diſcovered nearly under the ſame meridian to the North, as well as ſome others, which, though they have never hitherto been ſeen by any European voyagers, are under the dominion of Tongataboo. From the information received by captain Cook, this Archipelago appears to be very extenſive; above 150 iſlands were reckoned up by the natives, who made uſe of bits of leaves to aſcertain their number; and Mr. Anderſon, with his uſual diligence, procured all their names. Fifteen of them are ſaid to be high or hilly, ſuch as Toofoa and Eooa; and 35 of them large. Concerning the ſize of the 32 which were unexplored, we can only ſtate, that they muſt be larger than Annamoka, which was reckoned among the ſmaller iſles. Several, indeed, of thoſe which belong to this latter denomination are mere ſpots without inhabitants. Sixty-one of theſe iſles have their proper places and names marked upon the chart of the Friendly Iſlands, and the ſketches of the harbour of Tongataboo, which are given in Cook's Third Voyage, (vol. iii.) captain Cook had not the leaſt doubt but that Prince William's Iſlands, diſcovered or named by Taſman, were comprehended in the liſt furniſhed by the natives. He had alſo good authority for believing, that Keppel's and Boſcawen's Iſlands, two of captain Wallis's diſcoveries in 1765, were included in the ſame liſt; and that they were under the ſovereignty of Tongataboo, which is the grand ſeat of government. It muſt be left to future navigators to extend the geography of this part of the South Pacific ocean, by aſcertaining the exact ſituation and ſize of nearly 100 iſlands in the neighbourhood, which captain Cook had no opportunity of exploring. The ſoil in theſe iſlands is fertile, and in ſome of them highly cultivated, which, conſidering the imperfection of the agricultural implements, muſt have been attended with great labour. This labour, however, is amply rewarded by great produce. No one wants the common neceſſaries of life; in every face are painted joy and contentment. An eaſy freedom prevails among all ranks of people: they feel no wants which they do not enjoy the means of ſupplying; and they live in a clime, where the painful extremes of heat and cold are equally unknown. If nature has been in any reſpect deficient in its bounty, it is in the article of freſh water, which, being ſhut up in the bowels of the earth, muſt be procured by digging. A running ſtream was not ſeen, and but one well, at Amſterdam. At Middleburg, no water was ſeen beſides that which the natives had in veſſels; but this was ſweet and cool. The government of theſe iſlands

ſeems

ſeems to be monarchical, reſembling that of Otaheite. The king, or great chief, who is here called Areeke, has other chiefs under him, who are lords of certain diſtricts, and perhaps ſole proprietors, to whom the people appear to pay great reſpect and obedience. There is alſo a third rank, which has no ſmall degree of authority over the common people. Captain Cook thinks that all the land in Tongataboo is private property, and that there is here, as well as at Otaheite, a claſs of perſons who are ſervants or ſlaves, and who have no property in land. Their domeſtic animals are hogs and fowls; but they ſeem to have no dogs nor cats, nor any other wild quadrupeds, except ſmall lizards. The land birds are pigeons, turtle-doves, parrots, parroquets, owls, bald coots with a blue plumage, a variety of ſmall birds, and large bats in abundance. Their ſorts of fiſh ſeem to be the ſame with thoſe of the other iſles. Their fiſhing inſtruments are the ſame: that is, hooks made of mother of pearl, gigs with two, three, or more prongs, and nets made of a very fine thread, with the meſhes wrought exactly like ours. But their ingenuity is ſingularly conſpicuous in the conſtruction or form of their canoes, which exceeded every thing of the kind which captain Cook and his companions ſaw in that ſea. They are admirably adapted for diſtant navigation, as well as for the purpoſe of being veſſels of burden. Their working tools are made of ſtone, bone, ſhells, &c. as they are at the other iſlands; and their ingenious application of theſe tools excited admiration. Their knowledge of the utility of iron was barely ſufficient to teach them to prefer nails to beads, and ſuch trifles; ſome, but very few, would exchange a pig for a large nail, or a hatchet. Old jackets, ſhirts, cloth, and even rags, were in higher eſtimation among them than the beſt edged tool. The only piece of iron obſerved among them was a ſmall broad awl, which had been made of a nail.

The beſt articles for traffick, at theſe iſlands, are iron tools in general. Axes and hatchets; nails, from the largeſt ſpike down to tenpenny ones; raſps; files; and knives, are much ſought after. Sail cloth, and linen, both white and coloured, looking-glaſſes and beads, are alſo in eſtimation; but of the latter, thoſe that are blue are preferred to all others; as white ones are the leaſt valuable. A ſtring of large blue beads would, at any time, purchaſe a hog. In return for theſe favourite commodities, all the refreſhments may be procured which the iſlands produce. Theſe are hogs, fowls, fiſh, yams, bread-fruit, plantains, cocoa-nuts, ſugar-cane, and, in general, every ſuch article as can be met with at Otaheite, or any one of the Society Iſlands. The yams are excellent, and when grown to perfection, will keep well at ſea: but their pork, bread-fruit, and plantains are inferior in quality to thoſe of Otaheite, or its neighbourhood. Good water, as we have already obſerved, is ſcarce in theſe iſlands. The natives of the Friendly Iſlands ſeldom exceed the common ſtature, though ſome were above ſix feet; but they are very ſtrong, and well made, eſpecially as to their limbs. Their features are various; but the moſt diſtinguiſhing trait of the countenance is a fullneſs at the point of the noſe. Their eyes and teeth are good; but the latter are not ſo white nor ſo well ſet as thoſe generally obſerved among Indian nations. The women are deſtitute of that ſtrong fleſhy firmneſs which appears in the men. Their features indicate the delicacy of their ſex, and lay claim to a conſiderable ſhare of beauty and expreſſion. The bodies and limbs of moſt of the females are well proportioned, and ſome of them are perfect models of a beautiful figure. However, the moſt remarkable diſtinction of the women is the uncommon ſmallneſs and delicacy of their fingers, which vie with the fineſt in Europe. The general colour is a caſt deeper than the copper brown; but ſeveral of the men and women have a true olive complexion, and ſome of them are much fairer. But this may be owing to their being leſs expoſed to the ſun; as a tendency to corpulence among ſome of the principal people ſeems to be the conſequence of a more indolent life. The ſkin of the general maſs of the people is, more commonly, of a dull hue, with ſome degree of roughneſs, which may perhaps be occaſioned by ſome cutaneous diſeaſe. There are, however, few defects or deformities to be found amongſt them. But they are ſubject to a ſort of blindneſs, occaſioned by a diſeaſe of the cornea: to a kind of tetter or ring-worm; and to large broad ulcers, which in ſome caſes diſfigure them much and deſtroy the whole or part of the noſe. This ſeems to indicate venereal contagion, which is known to prevail amongſt them. There are two other diſeaſes frequent among them: one of theſe is an indolent firm ſwelling, which attacks the legs and arms, and cauſes them to ſwell to a very large ſize: and the other is a tumour of the ſame ſort in the teſticles. Upon the whole, they may, for the moſt part, be conſidered as a healthy people. They walk with a graceful air and firm ſtep; their countenances ſhew the mildneſs and good nature for which they are diſtinguiſhed: they are frank, cheerful, and good-humoured: though in the preſence of their chiefs they aſſume a grave or ſerious aſpect, which has the appearance of reſerve. Their diſpoſition is ſingularly peaceable, and they exerciſe hoſpitality and kindneſs to ſtrangers. They are well acquainted with the mode of trading by barter; and perhaps, ſays captain Cook, no nation in the world trafficks with more honeſty or leſs diſtruſt. Upon the whole, they ſeem to poſſeſs many of the moſt excellent qualities which adorn the human mind; ſuch as induſtry, ingenuity, perſeverance, affability, and probably other virtues which have eſcaped obſervation. The only defect that ſullies their character is a propenſity to thieving, which very much prevails among them, and which captain Cook candidly aſcribes to an intenſe curioſity or deſire to poſſeſs ſomething to which they had not before been accuſtomed, or that belonged to a ſort of people ſo different from themſelves. Their hair is in general ſtraight, thick, and ſtrong, and of a black colour; though it is ſometimes buſhy or frizzled, or ſtained of a brown, purple, or orange colour. Some have the hair cut off on one ſide, while on the other it remains long; ſome have it wholly cut off, except a ſingle lock on one ſide. The women, in general, wear it ſhort; and both men and women ſtrip the hair from their arm-pits. The men are ſtained from about the middle of the belly to about half down the thighs with a deep blue colour; which is done with a flat bone inſtrument, cut full of fine teeth, which being dipped in the colouring matter, is afterwards ſtruck into the ſkin with a ſtick, and thus indelible marks are made. Thus they have various lines and figures, which are very elegant, both from their variety and arrangement. The women have only a few ſmall lines or ſpots, thus imprinted in the inſide of their hands. Their kings are exempted from this cuſtom. The men are all circumciſed, or rather ſuperciſed; as the operation conſiſts in cutting off only a ſmall piece of the foreſkin, at the upper part, ſo that it is incapable of covering the glans; which operation they profeſſedly perform from a notion of cleanlineſs. A more extraordinary cuſtom prevails in theſe iſles, which is that of mutilating themſelves by the loſs of one or both of their little fingers. They alſo burn or make inciſions in their cheeks, near the cheek-bones. The dreſs of both the men and women conſiſts of a piece of cloth or matting, long enough to paſs once and a half round the waiſt, to which it is confined by

a girdle

a girdle or cord; it is double before, and hangs down like a petticoat, as low as the middle of the leg: the upper part above the girdle is plaited into ſeveral folds, ſo that, when unfolded, there is cloth ſufficient to draw up and wrap round the ſhoulders. The ornaments worn by perſons of both ſexes are amulets, necklaces, and bracelets of bones, ſhells, and beads of mother of pearl, tortoiſe-ſhells, &c. The women alſo wear on their fingers neat rings made of tortoiſe-ſhell, and pieces in their ears about the ſize of a ſmall quill. They have alſo a curious apron made of the outſide fibres of the cocoa-nut ſhell, and compoſed of a number of ſmall pieces ſewed together in ſuch a manner as to form ſtars, half-moons, little ſquares, &c. It is ſtudded with beads of ſhells, and covered with red feathers, ſo as to have a pleaſing effect. They are very attentive to perſonal cleanlineſs, and therefore frequently bathe in the ponds: nevertheleſs, the women rub themſelves all over with a yellow pigment, which ſeems to be a fine powder of turmeric, and they are ſo immoderately fond of cocoa-nut oil, that they pour it in great quantities upon their heads and ſhoulders, and rub their bodies over with it. The employment of the women is chiefly of the domeſtic kind, and the manufacture of their cloth is wholly conſigned to their care. This cloth is made of different degrees of fineneſs: the coarſer ſort receives no pattern, and of the fineſt ſort, they have ſome that is ſtriped and chequered, and differently coloured: their colours being black, brown, purple, yellow, and red, all procured from vegetables. Their cloth in general, which is made of the ſame materials as at Otaheite, will reſiſt water for ſome time; and they have a method of glazing it, which renders it in this reſpect preferable to that of Otaheite. They alſo manufacture various ſorts of matting, ſome of which is of a very fine texture, and uſed generally for clothing, whilſt the thicker and ſtronger ſort ſerves for ſleeping on, and for ſails to their canoes, &c. Among other uſeful utenſils, they have various ſorts of baſkets, ſome made of the ſame vegetable materials with their mats, and others of the twiſted fibres of cocoa-nuts. Theſe are not only durable, but beautiful, being generally compoſed of different colours, and ſtudded with beads made of ſhells or bones. The province of the men is more laborious and extenſive than that of the women; the objects of their care are agriculture, architecture, boat-building, fiſhing, and other articles relating to navigation. Their plantains and yams engage much of their attention and labour; and in cultivating them their inſtruments are merely pickets or ſtakes of different lengths, according to the depths which they have to dig. The cocoa-nut and bread-fruit trees, and ſome other trees which they plant, are diſperſed about in leſs order than the former, and ſeem to give them no trouble. In building their houſes, ingenious as they are in other reſpects, they diſplay little taſte. Thoſe of the lower people are poor huts, ſmall, and barely ſufficient to defend them from the weather. Thoſe of the better ſort are larger and more comfortable, but much inferior to what might be expected. Their houſe is, properly ſpeaking, a thatched roof or ſhed, ſupported by poſts and rafters; the floor is raiſed with earth ſmoothed, covered with ſtrong, thick matting, and kept very clean. Moſt of them are cloſed on the weather ſide with ſtrong mats, or branches of the cocoa-nut tree, plaited or woven into each other, and anſwering the purpoſe of a wall. A thick, ſtrong mat, bent into the form of a ſemicircle, envelopes a ſpace in which the maſter and miſtreſs of a family ſleep; the reſt of the family ſleep upon the floor; the unmarried men and women apart from each other. The ſervants retire in the night, when the family is large, to adjoining huts. Their whole furniture conſiſts of a bowl or two, a few gourds, cocoa-nut ſhells, ſmall wooden ſtools, which ſerve for pillows, and, perhaps, a large ſtool for the chief, or maſter of the family, to ſit upon. As they are fond of living much in the open air, they are leſs attentive to ornamental architecture. In naval architecture, however, they excel, as we may infer from the curious ſtructure of their canoes, already mentioned. The tools they uſe in the conſtruction of their boats are hatchets, or rather thick adzes, of a ſmooth black ſtone, that abounds at Toofoa; augres made of ſhark's teeth, fixed on ſmall handles; and raſps, of a rough ſkin of a fiſh, faſtened on flat pieces of wood. As knives, they uſe different ſhells. Their cordage is made from the fibres of the cocoa-nut huſk. The other manual employments conſiſt chiefly of making muſical reeds, flutes, warlike weapons, and ſtools or pillows, upon which they ſleep. Their reeds have eight, nine, or ten pieces placed parallel to one another, but not in any regular progreſſion, reſtricted commonly to ſix notes, but incapable of producing muſic diſtinguiſhable by the ears of Europeans. The flutes are a joint of bamboo, cloſe at both ends, with a hole beneath, and four others, two of which, and one of the firſt only, are uſed in playing. They apply the thumb of the left hand to cloſe the left noſtril, and blow into the hole at one end with the other. The middle finger of the left hand is applied to the firſt hole on the left, and the fore-finger of the right to the loweſt hole on that ſide: and thus, though the notes are only three, they produce a pleaſing, yet ſimple muſic, which they vary much more than one would think it poſſible, with an inſtrument ſo imperfect. They have alſo a drum, which may be compared to a hollow log of wood, about five feet ſix inches long, and thirty inches in girt, with a ſlit in it from the one end to the other, about three inches wide, by means of which it had been hollowed out. On the ſide of this log they beat with two drum-ſticks, and produce an hollow ſound, not quite ſo muſical as that of an empty caſk. Their weapons are clubs of different ſorts, and much ornamented, ſpears, and darts. They have alſo bows and arrows, deſigned merely for amuſement, ſuch as ſhooting at birds; and not for military purpoſes. Their ſtools are about two feet long, but only four or five inches high, and nearly four broad, bending in the middle, with four ſtrong legs and circular feet, all made of wood neatly poliſhed and ſometimes inlaid with bits of ivory.

The greateſt part of their vegetable diet conſiſts of yams, plantains, and cocoa-nuts. The chief articles of their animal food are hogs, fowls, fiſh, and all ſorts of ſhell-fiſh; but the lower people eat rats. Their food is generally dreſſed by baking, in the ſame manner as at Otaheite. At their meals they drink nothing but water, or the juice of the cocoa-nut. The women are not excluded from eating with the men; but there are certain orders or ranks among them, that can neither eat nor drink together. This diſtinction begins with the king. The time of their meals ſeems not to be fixed. They go to bed as ſoon as it is dark, and riſe with the dawn in the morning: but they frequently ſleep in the day. They are fond of ſociety, and frequently quit their houſes or huts for the purpoſe of converſing together, or engaging in other amuſements. Their private diverſions are chiefly ſinging, dancing, and muſic, performed by the women. When two or three women ſing in concert, and ſnap their fingers, it is called "oobai;" but when there is a greater number, they divide into ſeveral parties, each of which ſings in a different key, which makes very agreeable muſic, and is called "heeva" or "haiva." In the ſame manner they vary the muſic of their flutes, by playing on thoſe of a different ſize; but their dancing is much

much the ſame as when they perform publicly. The bulk of the people ſatisfy themſelves with one wife; but it does not appear whether their marriages are made laſting by any kind of ſolemn contract. The chiefs, however, have commonly ſeveral women, one of whom, as it was thought, was regarded as the miſtreſs of the family. The women in general appeared to be modeſt, though there is no want of thoſe of a different character. Such, however, appeared to be of the loweſt claſs, among whom were proſtitutes by profeſſion. The humanity of theſe people is ſtrikingly evinced by the concern they ſhew for their dead. Their mourning is expreſſed, not only by words but by deeds. They beat the teeth with ſtones, ſtrike a ſhark's tooth into the head until the blood flows in ſtreams, and thruſt ſpears into the inner part of the thigh, into their ſides below the arm-pits, and through the cheeks into the mouth. The deceaſed is buried after being wrapped up in mats and cloth, much after the European manner. The chiefs have the "fiatookas" appropriated to them as burial-places; but the common people are interred in no particular ſpot. They have long and general mourning, which indicates that they conſider death as a very great evil. And this is further confirmed by the very odd practice to which they reſort for averting it, which is that of cutting off one or both of their little fingers when they think themſelves in danger of dying; ſuperſtitiouſly ſuppoſing that the deity will accept of the little finger as a ſort of ſacrifice efficacious enough to procure the recovery of their health. They cut it off with one of their ſtone hatchets. From the rigid ſeverity with which ſome of their mourning and religious ceremonies are performed, it might be apprehended that they thus meant to ſecure to themſelves felicity beyond the grave; but their principal object relates to things temporal. However they ſeem, according to the account given of their religion by Mr. Anderſon, to entertain very proper ſentiments about the immateriality and immortality of the ſoul; and he thinks himſelf warranted in aſſerting, that they do not worſhip any thing that is the work of their own hands, or any viſible part of the creation. They nevertheleſs admit a plurality of ſubordinate deities, preſiding over the different elements of nature; and their notions of the future condition of the deceaſed are blended with many abſurdities. They do not make any offerings of hogs, dogs, and fruit, as at Otaheite, unleſs it be emblematically; for their "Morais" were perfectly free from every thing of the kind. But no doubt is entertained as to their offering real human ſacrifices. Their "Morais," or "fiatookas," are, as at Otaheite, and many other parts of the world, burying-grounds and places of worſhip; though ſome of them ſeemed to be only appropriated to the firſt purpoſe; but theſe were ſmall, and, in every other reſpect, inferior to the others. Their government, as we have before obſerved, is monarchical, but not deſpotic. A ſubordination ſeems to be eſtabliſhed among them, that reſembles the feudal ſyſtem of our progenitors in Europe. But, however independent on the deſpotic power of the king the great men, or chiefs, may be, people of the lower order have no property, nor ſafety for their perſons, but at the will of the chiefs to whom they belong. The inhabitants of Tongataboo, where the king reſides, call this iſland the "land of chiefs;" while the ſubordinate iſles are diſtinguiſhed by the appellation of "lands of ſervants." The chiefs are ſtyled by the people, not only lords of the earth, but of the ſun and ſky; and the king's family aſſume the name of "Futta-faihe" from the god ſo called, who is probably their tutelary patron, and perhaps their common anceſtor. There is a decorum obſerved in the preſence of their principal men, and particularly of their king, that is truly admirable. In addreſſing the king, they ſit down before him; and to ſpeak to the king ſtanding would be accounted here as a mark of rudeneſs. It does not appear, indeed, that any of the moſt civilized nations have ever exceeded theſe people in the great order obſerved on all occaſions; in ready compliance with the commands of their chiefs; and in the harmony that ſubſiſts through all ranks, and unites them, as if they were all one man, informed with, and directed by, the ſame principle. To their ſovereign they expreſs their reſpect and homage by every poſſible token of deference and ſubmiſſion. It appears, however, that if the king ſhould not govern according to law or cuſtom, the principal officer that preſides over the police would be ordered by the other great men, or by the people at large, to put him to death. A ſovereign thus liable to be controuled, and to be puniſhed for an abuſe of power, cannot be called a deſpotic monarch. When we conſider the number of iſlands that compoſe this little ſtate, and the diſtance at which ſome of them lie from the ſeat of government, attempts to throw off the yoke, and to acquire independency, it ſhould ſeem, might be apprehended. But this, it is ſaid, never happens. One reaſon why they are not diſturbed by domeſtic quarrels may be this: that all the powerful chiefs, whatever property they may poſſeſs in other iſlands, reſide at Tongataboo. They alſo ſecure the dependence of the other iſlands by the celerity of their operations; for if, at any time, a troubleſome and popular man ſhould ſtart up in any of them, the generaliſſimo or preſiding officer of the police, is immediately diſpatched thither to kill him: and they thus cruſh a rebellion in its infancy.

The common method of ſaluting one another in theſe iſlands is by touching or meeting noſes, as is done in New Zealand; and their token of peace to ſtrangers is the diſplay of a white flag or flags. A very ſingular cuſtom prevails among them of putting every thing you give them to their heads, by way of acknowledgment. This mode of paying a compliment is taught them from their infancy.

The language of the Friendly Iſlands has the greateſt affinity imaginable to that of New Zealand, of Wateeoo, and Mangeea; and conſequently to that of Otaheite, and the Society Iſlands. The mode of pronunciation differs; nevertheleſs a great number of words are either exactly the ſame, or ſo little changed, that their common original may be ſatisfactorily traced. Several hundred words were collected by Mr. Anderſon; and, amongſt theſe, are terms that expreſs numbers as far as a hundred thouſand; beyond which they would never reckon: for having proceeded thus far, they commonly uſed a word which expreſſes an indefinite number. Cooke's Second Voyage, vol. i. Cooke's Third Voyage, vol. i.

FRIENDLY *Societies* denote aſſociations, chiefly among the moſt induſtrious of the lower and middling claſs of tradeſmen and mechanics, for the purpoſe of affording each other relief in ſickneſs; and their widows and children ſome aſſiſtance at their death. Theſe have been thought worthy of the protection of the legiſlature, to prevent frauds which had ariſen from the irregular principles on which many of them were conducted.

The ſtatute 33 Geo. III. c. 54. provides that any number of perſons may form themſelves into a ſociety, and raiſe among themſelves a fund for their mutual benefit, and make rules and impoſe fines.—The rules, declaring the purpoſe for which ſuch ſocieties are eſtabliſhed, are to be exhibited to the quarter ſeſſions, who may annul or confirm them; in which latter caſe they are to be ſigned by the clerk of the peace. No rule thus confirmed is to be altered but at a general

general meeting of the ſociety, and ſubject to the controul of the ſeſſions. Societies may appoint officers, who are to give ſecurities for their truſt; the treaſurer or truſtees by bond to the clerk of the peace, and other perſons to the treaſurer or truſtees; which bonds are exempted from the ſtamp-duty. Committees of not leſs than eleven members may be appointed; their powers to be declared by the ſociety, and ſubject to their controul. Treaſurers and truſtees are enabled to lay out ſubſcriptions in purchaſe of ſtock, &c. and to ſell and change funds for the uſe of the ſociety; to render accounts, and pay over balances.—In caſe of miſbehaviour of truſtees, application is to be made to the court of chancery, in which proceedings are to be free of all expence of fees, ſtamps, &c. and counſel to be aſſigned gratis by the court. Executors or aſſignees of truſtees, &c. dying, or becoming bankrupt, to pay the demands of the ſociety in the firſt place. Effects of the ſocieties are veſted in treaſurers and truſtees, who may bring and defend actions.—Societies are not to be diſſolved without conſent of five-ſixths of the members.—Rules entered in a book are to be received as evidence.—Societies may receive donations.—Complaints of members againſt ſtewards, &c. are to be ſettled by two juſtices. If rules direct diſputes to be ſettled by arbitration, the award of the arbitrators ſhall be final.—Members of ſocieties producing certificates of ſteward, &c. are not to be removable till they become actually chargeable; and ſimilar proviſions are made relative to thoſe as to other certificates under the poor laws. See the article POOR.

FRIENDS, in *Eccleſiaſtical Hiſtory*, a denomination aſſumed by a reſpectable claſs of perſons, and which, as we are informed, they prefer to that of *Quakers*, by which they are alſo generally known. For an account of them, ſee QUAKERS.

FRIENDS *Alien*. See ALIEN.

FRIENDSHIP, in *Moral Philoſophy*, denotes that mutual attachment between different perſons, which proceeds from a cordial eſteem of the mental and moral qualities of one another; and which ſuppoſes, or produces, in a conſiderable degree, ſimilarity of diſpoſition and character, frequency of intercourſe, union of intereſts, and a reciprocity of confidence, good wiſhes, and kind offices. "Friendſhip," ſays Voltaire, "is a tacit contract between two ſenſible and virtuous perſons: *ſenſible*, I ſay; for a monk, or a hermit, may not be wicked, and yet may live a ſtranger to friendſhip. I add *virtuous*; for the wicked have only accomplices, the voluptuous have companions, the deſigning have aſſociates, the men of buſineſs have partners, the politicians form a factious band; the bulk of idle men have connections; princes have courtiers; but virtuous men alone have friends. Cethegus was Catiline's accomplice; and Mæcenas was Octavius's courtier; but Cicero was Atticus's *friend*." Without virtue there can be no genuine, permanent friendſhip, but whilſt thoſe eſtimable qualities ſubſiſt, that produce harmony of minds, and that bind true friends to each other, their friendſhip will continue, and will be rendered immortal.

Friendſhip, ſays lord Shafteſbury, is *that peculiar relation* which is formed by a conſent and harmony of minds, by mutual eſteem, and reciprocal tenderneſs and affection. Such was that between the two Jewiſh heroes, David and Jonathan. (2 Samuel, ch. i.) Such were thoſe friendſhips deſcribed ſo frequently by poets, between Pylades and Oreſtes, Theſeus and Pirithous, with many others. Such were thoſe between philoſophers, heroes, and the greateſt of men; between Socrates and Antiſthenes, Plato and Dion, Epaminondas and Pelopidas, Scipio and Lælius, Cato and Brutus, Thraſea and Helvidius.

The friendſhip of which we are now ſpeaking does not originate in ſelfiſh, intereſted views; and when it is formed and eſtabliſhed, it excludes ſuſpicion, jealouſy and reſerve, and is maintained by a free, candid, liberal intercourſe, which is not ſoon nor eaſily interrupted by diſcord, or which mutual explanation ſpeedily revives, and renewed affection perpetuates. This kind of friendſhip has been highly extolled by philoſophers, poets and divines, and they have concurred in deſcribing its excellence, enumerating its benefits, and recommending the cultivation and exerciſe of it. Lord Bacon has an excellent "Eſſay on Friendſhip;" and Dr. Young in his "Night Thoughts" thus deſcribes and recommends it:

"Friendſhip's the wine of life; but friendſhip new
——————————is neither ſtrong nor pure."

"Deliberate on all things with thy friend:
But ſince friends grow not thick on ev'ry bough,
Nor ev'ry friend unrotten at the core;
Firſt, on thy friend, delib'rate with thyſelf:
Pauſe, ponder, ſift; not eager in the choice,
Not jealous of the choſen; fixing, fix:
Judge before friendſhip, then confide till death."

Lord Shafteſbury (ubi ſupra) animated, ſays an ingenious writer, with a warm ſenſibility of the moral charms of this generous affection, and not being able, it ſeems, to diſcover that it is either enjoined or encouraged by the Chriſtian inſtitution, imputes this pretended omiſſion as a capital defect in the code of evangelical ethics. On the contrary, a late ingenious advocate for that ſacred cauſe, which it was the unhappy direction of this accompliſhed nobleman's learning and talents to depreciate; far from diſcerning any thing laudable or meritorious in private friendſhip, has attempted to prove, that "it is totally incompatible with the genius and ſpirit of the goſpel." Thus the very ſame ſuppoſed circumſtance which appears to have been no inconſiderable obſtruction to the noble philoſopher's faith, is aſſigned by the elegant defender of Chriſtianity, as one of thoſe internal marks which authenticate its divine origin! The ſame mode of reaſoning, however, which overturns either of the reſpective poſitions of theſe admired writers, will equally confute both. That private friendſhip does not expreſsly enter into the precepts of Chriſtianity, is unqueſtionably true; for the nature of the connection neceſſarily excludes it from being the ſubject of a religious or moral obligation. The diſtinctive character of this relation conſiſts in a ſpontaneous ſentiment of the heart, unconſtrained and uninfluenced by compulſive or external motives of every kind and degree. To attempt therefore to produce a voluntary affection, by the authority of a poſitive command, would be to publiſh a law evidently deſtructive of its own end; for its ſanctions could no ſooner operate as a primary, or determining inducement, than the ſentiment they were deſigned to create would thereby be prevented from exiſting. Beſides, a general ordinance for this purpoſe would not merely be abſurd, it would be unjuſt; becauſe it would require univerſally what is not in every man's power to perform. A great variety of circumſtances muſt concur to form and cement this union; and theſe are of a nature ſo exceedingly contingent and fortuitous, that they are frequently never realized in the courſe of the longeſt life. Indeed, they ſo rarely meet together, that what a ſagacious obſerver of mankind remarks concerning love, holds equally true in reſpect to *friendſhip*: "Il eſt du *veritable* comme de l'apparition des eſprits: tout le monde en *parle*, mais peu de gens ont *vû*."

Moreover, if what the noble author requires from revelation is, in the firſt inſtance, inconſiſtent with the eſſential na-

ture of its object, it implies, in the next place, an aſſertion no leſs contrary to fact; for although friendſhip could not, either in reaſon or juſtice, have been commanded by the precepts, it is evidently encouraged by the ſpirit of Chriſtianity; univerſal benevolence, or good will to mankind, is the vital principle that animates and pervades the whole ſyſtem of evangelical morality; and it is by a proper cultivation of this enlarged and comprehenſive virtue, that the heart is beſt prepared and qualified to enter into the engagements, and diſcharge the offices of private friendſhip. This the noble moraliſt himſelf acknowledges in another place. "Do you think," he ſays, "that particular friendſhip can well ſubſiſt without ſuch an enlarged affection and ſenſe of obligation to ſociety?" This kind of reaſoning, however, when applied to revelation, will not ſatisfy his demands; he contends that "friendſhip is no eſſential part of a Chriſtian's charity." But if there were any force in this objection, it would overſhoot its intended aim, and wound natural religion no leſs than revealed; as friendſhip, for the reaſons above aſſigned, can no more be the eſſential part of a theiſt's benevolence, than it is of a Chriſtian's.

It deſerves alſo to be conſidered, that our bleſſed Lord acted wiſely in not inculcating, by expreſs and poſitive command, private friendſhip, though he recommended it generally both by his doctrine and example. His commiſſion was primarily addreſſed to the Jews, and his religion was deſigned to aboliſh all thoſe diſtinctions of nation, party, and external privilege, that ſeparated between them and the Gentile world. The Jews were prone to indulge ſelfiſh and limited affections, and to reſtrict their benevolence to perſons of their own nation and profeſſion. Our Lord therefore very wiſely declines to recommend by poſitive law private friendſhip, and inculcates univerſal benevolence as beſt adapted to the diſpoſitions and circumſtances of the Jewiſh people, and as the moſt ſuitable preparation for the introduction of the Gentiles to a participation in common with the Jews, of the benefits and privileges which he was empowered to impart.

We may obſerve, however, that it is not ſolely by neceſſary implication, or circumſtantial inferences, that the Chriſtian revelation recognizes friendſhip. It ſtrongly and expreſsly recommends and encourages this amiable alliance; if, exhibiting it in the nobleſt and moſt animating examples may be allowed to have an immediate and direct influence over the heart of man. Two very remarkable inſtances for this purpoſe occur in the hiſtory of our Saviour's life. The Evangeliſt, in relating the miracle which Chriſt performed at Bethany, by reſtoring a perſon to life, who had lain ſome days in the grave, introduces his narrative by emphatically obſerving that "Jeſus loved Lazarus," intimating, it ſhould ſeem, that the ſentiments which Chriſt entertained of Lazarus were a diſtinct and peculiar ſpecies of that general benevolence with which he was actuated towards all mankind. Accordingly the ſiſters of Lazarus did not mention his name, but pointing him out to Jeſus by a more honourable and equally notorious deſignation, the terms of their meſſage were, "Behold! He whom thou loveſt is ſick." And when our Lord informs his diſciples of the notice he had thus received, his expreſſion is, "Our friend Lazarus ſleepeth." We obſerve that Chriſt did not upon this occaſion uſe the word "friend" in its looſe, undiſtinguiſhing acceptation, but in a reſtrained, and ſtrictly appropriated ſenſe; as is manifeſt, not only from this plain account of the fact itſelf, but as the ſequel farther evinces. For, as he was advancing to the grave, accompanied with the relations of the deceaſed, he diſcovered the ſame emotions of grief as ſwelled the boſoms of thoſe with whom Lazarus had been moſt intimately connected; and ſympathizing with their common ſorrow, he melted into tears. This circumſtance was too remarkable to eſcape particular obſervation; and it drew from the ſpectators, what we ſhould think it muſt neceſſarily draw from every reader, this natural and obvious reflection, "behold! how he loved him!"

But in the concluding cataſtrophe of our Saviour's life, he gave a ſtill more deciſive proof that ſentiments of the ſtrongeſt perſonal attachment and friendſhip were not unworthy of being admitted into his ſacred boſom; they were too deeply, indeed, impreſſed, to be extinguiſhed even by the moſt excruciating torments. In thoſe dreadful moments, obſerving among the afflicted witneſſes of his painful and ignominious ſufferings, that faithful follower, whom he had ſelected as his friend out of the ſmall band of his twelve apoſtles, and who is deſcribed by the hiſtorian as "the diſciple whom he loved;" he diſtinguiſhed him by the moſt convincing inſtance of ſuperior confidence, eſteem, and affection that was ever exhibited to the admiration of mankind. For, under circumſtances of the moſt agonizing torments, when it might be thought impoſſible for human nature to retain any other ſenſibility but that of its own inexpreſſible ſufferings, he recommended to the care and protection of this his tried and approved friend, in terms of peculiar regard and endearment, the moſt tender and ſacred object of his private affections. But no language can repreſent this pathetic and affecting ſcene with a force and energy equal to the ſublime ſimplicity of the evangeliſt's own narrative: "Now there ſtood by the croſs of Jeſus his mother, and his mother's ſiſter, and Mary Magdalen. When Jeſus ſaw his mother, and the diſciple ſtanding by, whom he loved; he ſaith to his mother, behold thy ſon! then he ſaith to the diſciple, behold thy mother! And from that hour that diſciple took her to his own home." It may ſafely be aſſerted, that among all thoſe memorable examples of friendſhip which have been celebrated with the higheſt encomiums by the ancients, there cannot be produced a ſingle inſtance in which the moſt diſtinguiſhing features of exalted amity are ſo ſtrongly diſplayed, as in the foregoing relation. The only one, perhaps, that bears even a faint ſimilitude to it, is that famous tranſaction recorded by a Greek author, which paſſed between Eudamidas and Aretheus. But when the very different circumſtances attending the reſpective examples are duly conſidered, it muſt be acknowledged that the former riſes as much above the latter in the proof it exhibits of ſublime friendſhip, as it does in the dignity of the characters concerned.

Upon the whole then it appears, that the divine founder of the Chriſtian religion, as well by his own example as by the ſpirit of his moral doctrine, has not only encouraged but conſecrated friendſhip. We are indebted for moſt of the preceding obſervations to the ingenious William Melmoth, eſq. in the concluding note to his elegant tranſlation of Cicero's "Lælius," or, "An Eſſay on Friendſhip, by Marcus Tullius Cicero," with remarks, p. 328—343.

FRIERA, in *Geography*, a town of Portugal, in the province of Tra los Montes; 12 miles S. W. of Outeiro.

FRIER'S COWL, in *Botany*. See ARUM.

FRIER'S *Head*, a cape on the E. coaſt of the iſland of Antigua. N. lat. 17° 11'. W. long. 61° 22'.

FRIESACH, a town of Germany in the Middle Mark of Brandenburg, on the Rhine; 28 miles N. W. of Berlin. N. lat. 52° 48'. E. long. 12.° 41'.

FRIESEN, a town of the duchy of Stiria; 9 miles N. N. E. of Wendiſchgratz.

FRIESLAND,

FRIESLAND, one of the ſtates or departments of Holland, ſo called from the Friſons, an ancient warlike people, whoſe country formerly extended from the Scheldt to the Weſer. (See Frisons.) It is bounded on the north by the German ocean, on the eaſt by Groningen and Overyſſel, on the ſouth by Overyſſel and the Zuyder ſea, and on the weſt by the Flie or Vlie river. Frieſland, particularly in its N.W. parts, which lie lower than the ſea, reſembles Holland in its air and ſoil, and is famous for its paſtures, ſupplying butter in ſuch quantities as to be a ſtaple article of commerce, and breeding excellent oxen, cows, and ſheep, and alſo large horſes. In the more elevated parts there is ſome good corn land, which affords wheat that has been held in eſtimation for the fineneſs of the ear, and the whiteneſs of the flour. The chief article of fuel is peat, and towards the ſouth and ſouth-eaſt there are extenſive heaths and foreſts of wood. For want of ſand-hills near the coaſt this country is defended at a great expence from the encroachments of the ſea by dykes. The canals of Frieſland are numerous; and ſerve not only for carrying off the ſuperfluous waters into the ſea, but for the purpoſes of commerce. The principal of theſe reaches from Harlingen through Francker as far as Leewarden, the capital of the country, and Dokkum, and Groningen, and even to the frontiers of Eaſt Frieſland. The whole province contains 11 towns and 336 villages. The inhabitants long retained that love of liberty and martial ſpirit which diſtinguiſhed their anceſtors, and many of thoſe cuſtoms, and that mode of living, which were tranſmitted to them from their progenitors; they have alſo preſerved among them the old Friſian dialect and accent, which renders the language of the country people unintelligible to the other Hollanders. Frieſland is famous for its woollen ſtuffs, and more eſpecially for its linen, which is the fineſt in Europe. This province, being a part of the ancient Friſia, had formerly princes of its own, afterwards dukes, and then kings: among whom Radbold II. was particularly celebrated. Theſe laſt were ſucceeded by podeſtats, ſelected from among the people. In the year 1436 part of Frieſland devolved to the houſe of Burgundy. In 1498 the emperor Maximilian I. created duke Albert of Saxony hereditary governor of Frieſland, under a ſtipulation that he ſhould maintain their ancient liberties; nevertheleſs they would never acknowledge him. In 1515 Charles V. purchaſed of George duke of Saxony his claim to this country, and ſubjected it to his own dominions; but under his ſon Philip II. the Friſons recovered their liberty, and acceded to the alliance of Utrecht. Since the United Provinces have been erected into a kingdom, and aſſigned by the emperor of France to his brother Louis, Frieſland forms a part of this treaty; and by the new conſtitutional code ſends three members to the legiſlative body. What farther changes await it, time muſt diſcloſe.

Friesland, *Eaſt*, a principality of Germany belonging to Pruſſia, is bounded on the north by the ſea, on the eaſt by the county of Oldenburgh, on the ſouth by the biſhopric of Munſter, and on the weſt by Groningen; about 38 miles from north to ſouth, and 36 from eaſt to weſt. The population, according to Hoeck, conſiſts of 102,594 perſons. The air, though moiſt and thick, is purified by ſea breezes; the ſpring and harveſts are late; the land is flat and low, and defended againſt the ſea by ſtrong and lofty dykes. Along the coaſt the ſoil is rich and fertile, and the land conſiſts chiefly of meadows, with ſome few corn fields. The cattle, ſheep, and horſes are of a large ſize and good quality. The butter and cheeſe are abundant and rich. The central part of the country is generally ſandy, interſperſed with fens and moors, whence the inhabitants ſupply themſelves with peat for fuel, as wood is ſcarce. The country abounds with game and fowl; and its geeſe are of an uncommonly large ſize. One-third part of this principality is uncultivated. The chief river is the Ems, which contributes to render the trade and navigation of this province very conſiderable. The exportation principally conſiſts in large horſes, horned cattle, cheeſe, butter, oats, beans, rape-ſeed, and fine linen. Anciently Eaſt Frieſland was divided into a great number of lordſhips, moſt of which ſubmitted, in the year 1430, to Edzard, ſurnamed Cyrkſena or Syrkſena, whoſe ſucceſſors became princes of the empire in 1454, under the title of count. After this family had become extinct, Frederick II. king of Pruſſia, in 1744, ſeized on the province, in conſequence of an expectancy granted to the houſe of Brandenburg by the emperor Leopold in the year 1694. But George II. king of England, being of the houſe of Brunſwick Luneburg, proteſted, and claimed the principality, on account of an hereditary union entered into in the year 1691, with prince Chriſtian Eberhard; and made known his pretenſions to the regency of Eaſt Frieſland, and to the Aulic chamber of the empire. However, the king of Pruſſia, denying the authority of the emperor and regency, and threatening to ſupport his claim by force of arms, was permitted to remain in undiſturbed poſſeſſion. The inhabitants are Lutherans and Calviniſts; but the Catholics enjoy toleration in many towns, and the Moravians at Emden, Leer, and Norden. The Jews are alſo tolerated. The nobility, lords, and peaſants form the ſtates, whoſe tranſactions with their princes, joined to the imperial ordinances, ſerve for the laws of the country. The ſtates conſent to taxes and raiſe them; the revenue of the ſovereign is about 300,000 rix-dollars. The principal towns are Aurich, Norden, and Emden.

FRIESLANDERS, in *Eccleſiaſtical Hiſtory*, a ſect of moderate Anabaptiſts, deriving their name from Frieſland, the country which they inhabit. See Waterlandians.

FRIEZE, Frize, or Freeze. See Freeze.

FRIGATE, in *Sea Affairs*, a ſhip of war, uſually of two decks, light built, deſigned for ſwift ſailing. When it hath but one deck, and conſequently is of a ſmaller ſize, they call her a light frigate.

Frigates mount from twenty to thirty-eight guns, and are eſteemed excellent cruiſers. The name was formerly known only in the Mediterranean, and applied to a long kind of veſſel, navigated in that ſea with ſails and oars. The Engliſh were the firſt who appeared on the ocean with theſe ſhips, and equipped them for war as well as for commerce.

Frigate-*built* denotes the diſpoſition of the decks of ſuch merchant ſhips as have a deſcent of four or five ſteps from the quarter deck and fore-caſtle into the waiſt, in contradiſtinction to thoſe whoſe decks are on a continued line for the whole length of the ſhip, which are called galley-built. See *Fluſh*-Deck.

Frigate-*bay*, in *Geography*, a bay on the S. coaſt of the iſland of St. Chriſtopher; two miles E.S.E. of Baſſeterre.

FRIGATOON, a Venetian veſſel, commonly uſed in the Adriatic, built with a ſquare ſtern, and without any fore-maſt, having only a main-maſt, mizen-maſt, and bowſprit.

FRIGENO, in *Geography*, a town of Italy, in the department of the Adda and Oglio; ſeven miles N.N.E. of Breno.

FRIGENTUM, in *Ancient Geography*, a town of Italy, E. of Eclana or Æculænum, to which it ſucceeded in power.

FRIGERATORY, among *Builders*, denotes a place intended to keep things cool in ſummer.

FRIGHT, a ſudden and violent degree of fear. (See FEAR.) This paſſion has been known not only to cauſe, but to cure diſeaſes. Epilepſy, ſtupor, madneſs, &c. have in ſome inſtances been produced by frights. Mr. Boyle mentions agues, gout, and ſciatica, cured by this means. It is a commonly known cure for the hiccough, to put the patient in a ſudden fright.

FRIGID, FRIGIDUS, *cold*, is variouſly uſed. A frigid ſtyle, is a low, jejune manner of diction; wanting force, warmth of imagination, figures of ſpeech, &c. This, and the bombaſt, are the two chief faults oppoſite to the *ſublime*, which ſee. The frigid conſiſts in degrading an object, or ſentiment, which is ſublime in itſelf, by our mean conception of it, or by our weak, low, and childiſh deſcription of it; this betrays entire abſence, or at leaſt great poverty of genius. Of this there are numerous examples commented upon with much humour, in the treatiſe on the art of ſinking, in Dean Swift's works; the inſtances being taken chiefly from ſir Richard Blackmore. The *Bombaſt* (which ſee) lies, in forcing an ordinary or trivial ſubject out of its rank, and endeavouring to raiſe it into the ſublime; or in attempting to exalt a ſublime object beyond all natural and reaſonable bounds. Writers of genius may ſometimes fall into this error, which is too common, by unluckily loſing ſight of the true point of the ſublime. This is alſo called *Fuſtian*, or *Rant*. Shakeſpeare is not altogether unexceptionable in this reſpect. Dryden and Lee, in their tragedies, abound with it.

FRIGID *Zone*, or *Frozen Zone*, in *Geography*. See ZONE.

FRIGIDITY is alſo uſed in the ſame ſenſe with impotence.

FRIGIDUS, in *Ancient Geography*, a river of Italy, in Venetia, which roſe in the Alpes Carnicæ, ran towards the weſt, watered a place called Caſtra, and diſcharged itſelf into the Sontius near Pons Sontii.

FRIGILIORA, in *Geography*, a town of Spain, in Grenada; 13 miles E. of Velez Malaga.

FRIGNANO, a town of Italy, in the department of the Panaro; 15 miles S. of Modena.

FRIGORIFIC, of *frigus*, *cold*, and *facio*, *I make*, in *Phyſics*, ſomething that occaſions cold. Some philoſophers, particularly Gaſſendus, and other corpuſcularians, denying cold to be a mere privation, or abſence of heat, contend that there are actual frigorific corpuſcles, or particles, as well as fiery ones: whence proceed *cold* and *heat*; which ſee. See alſo CONGELATION, FREEZING, and FREEZING *Mixtures*.

FRIKEN, in *Geography*, a lake of Sweden, in Warmeland, 40 miles in length, but narrow.

FRILL, in *Falconry*; when a hawk trembles or ſhivers, they ſay ſhe frills. Dict. Ruſt.

FRILLENDORF, in *Geography*, a town of Germany, in the county of Ziegenhayn; five miles N.N.E. of Ziegenhayn.

FRIM, in *Agriculture*, a term employed to denote any ſort of plant which is full of juice. It is often applied to graſs and grain while young, and in a tender ſtate of growth.

FRINGE OF MOSSES, *Periſtomium*, in *Botany*, a ſimple or double row of ſeparate or connected teeth, which border the orifice of the capſule in almoſt all the genera of Moſſes, and are originally covered by the lid and veil. When thoſe parts are fallen, the fringe becomes conſpicuous. It is a very ſenſible hygrometer, for the moſt part expanding by drought, to allow of the diſcharge of the ſeeds. Sometimes however the fringe is expanded by moiſture, and folds together in a dry ſtate of the atmoſphere. The outer fringe, which is in many caſes the only one, is of a much firmer texture, and more deeply coloured, than the inner. It conſiſts either of 4, 8, 16, or 32 teeth, which numbers are as conſtant and invariable in all caſes, as in any other inſtance in natural hiſtory, and far more ſo than thoſe numerical differences in general by which the characters of more ſplendid flowers and fruits are defined. The inner fringe is moſtly a fine plaited membrane, entire at the baſe, but variouſly toothed, jagged, or perforated in the upper part. Sometimes however the inner fringe conſiſts of ſeparate teeth like the outer, only much more delicate. All the parts in queſtion are, in ſeveral inſtances, very brittle and fugacious, but in general they are tolerably durable.

The celebrated Hedwig firſt ſuggeſted the ingenious and fortunate idea of making the fringe of moſſes ſubſervient to the purpoſes of generic diſcrimination. This conſtitutes the chief merit of his ſyſtem, which we ſhall more fully explain when we come to treat of the natural order of MOSSES. At preſent we ſhall deſcribe the ſtructure of the fringe in each genus.

Phaſcum, *Sphagnum*, *Gymnoſtomum*, and *Aniſtangium*, have no fringe at all. In the firſt the lid is of one piece with the capſule, and only ruptured irregularly at one ſide; in the three others the lid ſeparates and falls off entire, leaving the margin of the capſule quite naked and beardleſs.—Theſe genera are diſtinguiſhed from each other by marks derived from other parts of the fructification.

We ſhall now firſt enumerate ſuch genera as are furniſhed with a ſimple fringe.

1. *Tetraphis*. Fringe of four teeth. Theſe are erect, acute, firm, poliſhed and permanent. Mr. Dickſon firſt pointed out to us this ſingularity of ſtructure in the Linnæan *Mnium pellucidum*, long before the publication of Hedwig's diſcoveries. *Botany.—Plate Fringes, fig.* 1.

2. *Octoblepharum*. Fringe of eight teeth. Capſule without an apophyſis. *Bryum albidum* of Linnæus, an Indian plant.—*Fig.* 2.

3. *Splachnum*. Fringe of 16 teeth, dilated at the baſe, approaching each other in pairs. Capſule cylindrical, ſtanding on a fleſhy baſe, or *apophyſis*.—*Fig.* 3.

4. *Encalypta*. Fringe of 16 linear upright teeth. Veil ample, bell-ſhaped.—*Fig.* 4.

5. *Pterogonium*. Fringe of 16 linear upright teeth. Capſule from a lateral ſheath.—*Fig.* 5.

6. *Grimmia*. Fringe of 16 equi-diſtant teeth, dilated at the baſe. Veil cylindrical.—*Fig.* 6.

7. *Conoſtomum*. Swartz in Schrad. N. Tourn. v. 1. faſc. 3. 24. t. 5, 6. Fringe of 16 tapering teeth, approaching each other in pairs, and all cohering at the points. —*Fig.* 7.

This genus is founded by Dr. Swartz on the *Bryum tetragonum* of Dickſon, (*Grimmia conoſtoma*; Engl. Bot. t. 1135. Fl. Brit. 1196), and another ſpecies gathered by Mr. Menzies in Staten-land. They are very much alike, and have the habit, as well as the globoſe furrowed capſule, of a *Bartramia*; but the fringe is totally different. We cannot but confeſs however that the part in queſtion offers conſiderable violence to nature, in obliging us to ſeparate theſe two plants from *Bartramia*.

8. *Dicranum*. Fringe of 16 flat, ſomewhat inflexed teeth, cloven half way down.—*Fig.* 8.

There is no natural difference of habit between this genus and *Grimmia*.

9. *Trichoſtomum*. Fringe of 32 linear ſtraightiſh teeth, approaching

approaching each other in pairs, ſometimes joined in pairs at the baſe.—*Fig.* 9.

10. *Tortula.* Fringe of numerous linear teeth, ſpirally and repeatedly twiſted together.—*Fig.* 10.

In ſome ſpecies of *Tortula* the teeth are united into a cylinder at the baſe, pierced with numerous holes, upon which ſome recent botaniſts have founded a new genus, called *Syntrichium*; but it ſeems ſcarcely neceſſary, nor even allowable. See *fig.* 11.

The following genera are furniſhed with a double fringe, ſome few ſpecies of *Orthotrichum*, and one of the *Buxbaumiæ* perhaps excepted.

11. *Orthotrichum.* Capſule terminal. Outer fringe of 16 teeth; inner of 8 or 16 linear ones, ſometimes altogether deficient. *Veil* furrowed.

This, though a very natural genus, is variable in its fringe, which differs in different ſpecies otherwiſe nearly akin, but it is the only one ſo circumſtanced. *O. pumilum* has but eight teeth in the outer fringe.—*Fig.* 12.

12. *Neckera.* Capſule from a lateral ſcaly ſheath. Outer fringe of 16 teeth; inner of 16 capillary ones. Veil naked and even.—*Fig.* 13.

13. *Funaria.* Capſule obovate. Outer fringe of 16 oblique teeth, cohering at the points; inner of 16 flat teeth. Veil quadrangular.—*Fig.* 14.

14. *Buxbaumia.* Capſule oblique, gibbous on one ſide. Outer fringe of 16 very ſhort teeth; inner membranous, plaited.—*Fig.* 15.

In *B. foliosa* the outer fringe is ſcarcely perceptible. See *fig.* 16.

15. *Bartramia.* Capſule ſpherical, furrowed. Outer fringe of 16 awl-ſhaped teeth; inner membranous, laciniated. Lid depreſſed.—*Fig.* 17.

16. *Mnium.* Capſule terminal, cylindrical, furrowed. Outer fringe of 16 awl-ſhaped teeth; inner membranous, laciniated.—*Fig.* 18.

17. *Bryum.* Capſule ovate-oblong, ſmooth. Outer fringe of 16 teeth, dilated at the baſe; inner membranous, toothed. Flowers terminal.—*Fig.* 19.

18. *Hypnum.* Capſule ovate-oblong, from a lateral ſcaly ſheath. Outer fringe of 16 teeth, dilated at the baſe; inner membranous, variouſly toothed. Veil ſmooth.—*Fig.* 20.

In theſe four laſt genera the fringes do not ſerve us much, the outer one being preciſely alike in all, and the inner one, though different in the number and ſhape of its ſegments in various ſpecies, rather tending by that means to perplex the ſubject, by leading to unnatural combinations. This is the weakeſt part of the ſyſtem of Hedwig, and of thoſe who follow him in making his rules abſolute, without regard to natural affinity. Thus out of *Hypnum*, whoſe inner fringe, for the moſt part, has 16 principal teeth, with ſingle or double intermediate ones beſides, is taken a genus named *Leſkea*, in which there is only a ſimple row of 16 teeth to the inner fringe. This might be allowed, were there any differences of habit or other characters to ſupport the meaſure, but, on the contrary, it ſeparates ſpecies cloſely akin, and ſerves only to divide a moſt natural genus, by a very obſcure and difficult character. Weber and Mohr, in their Swediſh Tour, ſuggeſt another genus founded on *Hypnum dendroides* only, the character of which depends on the inner fringe having 32 teeth, approaching each other in pairs, and moreover meeting by tranſverſe bars, ſo as to imitate bladders, joined at the ſummits. It is named *Climacium*, from κλιμαξ, a ſcale. Whoever is converſant with the varieties of ſtructure in different ſpecies of *Hypnum*, will at once perceive the futility of ſuch generic diſtinctions, in which great pains are taken to render the ſcience not only difficult but unnatural.

19. *Fontinalis.* Capſule enveloped in a lateral ſcaly ſheath. Outer fringe of 16 teeth, dilated at the baſe; inner reticulated.—*Fig.* 21.

Here the inner fringe comes in aid of the generic character in the happieſt manner, being altogether peculiar, and unlike that of any other moſs. It conſiſts of a latticed cone, uſually, if not invariably, of a fine red colour.

20. *Polytrichum.* Outer fringe of 32 or 64 ſhort, flat, inflexed, teeth; inner a tranſverſe orbicular membrane, affixed to the teeth of the outer. Veil moſtly double; the outer hairy.—*Fig.* 22.

Mr. I. D. Sowerby has firſt noticed a ſhort entire membrane, in the mouth of the capſule of this genus, which we are much inclined to think, with him, is the real inner fringe, that above deſcribed being merely the membranous lining of the lid. See *fig.* 23.

We forbear to conſider the whole ſubject of the generic diſtinctions of Moſſes, till we come to them in their proper place, in treating of this natural order. *Andræa* is left out of the above enumeration of genera furniſhed with a fringe, becauſe the recent obſervations of Mr. W. J. Hooker, communicated to the Linnæan Society, prove it to have a capſule of four valves, and no real fringe, thoſe valves having been erroneouſly taken for one of four teeth. S.

FRINGE-*tree*. See CHIONANTHUS.

FRINGE-*tree*, in *Gardening*, a tree of the ornamental kind. See CHIONANTHUS.

FRINGILLA, in *Ornithology*, a genus of paſſeres, the character of which conſiſts ſimply in the form of the bill, which is conic, ſtraight, and pointed. The ſpecies of the fringilla or finch tribe are rather numerous, amounting altogether to about one hundred, independently of many varieties. The finches are in general birds of ſmall or rather moderate ſize, and no very inconſiderable portion of them are excluſively natives of extra-European climates. Some are in particular remarkable for the ſplendour of their plumage.

Species.

LAPPONICA. Head black; body grey and black; eyebrows white; outer tail-feathers with a white wedge-formed ſpot. Linn. *Fringilla Montana*, Briſſ. *Le grand Montan*, Buff. *Greater brambling*, Albin. *Lapland finch*, Arct. Zool.

Native of the Northern parts of Europe and America. The ſpecies aſſociates in ſmall flocks, runs on the ground like the lark, and has a note reſembling that of the linnet. In America it is obſerved to be very partial to the juniper. The female lays five or ſix eggs, of a browniſh ſlate colour; the neſt is compoſed of moſs and graſs lined with feathers.

NIVALIS. Black, beneath ſnowy; ſecondary quill and tail-feathers white. Linn. *Pinçon de neige, ou nouverolle*, Buff. *Snow-finch*, Lath.

Length ſeven inches, with the bill black; head and neck above cinereous; back and rump grey-brown; two middle tail-feathers black, the lateral ones white tipped with black. This ſpecies inhabits Europe, and is alſo a native of part of Aſia. Pallas deſcribes a variety found about the nowy ſummits of the Caucaſian mountains, in which the flanks are ſtreaked with black; and the two outer-moſt tail-feathers marked with a white wedge-formed ſpot.

CASPA. Reddiſh-grey; face and chin white; wing and tail black, the latter forked. Gmel. *Le Dattier*, Buff. *Caſpa ſparrow*, Shaw's Travels. *Caſpa finch*, Lath.

A gregarious ſpecies diſtinguiſhed for its fine note; this bird

bird inhabits Barbary and Abyſſinia, where it is as common near granaries as the common ſparrow in Britain; it feeds on the date as well as grain.

ELEGANS. Above green, with cinereous collar; breaſt yellow; frontlet, throat, rump, and tail red; abdomen with white lunate ſpots. Gmel. *Le beau marquet*, Buff. *Beautiful finch*, Lath.

Length five inches, and in bulk reſembling the common ſparrow; the bill and legs are red; rump and tail cheſnut-red. Inhabits Africa.

FORMOSA. Green; chin and throat yellowiſh; belly barred with black and white; bill and legs red. Lath. *Lovely finch.*

Native of India, and perhaps differing only in ſex from the former.

NOCTIS. Black; chin and lores rufous; bill black. Linn. *Paſſer niger*, Briſſ. *Yohualtototl*, Ray. *Pere noir*, Buff. *Rufous-chinned finch*, Lath.

Size of a ſparrow, with the legs black, and the irides red; the ſpecies inhabits South America, and the American iſlands.

ARCUATA. Cheſnut, beneath white; head and lower part of the neck black; collar and ſtripe behind the eyes white. Gmel. *Moineau du Cap de Bonne Eſperance*, Buff. *Creſcent finch*, Lath.

Native of the Cape of Good Hope; the length of this bird is ſix inches; the leſſer wing-coverts are bay, middle ones white at the tip; quill and tail-feathers brown.

NITENS. Steel-blue black; bill and legs fleſh-colour. Gmel. *Paſſer niger erythrorynchos*, Briſſ. *Paſſer indicus brachyurus*, Ray. *Moineau du Breſil*, Buff. *Short-tailed Indian ſparrow*, Will. *Gloſſy finch*, Lath.

Rather ſmaller than the ſparrow; the bill fleſh-colour, and the irides white. A variety of this ſpecies inhabits Carthagena, in South America, the plumage of which is entirely black; the legs and bill duſky. The Nootka finch, which is totally black, with a white bill, is ſuppoſed to be likewiſe a variety.

LEUCURA. Yellowiſh, ſpotted with cheſnut, and varied with white lines; beneath and head whitiſh-yellow; tail-feathers whitiſh-aſh. Gmel. *Paſſer albicilla bononienſis*, Briſſ. *White-tailed ſparrow*, Aldr.

Inhabits Italy, about Bologna.

BRACHYURA. Entirely yellowiſh. Gmel. *Paſſerculus bononienſis*, Briſſ. *Paſſer brachyurus noſtras*, Ray. *Short-tailed ſparrow*, Will.

The yellow on the breaſt and belly paler than the reſt of the body. The ſpecies inhabits with the former.

CANA. Above yellow-brown, beneath yellow; head and chin grey; vent white; wings and tail brown with white lines, Gmel. *Serinus jamaicenſis*, Briſſ. *Serino affinis e cinereo, luteo et fuſco varius*, Ray. *Grey-headed finch*, Lath.

Length eight inches; legs blueiſh, claws brown, ſhort, and hooked.—Inhabits America.

DALMATICA. Above reddiſh, beneath whitiſh; tail forked. Gmel. *Paſſer Sclavonicus*, Briſſ. *Dalmatic ſparrow*, Will.

Larger than the houſe ſparrow, and inhabits Dalmatia.

BENGALUS. Pale blue; head and back grey; ſides of the head purple. Gmel. *Bengali*, Buff. *Blue-bellied finch*, Lath.

Native of Angola and Bengal. The length is four inches and three quarters; the bill dirty fleſh-colour; quill-feathers brown edged with grey; tail pale blue, a little cuneate; legs white. The female is deſtitute of the purple on the ſides of the head, conſpicuous in the male.

FLAMMEA. Fuſcous; creſt flame-coloured; body beneath roſy. Linn. *Fringilla criſtata*, Briſſ. *Flaming finch*, Arct. Zool. *Crimſon-crowned finch*, Lath.

Size of the red-pole; the bill pale brown; the whole of the top of the head deep flame-colour, inclining to crimſon, and the legs pale brown.

Deſcribed by Linnæus from the paintings of Rudbeck, as a native of Norland, and ſuppoſed to be peculiar to Northern regions.

ILIACA. Cinereous olive; feathers of the upper part of the body ſteel-blue, at the baſe; in the middle olive, with the tip brown; beneath white; tail-feathers and coverts above rufous. Gmel., &c.

Size of a thruſh. This ſpecies inhabits South America.

FLAVIROSTRIS. Brown; bill yellowiſh; feathers on the breaſt roſy at the tips. Linn. *Fringilla fuſca*, Briſſ. *Le Pinçon brun*, Buff. *Arctic finch*, Arct. Zool.

A migratory ſpecies found in Norway and Sweden.

MONTIFRINGILLA. Baſe of the wings beneath fine yellow. Gmel. *Fringuello montanino*, Olin. *Pinſon d'Ardenne*, Buff. *Bramble, brambling, bramble-finch*, Will. Ray, &c.

Length ſix inches and a half, and inhabits Europe and Siberia, where it frequents woods, and feeds on the maſt of beech and other trees. In the male, the head, neck and back are black, in the female brown; the throat and breaſt of the male are tawny, inclining to reddiſh; in the female reddiſh-grey; the quill-feathers are black, edged with yellow; tail ſlightly forked, and the legs grey. One variety of this bird has the eye-brows and band on the nape black; body beneath, and rump white; chin and breaſt red; wing-coverts with a whitiſh band. Another is diſtinguiſhed by the paler colour of the plumage, and in having the head white.

DOMESTICA. Quill and tail-feathers brown; body grey and black; wings with a ſingle white band. Linn. Fn. Suec. *Paſſer domeſticus*, Geſn. *Paſſera noſtrale*, Ol. *Moineau franc*, Buff. *Houſe-ſparrow*, Donov. Brit. Birds, &c.

This well known ſpecies is a general inhabitant of Europe, Africa, and Aſia, and from the boldneſs and familiarity of its habits is moſt abundant in the vicinity of populous places. It builds under the eaves of thatched houſes, and in other ſimilar ſituations; feeds on ſeeds and fruits, and alſo on inſects, and lays about five or ſix eggs, the colour of which is pale-aſh with ſpots of brown.

The principal varieties of this bird are 1ſt, white; 2d, yellow, clouded above with cheſnut; 3d, with the plumage blackiſh. The colours of the female are more obſcure than thoſe of the male.

CRISTATA. Cheſnut, beneath red; crown creſted and red; temples black. Gmel. *Friquet huppé, et Moineau de Cayenne*, Buff. *Black-faced finch*, Arct. Zool.

Size of the common ſparrow, with the bill red, and legs brown. The upper part of the plumage, wings, and tail reddiſh brown; rump crimſon; ſides of the head under the creſt black. This bird inhabits Cayenne.

CAROLINENSIS. Reddiſh brown; belly white; face and pectoral band black; throat and rump ſcarlet. Lath. *Le Moineau de la Caroline*, Buff. *Carolina black-faced finch.*

Native of Carolina, and from its cloſe affinity to the preceding has been conſidered as the female of that ſpecies by ſome writers. Its ſize is rather inferior, the ſpecies criſtata being ſix inches and an half in length, the latter only five inches and an half.

PETRONIA. Grey; eye-brows white; chin pale yellow.

Linn. *Paſſer torquatus*, Ray. *Paſſer ſylveſtris*, Briſſ. *La ſoulcie*, Buff. *Ring-ſparrow*, Will.

Length five inches and a half; feeds on fruits, ſeeds, and inſects. This ſpecies inhabits the ſouth of Europe. It frequents woods, builds in cavities in the trunks of trees, and lays four or five eggs. The red-headed ſparrow of Albin, and the bird called by Briſſon Paſſer torquatus, are ſuppoſed to be two varieties of F. petronia.

STULTA. Reddiſh-grey ſpotted with ferruginous, beneath yellowiſh; wings with a double white band. Lath. *Paſſer ſtultus*, Briſſ. *Paſſer mattugia*, Olin. *Fooliſh ſparrow*, Will.

Inhabits Italy. Size of the houſe-ſparrow.

BONONIENSIS. Spotted with white, black, and yellow, beneath yellowiſh white; head white, with pale yellow ſpots; tail-feathers pale yellow. Lath. *Paſſer maculatus*, Ray. *Speckled ſparrow*, Will.

Size of the former, and an inhabitant of the ſame country.

CÆLEBS. Limbs black; quill-feathers white on both ſides, the three firſt without ſpots; two of the middle tail-feathers obliquely white. Linn. Fn. Suec. *Fringilla ſylvia*, Scop. *Fringuello*, Olin. *Pinſon*, Buff. *Chaffinch*, Donov. Brit. Birds, &c.

A ſpecies found throughout Europe, in ſome parts of Aſia, and on the coaſts of Africa. The chaffinch is a conſtant inhabitant of the Britiſh iſles, being ſeen at all ſeaſons, and is one of the moſt frequent, as well as beautiful of our feathered tribe. In Sweden and Holland the ſpecies muſt be conſidered of the migratory kind, though it is not unworthy of remark that the females only leave thoſe countries, their males remaining behind. This ſingular migration, which is not entirely peculiar to the chaffinch, takes place in autumn, and at a ſtated period in the enſuing ſpring they conſtantly return to their former haunts.

The chaffinch is eſteemed a bird of ſong; its note is pleaſing, but does not continue throughout the whole year. It builds in low and thickſet buſhes. The neſt is compoſed of the fibres of plants and moſs, with a lining of hair, wool, and feathers. The eggs amount to five or ſix, and are of a pale reddiſh grey, with black ſpots at the larger end. The male is diſtinguiſhed from the female by the ſuperior beauty of its plumage, as well as by having the breaſt and other parts tinged with red.

There are many varieties of this ſpecies, among the principal of which the following may be ſpecified:

1. *Le Pinçon à ailes et queue noires*, Briſſ.; the plumage of which is aſhy above, beneath fleſh-colour; wing-coverts white, in the middle black, with the wings and tail black.

2. *Le pinçon blanc*. Entirely white.

3. *Le pinçon à collier*. Like the common kind, except that the collar and crown are white.

4. *Fringilla anterius alba, poſterius ferruginea*, Gmel. The fore-part white; hind-part ferruginous.

5. *Fringilla ſubtus pallidiſſima, dorſo flavicante*, Gmel. Beneath very pale; back yellowiſh.

MEXICANA. Greeniſh-brown, beneath whitiſh. Gmel. *Ligurinus mexicanus*, Briſſ. *Acatechichictli*, Ray. *Mexican ſiſkin*, Lath.

Size of the laſt; this ſpecies is a native of Mexico, and inhabits among reeds.

CACATOTOTL. Blackiſh and fulvous varied; beneath white. Gmel. *Ligurinus mexicanus niger*, Briſſ. *Cacatototl*, Ray. *Black Mexican ſiſkin*, Lath.

Inhabits Mexico.

SERINUS. Somewhat greeniſh; lower mandible whitiſh; back and ſides ſpotted with fuſcous; band on the wing yellow. Linn. *Serinus*, Briſſ. *Serin*, Buff. *Loxia ſerinus*, Scop. *Serin finch*, Lath.

A gregarious ſpecies found in the ſouth of Europe, where it is not uncommon.

FLAVEOLA. Yellow; back greeniſh; front fulvous; quill and tail-feathers black, ſpotted with yellow. Linn. *Saffron-fronted finch*, Lath.

Size of a canary bird, and conjectured to be a mongrel kind produced between the canary bird and goldfinch. The bill is convex, and of a pale colour, with the tip brown; the tail forked and the legs pale. Native place unknown.

AUTUMNALIS. Greeniſh; cap ferruginous; vent teſtaceous. Linn. *Autumnal finch*, Lath.

Native of Surinam.

LEPIDA. Greeniſh fuſcous; band above and beneath the eyes, with the chin orange; breaſt black. Linn. *Lepid finch*, Lath.

Inhabits woods in the Havannah.

BUTYRACEA. Greeniſh; eye-brows, breaſt, and abdomen yellow; primary quill-feathers white at the outer margin. Linn. *Chloris indica*, Briſſ. *Indian green-finch*, Edwards. *Yellow-finch*, Lath.

Native of Madeira, India, and the Cape of Good Hope.

BICOLOR. Head and breaſt black; back, wings, and tail dull greeniſh. Linn. *Chloris bahamenſis*, Briſſ. *Le verdinere*, Buff. *Bahama finch*, Arct. Zool.

A variable ſpecies common in the woods of Bahama. In ſize it agrees with the canary bird. The note is melodious.

BARBATA. Pale yellow; wings green, ſpotted with black and red; chin bearded. Molin. Chili.

According to Molina this ſpecies inhabits the mountainous parts of Chili, and deſcends into the plains in winter; it is eaſily tamed, ſings extremely well, and builds in trees. Its ſize is that of the canary bird. The female is without beard, of a cinereous colour, and has the wings marked with a few yellow ſpots.

AMANDAVA. Fuſcous and reddiſh, with white ſpots; tail-feathers black, with a white dot at the tip. Linn. *Fringilla rubra minima*, Klein. *Bengalus punctulatus*, Briſſ. *Le Bengali piqueté*, Buff. *Amaduvade finch*, Will.

This pretty ſpecies is the ſize of a wren. The female differs in having a mixture of white on the throat and fore-part of the neck, and the belly of a pale yellow colour. It inhabits Bengal, Java, and other parts of Aſia. There is a variety of this bird of a brown colour, in which the wings are marked with only a few white ſpots, and another without any ſpots.

SENEGALA. Ferruginous brown; beneath and crown rufous; bill red, ſtreaked with black. Gmel. *Senegalus ruber*, Briſſ. *Senegal finch*, Lath.

Rather larger than the wren, with tail black, and legs pale grey. It is a native of Senegal, and ſubſiſts chiefly on millet-ſeed; the males ſing well, and the ſong of the females is little inferior to that of the males. The ſpecies bears the climate of Europe extremely well. A ſuppoſed variety of this bird is found in Abyſſinia, the bill of which is purple inſtead of red; the neck and wing-coverts rufous, ſides of the breaſt and wings above ſpotted with white. The female of the latter is entirely brown.

LEUCOTIS. Above duſky, beneath yellow; ears with a white ſpot; primary quill-feathers blue, ſecondary green. Gmel. *White-eared finch*, Oſbeck.

Oſbeck deſcribes, on the authority of ſome Chineſe drawings, ſix analogous kinds of the finch tribe, all which poſſeſs the diſtinctive white ſpot under the ear, which is ſuppoſed

to

to conſtitute a material character of the ſpecies; and hence it is concluded they muſt be varieties of each other. One of theſe has the back and tail purple; another the head green, with the breaſt and tail purple; a third the head, back, and wing-coverts purple, and the tail blue; the head and leſſer wing-coverts are brown, and the breaſt pale green in the fourth; and the fifth is red beneath, with the head, back, tail, and wing-coverts brown; the lower ones ſcarlet. Theſe, with the variety firſt deſcribed, are the ſix mentioned by Oſbeck; they are ſmall, and inhabit China.

ALARIO. Head, collar, and breaſt deep black; body cheſnut, beneath white; four extreme tail-feathers marked with a black line near the tip. Linn. *Paſſerculus capitis bonæ ſpei*, Briſſ. *Cape finch*, Lath.

Size of the common ſparrow, and in length four inches and a half. This is a native of the Cape of Good Hope.

MAIA. Purpliſh, with a purple cheſnut band on the breaſt. Linn. *Cuba finch*, Lath.

The length of this bird is three inches and three quarters. The female is fulvous above, beneath yellowiſh, and the bill whitiſh inſtead of grey, as in the male. In the iſland of Cuba, the native place of this ſpecies, the inhabitants call it Maia. It is a gregarious kind, flies in innumerable flocks, and is extremely deſtructive to the rice plantations, as beſides inſects, the rice conſtitutes its principal food. The fleſh of the Maia is eſteemed delicious.

GRANATINA. Tail wedge-form; body reddiſh brown; bill red; temples, rump, and abdomen violet. Linn. *Braſilian finch*, Edwards.

Theſe birds vary in colour, and in being more or leſs ſpotted with brown; beſides which, there are three or more diſtinct varieties, one having the lores fuſcous, and the hind part of the body violet; another the lower part of the belly and thighs the ſame colour as the body; and a third with the thighs grey-brown; beneath pale tawny, and crown the ſame. Birds of this kind with the tail of a reddiſh colour are alſo ſometimes met with.

The bill of the female, like that of the male, is red; the ſpace beneath the eyes rather purple, the top of the head fulvous; back grey-brown; throat and under parts pale fulvous; and lower part of the belly and vent whitiſh. This is a beautiful ſpecies, of a lively diſpoſition, and has an agreeable ſong. For the latter reaſon it is not unfrequently kept in cages by the Europeans in the Braſils.

FUSICOLLIS. Crown, rump, and vent green; back ferruginous; throat browniſh, with a cinereous and reddiſh ſpot; tail half yellow, half black. Gmel. *Brown-throated finch*, Lath.

Bill red; legs yellow; behind the eyes a white line. This ſpecies inhabits China, and is of a ſmall ſize.

ZEYLONICA. Yellow; back greeniſh; head black; body beneath white, and blackiſh varied; quill and tail-feathers blackiſh. Gmel. *Ceylon finch*.

A ſpecies of ſmall ſize inhabits China, and alſo Ceylon; there is a variety of this bird, the back of which is green; breaſt and belly yellowiſh white, and the head brown-red.

IGNITA. Shining fuſcous red; wings and cuneated tail black. Gmel. *Fire-finch*, Brown.

Inhabits Africa. The ſize is that of the linnet, and the female is browniſh, with the front and lores red, and the tail reddiſh with the tip duſky.

TRICOLOR. Black, head and rump blue; ſhoulders green; abdomen yellowiſh. Linn. *American ſparrow of Seba*, Bancroft. *Blue-faced finch*.

Native of Surinam.

CYANOCEPHALA. Red-brown; crown and rump blue; beneath yellow; nape red, orbits white. Gmel. *Blue-crowned finch*, Lath.

Length ſeven inches. This inhabits Senegal.

CYANOMELAS. Blue; frontal line, chin, and dorſal lunule black; quill-feathers fuſcous; tail blackiſh. Gmel. *Demi-fin noir et bleu*, Buff. *Blue-headed finch*, Lath.

Size of the greater linnet; the bill brown, and legs black. Native place not aſcertained.

DIUCA. Azure; throat white. Molina.

Inhabits Chili.

ULTRAMARINA. Entirely deep azure; bill white; legs red. Gmel. *L'Outre-mer*, Buff. *Ultramarine finch*, Lath.

Native of Abyſſinia; female and young grey.

ABYSSINICA. Yellow; beneath, and collar black; wings and tail black with yellowiſh margins. Gmel. *Le Worabé*, Buff. *Black-collared finch*, Lath.

Size of the canary bird, gregarious, and inhabits Abyſſinia.

SYRIACA. Fuſcous, blackiſh and yellow varied; beneath whitiſh with duſky ſpots; crown red. Gmel. *L'Habeſch de Syrie*, Buff. *Tripoline finch*, Lath.

Rather leſs than the linnet. This ſpecies inhabits Syria, and is migratory.

ATRA. Blackiſh, breaſt and rump pale aſh. Gmel. *Fringilla obſcura*, Lath. Ind. Orn. *La Linotte brune*, Buff. *Duſky finch*, Edwards.

Length four inches, the bill aſh colour, legs duſky, and the feathers throughout paleſt at the tips. The ſpecies is ſuppoſed to inhabit Angola.

ANGOLENSIS. Browniſh-aſh, with fuſcous ſpots, beneath cheſnut; frontlet and chin black; cheeks and throat ſpotted with white; rump pale yellow. Gmel. *Lniaria Angolenſis*, Briſſ. *Vengoline*, Buff. *Angola finch*, Lath.

Size of the common linnet; the bill brown, and the legs fleſh colour; the upper part of the plumage in the female is reddiſh brown, beneath reddiſh, with a fuſcous band extending from the baſe of the bill to the back part of the head. In Angola the male is called by the natives Negral, and the female Benguelinha. The ſpecies is remarkable for its melodious ſong, which is even ſaid to ſurpaſs that of any other extra-European bird, the American mocking-bird excepted.

BENGALUS. Pale azure; head and back grey; ſides of the head purple. Linn. *Fringilla Benghalus*, Lath. Ind. Orn. *Le Bengali*, Buff. *Blue-bellied finch*, Edwards.

The female differs from the male in wanting the red ſpot beneath the eyes, in other reſpects they nearly agree. The ſpecies inhabits Bengal and alſo Angola. Its length is about four inches and a half; the bill dirty fleſh-colour; quill-feathers brown edged with grey; tail pale blue, rather wedge-form and the legs whitiſh. There is a variety of this ſpecies with the back brown, and the belly and tail blue.

CARDUELIS. Quill-feathers black, in the middle yellow, with the two outer black; two extreme tail-feathers white in the middle, the reſt white at the tips. Linn. Fn. Suec. *Carduelis*, Geſner. *Cardello*, Olina. *Chardonneret*, Buff. *Goldfinch, or thiſtle-finch*, Will. Albin. Donov. Brit. Birds.

The goldfinch is a general inhabitant of Europe, and a conſiderable part of Aſia and Africa, and a variety of it at leaſt is found even in the American iſlands. This beautiful and well known ſpecies conſtructs its neſt of fine moſs intermingled with lichens, the down of thiſtles and other plants, and lines the interior with hair and wool; the eggs are five in number, of a white colour, marked with deep purple at the larger end. It often builds in orchards, and has com-

monly two broods in a year. The goldfinch is obſerved to abound moſt in thoſe places where thiſtles occur in the greateſt plenty, and hence it was called by early Engliſh writers the thiſtle finch. The ſeeds of the thiſtle is a favourite food with this bird; it will alſo feed on hemp and other ſeeds as well as fruit and inſects. The ſpecies is remarkable for the docility of its diſpoſition, and as it ſings charmingly, it is frequently kept in cages. The male differs from the female chiefly in the ſuperior ſtrength and beauty of its colours. The varieties of the goldfinch are altogether numerous, among which the following are conſidered the moſt permanent.

1. *Carduelis leucocephalos*, Briſſ. *Chardonneret à tête blanche*, Buff. *White-headed goldfinch*, Will. In this the region of the bill and eyes are ſnowy.

2. *Carduelis capite ſtriato*, Briſſ. *Chardonneret à tête rayée*, Buff. *Goldfinch*, Brown, Jamaica. Having the head ſtreaked with red or yellow.

3. *Carduelis melanocephalos*, Briſſ. *Chardonneret à tête noire*, Buff. The head black; ſometimes the neck of this kind is alſo black, and the bill ſpotted at the baſe with red.

4. *Carduelis albida*, Briſſ. *Chardonneret blanchâtre*, Buff. *Whitiſh goldfinch*, Will. A variety of a whitiſh colour, with the front, cheeks, and chin red; and the wings and tail browniſh-aſh.

5. *Carduelis nigra*, Briſſ. *Chardonneret noir*, Buff. Entirely black.

The plumage of the goldfinch, like that of the lark and ſome other ſmall birds, becomes black from the bird feeding on hemp ſeed, a fact extremely well authenticated by the experiments of modern ornithologiſts.

6. *Carduelis nigra icterocephalos*, Briſſ. *Carduelis congener*, Ray. *Chardonneret noir à tête jaune*, Buff. *A bird of kin to the goldfinch*, Will. This is rather larger than the common goldfinch; the bill ſurrounded with a ſaffron-coloured ring, the reſt of the head and upper parts dark.

7. *Carduelis hybrida*, Briſſ. *Chardonneret métis*, Buff. *Canary goldfinch*, Albin. Like the former this exceeds the common goldfinch in magnitude; the colours on the head are ſimilar to the ordinary kind, but more obſcure; the upper parts of the body yellowiſh-brown; under parts yellow; wings as in the goldfinch, and the tail yellow with the tip black. This is the hybrid between the goldfinch and canary.

8. *Le Chardonneret blanc*, Briſſ. A variety wholly white. Sometimes the white variety has the outer edge of the quills tinged with yellow, or a little mixture of yellow on the wing-coverts. In others thoſe parts of the plumage which in the common bird are red, exhibit a faint bluſh or tint of that colour; or are more or leſs mottled with red.

Cannabina. Cheſnut-brown, beneath reddiſh-white; wings with a longitudinal white band; ſpot on the crown and breaſt red. Linn. *Linaria marina*, Aldr. *Grande linotte de vignes*, Buff. *Greater red-headed linnet*, Ray. *Greater red-pole*, Arct. Zool.

This pretty bird is an inhabitant of Europe and America; its ſize is rather leſs than that of the common linnet, and its length nearly the ſame. The head of the female is aſh-coloured, ſpotted with black, the back and ſcapulars of a reddiſh-brown, the breaſt and ſides dirty yellow, ſtreaked with duſky lines.

Linaria. Brown, varied with grey; beneath reddiſh-white; wings with a double white band; crown and breaſt red. Gmel. *Leſſer redpole*.

Numerous throughout Europe. The ſize is conſiderably leſs than that of the greater red-pole; the bill and legs brown; the back black; ſides marked with narrow duſky lines, and the legs duſky. The female has a ſpot of ſaffron on the front.

Linota. Cheſnut-brown, beneath whitiſh; wings with a longitudinal white band; tail-feathers each ſide edged with white. Gmel. *Common linnet*.

Size of the laſt. The bill is grey with the tip brown; ſides of the neck cinereous; throat with a brown line in the middle, bounded on each ſide with a white one; bottom of the breaſt blood red; vent yellowiſh, with the two middle tail-feathers edged with red. In the female and young birds the red is wanting on the breaſt. This ſpecies inhabits Europe, and feeds principally on hemp ſeed, which it peels before it eats.

The linnet is common in England, and is often kept in cages, being in high eſteem for the ſweetneſs of its ſong. It alſo breeds in this country. The neſt, which is compoſed of dried herbs, graſs, and moſs, and lined with hair and wool, is uſually built in thickets of black and white thorn, or in a furze buſh. The female lays from four to five white eggs, ſpotted with reddiſh-brown at the larger end. Linnets are frequently found in flocks during winter, and when in want of food will eat any kind of ſeed, though they prefer the hemp ſeed. Linnets are ſometimes met with entirely of a white colour, and there is beſides another variety which has the quills and tail black, edged with white.

Canaria. Bill and body ſtraw-colour; quill and tail-feathers greeniſh. Linn. *Le Serin des Canaries*, Briſſ. *Canary bird*, Will.

In a wild ſtate the canary bird is, as the name implies, an inhabitant of the Canary iſlands; and is alſo found in other places, as Palma, Cape Verd, Fayal, and Madeira, where it frequents watery places, and feeds on ſeeds, eſpecially thoſe of the hemp and canary-graſs. The delightful ſong of the canary bird is familiar to every one. They are caught in vaſt numbers, and tranſported from their native climate to different parts of Europe, where they bear the confinement of the cage remarkably well, and not only thrive, but breed with perfect facility.

The canary bird, beſides becoming productive with its own ſpecies in European climates, will breed pretty freely with the ſiſkin and the goldfinch, and alſo with the linnet, the yellow-hammer, and chaffinch, and even the houſe-ſparrow. The male canary bird will not aſſimilate with the females of thoſe birds, the hen muſt be of the canary kind to produce this union; the young obtained from croſſing the breeds are in general mules, though the contrary does ſometimes happen.

An enumeration of the many varieties of theſe birds that are to be found in a ſtate of domeſtication, would be altogether tedious; we may briefly obſerve that in a ſtate of nature the prevailing colour of the plumage is grey, and that by various means of culture, and pairing them with other ſpecies, the varieties are at leaſt as numerous as thoſe of our common poultry. Buffon particularly deſcribes twenty-nine diſtinct varieties, and there are many others which he has entirely omitted.

It is a long-lived bird, attaining to the age of ten or fifteen years, or, according to Salerne, even as far as eighteen.

Macroura. Body fuſcous, with blackiſh ſpots, beneath pale cinereous, tail wedge-formed and elongated, the two middle tail-feathers narrow, pointed, and greeniſh-brown. Gmel. *Long-tailed finch*, Lath.

From Cayenne. In ſize agrees with the linnet; length ſeven inches and a half, the legs and bill brown.

Argentoratensis. Fuſcous, beneath rufous, ſpotted with

with fuſcous, belly and vent whitiſh. Gmel. *Linaria argentoratenſis*, Briſſ. *Le Gyntel de Straſburg*, Buff. *Straſburgh finch*, Lath.

Size of the common linnet. Inhabits the environs of Straſburgh, where it is called Gyntel. The quills and tail are brown, the legs reddiſh.

CAUDACUTA. Varied with rufous and brown; eye-brows, chin, and neck above rufous; tail entire, the feathers all pointed at the tips. Lath. Ind. Orn.

Inhabits the interior of Georgia in America. The length of this bird is four inches and a half, the bill and legs pale; irides fuſcous.

GEORGIANA. Fuſcous, beneath whitiſh; leſſer wing-coverts entirely, with the edges of the outer webs of the tail-feathers, rufous; chin and throat mouſe-coloured; beneath the arm-pits a black ſtreak. Lath. Ind. Orn.

About ſix inches in length; the bill duſky, irides fuſcous; head fuſcous, the back blackiſh in the middle; legs fuſcous. This ſpecies inhabits the ſame country as the former.

MELANICTERA. Black; abdomen ſpotted with white; wings and tail edged with ferruginous. Gmel. *Moineau de Macao*, Buff. *Black and orange finch*, Lath.

Size of a linnet. The ſpecies inhabits Macao.

MELANOLEUCA. Black, with a white pectoral band. Gmel. *Moineau de Java*, Buff. *White-breaſted finch*, Lath.

Found in Java, and inhabits ſame country as the laſt.

PECORIS. Fuſcous, beneath paler; tail ſomewhat forked. Gmel. *Fringilla virginiana*, Briſſ. *Brunet*, Buff. *Cowpen bird*, Cateſby. *Cowpen finch*, Lath.

Native of Virginia and Carolina. Length ſix inches and three quarters.

JAMAICA. Grey; breaſt blueiſh-green; quill and tail-feathers black. Linn. *Le Bonana*, Buff. *Paſſer cæruleo-fuſcus*, Ray. *Grey groſbeak*, Brown. *Bonana finch*, Lath.

Size of the ſiſkin, with bill and legs black. Native of Jamaica.

CANA. Yellow-brown, beneath pale yellow; head and chin grey; wing and tail-feathers fuſcous, with white lines. Gmel. *Serinus jamaicenſis*, Briſſ. *Grey-headed finch*, Lath.

Inhabits Jamaica. Length eight inches; legs blueiſh.

SAVANNARUM. Above brown, varied with whitiſh and pale yellow; beneath yellowiſh-brown; belly and tip of the quill-feathers white; wings and tail brown; eye-brows yellow. Gmel. *Paſſer jamaicenſis*, Briſſ. *Paſſer pratorum*, Klein. *Savanna bird*, Ray. *Savanna finch*, Lath.

Native of Jamaica. The length of this bird is four inches and a quarter; the bill ſhort, thick, and pointed, and the legs whitiſh. Sloane relates, that "they ſit on the ground in the plains, and run thereon after the manner of ſkylarks, as low as they can to avoid being diſcovered, and when raiſed, fly not far nor high, but light again very near."

COCCINEA. Fulvous ſcarlet; wings and tail black; quill-feathers orange at the outer edge, the primaries black at the tips. Gmel. *Scarlet finch*, Lath.

Length four inches; the bill pointed, and of a pale colour; tail even at the end; legs black.

ROSEA. Roſy; frontlet ſilvery; back with browniſh-grey ſtripes; wings and tail blackiſh; tail-feathers roſy on the outer edge. Gmel. *Fringilla roſea*, Pallas. *Roſy finch*.

A rare ſpecies found among the willows in Siberia. There is a variety of this kind found likewiſe in Siberia, the plumage of which is reddiſh-aſh above, beneath white; the feathers of the head, rump, and throat tipped with fine red; quill and tail-feathers brown, edged with pale yellow. This is the crimſon-crowned finch of the Arctic Zoology. The loxia erythrina of Gmelin is conſidered by Dr. Latham as a variety alſo; its colour is reddiſh cinereous above, beneath white, with the head, rump, chin-feathers red at the tip; lower part of the neck whitiſh; and the tail, which is rather forked, with brown ſhafts, and pale yellow margins. This laſt-mentioned bird inhabits the thick woods about the Volga and Samara, where it is ſaid to breed. The female makes a neſt of hay between the branches of trees.

PUNICEA. Black; cheeks, throat, and breaſt red; wing-coverts with two white lines. Gmel. *Red-breaſted finch*. Arct. Zool.

Native of America.

FERRUGINEA. Fuſcous, with ferruginous margins, beneath pale; breaſts with duſky ſpots; region of the eye white. Gmel. *Little ſparrow*, Edwards. *Ferruginous finch*, Arct. Zool.

Size of the common ſparrow, and inhabits Pennſylvania.

ALBICOLLIS. Cheſnut, beneath hoary; chin white; cheeks hoary; eye-brows orange. Gmel. *Fringilla Penſylvanica*, Lath.

Length ſix inches and a quarter. Inhabits ſame country as the former.

FASCIATA. Spotted, above ferruginous, beneath white; tail fuſcous, with numerous blackiſh bands. Gmel. *Faſciated finch*, Arct. Zool.

Native of New York.

GRAMINEA. Varied with ferruginous, cinereous and black; beneath white; breaſt and ſides ſpotted; throat ſtriated; tail, and primary quill-feathers blackiſh; leſſer wing-coverts bay. Gmel. *Gräſs finch*, Arct. Zool.

Inhabits with the former, and lays its eggs in the graſs.

PINETORUM. Above reddiſh, teſtaceous, beneath yellow; breaſt with a tranſverſe ferruginous band. Lepechin.

A ſpecies found in the pine foreſts of Siberia.

CINEREA. Fuſcous with ferruginous margin; two lateral lines on the head with the chin grey; throat greyiſh; abdomen white in the middle. Gmel. *Cinereous finch*, Arct. Zool.

Native of Aoonalaſhka.

ZENA. Black, beneath white; above and beneath the eye a white line; breaſt orange. Linn. *Fringilla bahamenſis*, Briſſ. *Le Pinçon à tête noir et blanche*, Buff. *Bahama finch*, Cateſby. *Orange finch*, Arct. Zool.

The bill and legs are lead colour; wings and tail brown, and the wing-coverts marked with a white band. The female has the head and neck cinereous. This ſpecies inhabits South America. Its length ſix inches and a quarter.

SYLVATICA. Head banded; body above grey and black varied; breaſt and belly hoary. Lepechin. *Wood-finch*.

Inhabits the pine foreſts of Siberia.

NORTONIENSIS. Black, beneath white; threat ſpotted with ferruginous; quill-feathers and tail black, the outer

feathers

feathers on each ſide the latter with a white longitudinal line. Gmel. *Norton finch*, Arct. Zool.

Found in Norton Sound.

HYEMALIS. Fuſcous, clouded with black, beneath white; lower part of the neck, breaſt, and ſides ſpotted with brown. Gmel. *Winter finch*, Arct. Zool.

Inhabits New York during the winter ſeaſon.

STRIATA. Clouded with fuſcous; head with four black ſtreaks; face yellow; temples whitiſh; wing-coverts and ſub-cuneated tail brown; wings blackiſh. Gmel. *Striped-headed finch*, Arct. Zool.

Inhabits with the laſt, and meaſures in length five inches and a half.

PURPUREA. Sub-violaceous; belly white; quill-feathers brown on the inner webs. Gmel.

Size of the laſt. This kind inhabits Carolina, and feeds on the juniper berries and the buds of fruit-trees. The tail is ſlightly forked, the female fuſcous, and having the belly ſpotted with white.

SURINAMA. Grey; quill-feathers each ſide and lateral tail-feathers within white. Linn. *La linotte de Surinam*, Ferm. *Surinam finch*, Lath.

Native of Surinam. Its ſize rather exceeds that of our common ſparrow, its note is indifferent, but the fleſh is in much eſteem.

LONGIROSTRIS. Grey, varied with brown and yellow; beneath orange; tail olive, head and chin black, with cheſnut collar. Gmel. *Le Pinçon a long bec*, Buff. *Long-billed finch*, Lath.

Remarkable for the length of its bill; the ſpecies is larger than the chaffinch, and inhabits Senegal.

SINICA. Rufous olive, beneath teſtaceous; quill and tail-feathers black, with the baſe pale yellow. Linn. *L'Olivette*, Buff. *Pinçon de la chine*, Pl. Eul. *Chineſe finch*, Lath.

Native of China, and in ſize reſembles the linnet.

SINENSIS. Olive, beneath yellow: head, bill, legs, and quill-feathers black, the greater quill and tail-feathers half yellow. Gmel. *Le Tarrain de la Chine*, Sonnerat. *Chineſe ſiſkin*, Lath. *Fringilla aſiatica*, ibid.

Inhabits with the preceding.

NÆVIA. Cinereous with obſcure ſpots, beneath cinereous; chin white; lores rufous; on the jaw a black ſtreak. Gmel. *White-cheeked finch*, Lath.

Size of the common ſparrow; and is an African ſpecies, found chiefly at the Cape of Good Hope.

MELANOCEPHALA. Ferruginous brown; head, throat and quill-feathers black; nape and abdomen white, with the bill red. Gmel. *Black-headed finch*, Lath.

Native of China.

FUSCA. Brown, with the margins of the feathers blackiſh; beneath brown-white. Gmel. *Brown finch*, Lath.

Inhabits ſame country as the preceding.

EUSTACHII. Yellow, beneath orange; ſpot beneath the eye blue; wings and tail red. Gmel. *Fringilla inſulæ S. Euſtachii*, Briſſ. *Le pinçon jaune et rouge*, Buff. *Paſſer Africanus extimius*, Seba. *Euſtachian finch*, Lath.

Native of the iſland of St. Euſtatia. Length five inches and a half.

VARIEGATA. Red, yellow, blue, and white, varied; breaſt pale-yellow, clouded; tail at the tip and margin white. Gmel. *Le Touite*, Buff. *Variegated finch*, Lath.

Size of the laſt; the bill yellow, and legs red. The ſpecies inhabits New Spain.

CRISPA. Olive, beneath pale yellow; head black; many of the feathers recurvate. Linn. *Le Pinçon friſé*, Buff. *Black and yellow frizzed ſparrow*, Edwards. *Frizzled finch*, Lath.

Inhabits Africa.

INDICA. Cinereous fuſcous, beneath rufous white; frontlet, throat, collar and neck white; pectoral band with the wings and tail black. Gmel. *Fringilla torquata indica*, Briſſ. *Le Pinçon à double collier*, Buff. *Collared finch*, Edwards.

Native of India.

MELBA. Green; face and tail red, abdomen undulated with black and white. Linn. *Carduelis viridis*, Briſſ. *Maracaxao*, Buff. *Green finch*, Edwards.

Size of the goldfinch; the bill is fleſh colour; lores blueiſh; and tail entire. The female is diſtinguiſhed by having the bill pale yellow; top of the head and neck aſh-colour, and the baſe of the wings and rump yellowiſh. Linnæus deſcribes it as a native of China.

AFRA. Fuſcous-green; cheeks pale crimſon; tail ſcarlet; primary quill-feathers duſky, with orange margins. Gmel. *Red-faced finch*, Brown.

Inhabits Angola.

PSITTACEA. Green; face, rump, and tail ſcarlet; inner edge of the quill-feathers brown. Gmel. *Parrot finch*, Lath.

A beautiful ſpecies, rather leſs than the wax-bill; it inhabits New Caledonia.

ERYTHROCEPHALA. Olive; head and collar ſcarlet, with black orbits; wings black with two bars of white on the coverts. Gmel. *Red-headed finch*, Brown.

Inhabits Mauritius.

LULENSIS. Fuſcous; breaſt and ſhoulders rufous; wings black with a rufous ſpot; collar and body beneath white. Linn. *Carduelis ſuecica*, Briſſ. *Le Chardonneret a quatre races*, Buff. *Lulean finch*, Arct. Zool.

Native of Sweden, chiefly about Weſt Bothnia, and in ſize correſponds with the goldfinch.

TRISTIS. Yellow; front black; wings fuſcous. Linn. *Carduelis americana*, Briſſ. *Le Chardonneret jaune*, Buff. *American goldfinch*, Arct. Zool. *Green ſparrow*, Bancroft.

Length four inches and a half, with the bill and legs white, the female duſky and deſtitute of the black on the head. They inhabit New York during the ſummer ſeaſon, and feed on thiſtles. The bird called by Buffon le tarin de la Nouvelle Yorck is ſuppoſed to be a variety of this ſpecies, or the ſame in its winter dreſs.

SPINUS. Quill-feathers pale yellow in the middle, the firſt four without ſpots; tail-feathers yellow at the baſe, and tipped with black. Linn. Fn. Suec. *Acanthus avicula*, Geſner. *Ligurinus*, Briſſ. *Lucarino*, Ol. *Abadavine*, Albin. *Siſkin*, Donov. Br. Birds.

PICTA. Purpliſh; crown, wings, and tail blue; rump yellow; collar, breaſt, and vent red. Gmel. *Azure-headed finch*, Lath.

Deſcribed by Dr. Latham from a Chineſe drawing in the poſſeſſion of Dr. Fothergill. The length is four inches, the bill and legs red, and the greater wing-coverts green.

TORQUATA. Reddiſh; rump blue; lunule on the cheeks black; quill-feathers black with the tips blue, and a white ſpot at the extremity. Gmel. *Lunar finch*, Lath.

Native of India. Length ſix inches.

MULTICOLOR. Black, beneath yellowiſh; vent yellow; cheeks yellowiſh; lower part of the back green; wing-coverts with a white ſpot; ſecondary quill-feathers with white lines near the tip. Gmel. *Green-rumped finch*.

Inhabits Ceylon.

TESTACEA. Teſtaceous brown clouded with black;

quill-feathers and tail fuſcous; bill and legs fleſh colour. Jacquin. *Teſtaceous finch.*

Length five inches and a half, and ſuppoſed to inhabit Luſitania.

FLAVICOLLIS. Cinereous, beneath whitiſh; chin white; throat with a yellowiſh ſpot; primary quill-feathers black, edged with brown; bill and legs blueiſh-grey. Gmel. *Yellow-throated finch*, Arct. Zool.

Native of North America.

CARTHAGINIENSIS. Entirely cinereous with fuſcous and yellow ſpots; bill and legs pale fuſcous. Jacquin. *Carthagena finch.*

Size of the canary bird. The ſpecies inhabits South America, and in ſong reſembles the chaffinch.

OCHRACEA. White; head, ſides of the neck, breaſt, and wing-coverts ochre colour; bill and legs yellow. Jacquin. *Ochre finch.*

Inhabits Auſtria. Size that of the chaffinch.

IMPERIALIS. Ruſty-roſy; crown, and beneath yellow; quill-feathers and tail ſhort and obſcure. Lath. *Imperial finch.*

Size of the Amaduvade; bill and legs fleſh colour; inhabits China.

AUSTRALIS. Fuſcous; collar ferruginous. Lath. *Ruſty collared finch.*

Inhabits the iſle of Terra del Fuego.

FRINGILLAGO, a name by which ſome have called the whole genus of the titmouſe; but others have reſtrained it only to one ſpecies of them, which is the common larger kind, called by us the ox-eye. See PARUS *major.*

FRINGILLAGO *Americana cærulea*, a name given by Mr. Ray to the American titmouſe, otherwiſe known by its Braſilian name *guiragenoia.* See TANAGRU *braſilienſis.*

FRINGILLARIUS, ACCIPITER, the name of a ſpecies of hawk, called by ſome *niſus*, and in Engliſh the ſparrow-hawk. See FALCO *Niſus.*

FRINGYBAZAR, in *Geography*, a town of Hindooſtan; 11 miles S.S.E. of Dacca.

FRINGYPAT, a town of Hindooſtan, in Canara; ſix miles E. of Mangalore.

FRIO, a river of Spain, which riſes in Grenada, and runs into the ſea at Toros.

FRIO, a ſmall iſland on the coaſt of the Brazils, ſituated in S. lat. 32° 2′. and in W. long. 41° 31′ 45″. The land is high, with a hollow in the middle, which makes it appear at a diſtance like two ſeparate iſlands. The paſſage between the iſland and the continent is about a mile broad, and ſeemed to ſir Eraſmus Gower to be clear of ſhoals.

FRIPPERY, a French term, ſometimes uſed in our language; properly importing the trade, or traffick of old ſecond-hand cloaths and goods.

The word is alſo uſed for the place where ſuch ſort of commerce is carried on, and even for the commodities themſelves. The company of Frippiers, or Fripperers, at Paris, form a regular corporation, of an ancient ſtanding, and make a conſiderable figure among the companies of that city.

FRISAWA, in *Geography*, a river of Moravia, which runs into the Marſch, five miles N. of Maglitz.

FRISCH, JOHN LEONARD, in *Biography*, was born at Sulztach, in the Upper Palatinate, in 1666. He ſtudied at various univerſities in Germany, and after travelling through France and Switzerland, he ſucceeded the evangelical preacher, Elias Breithorn, at Newſol in Hungary, but was driven from thence by perſecution, and became an interpreter during the Turkiſh war. From Hungary he went to Venice and other parts of Italy, and was in 1693 appointed ſuperintendant of a nobleman's eſtate near Nuremberg. After this he went firſt to Holland, and then to Berlin, where he was appointed ſub-rector, and then rector of the Grey Convent Gymnaſium in 1726. By the recommendation of the celebrated Leibnitz, whom he inſtructed in the Ruſſian language, he was choſen a member of the Royal Academy of Sciences, and of the Imperial Academy of the Searches into Nature. He had already perpetuated his name by being the founder of the ſilk manufactory at Brandenburg, and he was the firſt perſon who cultivated mulberry-trees in the neighbourhood of Berlin, where he formed a plantation of them, which flouriſhed to a very great degree. He conceived an idea that church-yards, in the city and adjacent villages, might be planted with theſe trees to great advantage, and the plan was recommended in the year 1718 by Frederic William I. He was author of a German dictionary, and wrote a deſcription of all the inſects of Germany, of which thirteen parts were publiſhed. Theſe have been of no ſmall uſe to ſucceeding naturaliſts. He was author of many other works, among theſe was one entitled, "A Repreſentation of the birds of Germany, with a few of foreign countries, coloured after nature." This was finiſhed, and publiſhed by Friſch's ſon, and is eſteemed by naturaliſts on account of the great accuracy of the colouring. It contains twelve grand claſſes, which occupy 255 plates, and 179 pages of deſcription; of theſe Friſch wrote the deſcription of the four firſt claſſes only. Gen. Biog.

FRISCH *Haff*, in *Geography*, a gulf or arm of the ſea, on the coaſt of Pomerania, S. of the Baltic; about 25 miles in length from eaſt to weſt, and eight from north to ſouth. The Oder paſſes through it at its eaſtern extremity.—Alſo, a bay or arm of the ſea, between Konigſberg and Elbing, ſeparated from the Baltic by a tongue of land, called "Friſen Nerung," 26 miles long, and ſcarcely two wide. The bay is about 54 miles in length, and hardly ſix in breadth. It communicates with the Baltic by a narrow paſſage near Pillau.

FRISCHBACH ALLEN, a mountain of Stiria; 10 miles E. of Pruck.

FRISCHLIN, NICODEMUS, in *Biography*, a learned German, was born in the duchy of Wirtemberg in 1547. He was educated partly under his father, and partly at the univerſity of Tubingen, and at the latter place he taught the belles lettres, and other ſubjects relating to polite literature. He profeſſed to teach the principles of grammar in a new and eaſy method, and publiſhed ſtrictures upon former grammarians, in a work entitled "Strigil Grammatica," which involved him in ſome angry controverſies with others of the profeſſion. In a commentary, which he publiſhed on the Bucolics and Georgics of Virgil, he indulged ſuch acrimony of ſtyle in declaiming upon the compariſon between the innocence of a country life, and the corrupt manners of the great, that he was compelled to quit his native country, and wander through the different parts of Germany. At Mentz he wrote to the duke of Wirtemberg for pecuniary aſſiſtance, of which he ſtood in great need, but being diſappointed in his application, he wrote back a remonſtrance ſo full of abuſe, that he was arreſted, and carried to the priſon of Aurach, in the duchy. Attempting to eſcape from this place by cutting his ſheets into ſlips, and thus to let himſelf down from the window, his weight broke the ſupport, and he was unfortunately killed by the fall. This happened in November 1590, when he was forty-three years old. He had a wonderful facility in making verſes, and wrote 16 books of elegies, ſeven comedies, two tragedies, and a multitude of anagrams, odes, &c. From the emperor Rodolph he obtained the golden laurel, and the title of "Crowned Poet."

He

He left commentaries upon the epiſtles of Horace, and the ſatires of Perſius, and tranſlations of Oppian, Ariſtophanes, Callimachus, and Heliodorus. Moreri.

FRISCHLING, in *Geography*, a river of Pruſſia, which riſes about 10 miles N. of Pruiſch Eglau, and runs into the Friſch Haff; two miles S. W. of Brandenburg.

FRISNIK, a town of Moravia, in the circle of Iglau; four miles S.S.E. of Iglau.

FRISONS, or FRISIANS, in *Ancient Geography*, ancient inhabitants of the country which ſtill bears their name; between the Amaſia or Ems, and the Rhine. To the eaſt they had the Chauci, Chamari, and Angrivari, from whom they were ſeparated by the Amaſia; to the weſt, the Rhine; to the ſouth, the Bructeri; and to the north, the ocean. But in the decline of the Roman empire, their name and dominion extended from the Cimbric Cherſoneſus to the Scheldt; their limits being variable according to the circumſtances of the times. They were diſtinguiſhed into the Upper and Lower Friſons; the former being divided, as we have ſaid, from the Lower Chauci by the Amaſia, and from each other they were divided by an arm of the Rhine. Their country ſtill retains the name of Frieſland, and is divided into eaſt and weſt; but the latter has been diſmembered from Germany, and conſtituted one of the ſeven United Provinces. See FRIESLAND.

In order to account for the extenſion of their dominion, it ſhould be recollected, that when the Roman power declined in Gaul and the Barbarians encroached on its limits, the maritime people of Germania Secunda, whoſe fidelity to the Romans had rendered them odious to thoſe nations who inhabited the other ſide of the Rhine, re-united for their defence. With this view they choſe a general, to whom they gave the command of their combined troops, but they maintained their own laws and cuſtoms, and the particular form of their government. The Friſons, being the moſt powerful, gave their own name to this league. In proceſs of time they were joined by the Saxons, who participated of this honour, and the two names were for ſome time ſynonymous. Accordingly, under the appellation of Friſons many people of leſs note, but of appropriate denominations, were comprehended; and this appellation was given to their whole country. The Friſons were ſimple and ingenuous; but eminently courageous; they loved liberty and recurred to arms in order to defend it. So jealous were they of their freedom and independence, that in order to guard againſt the intruſion of ſtrangers, they cauſed them to articulate certain words, peculiar to themſelves; and if they were unable to do this, they were precipitated into the marſhes. The Friſons were for a long time, as it is ſaid, governed by kings. Druſus having paſſed the Rhine, conquered Friſia, and the inhabitants became his allies and reſcued him from danger incurred by his attack on the Cauci. Druſus impoſed upon them an eaſy tribute, which conſiſted merely of ſome ox-hides for the ſoldiers' bucklers and machines of war. This tribute they contentedly paid till Olennius, firſt centurion of a legion under Tiberius, having been appointed governor of Friſia, inſiſted that the hides of wild bulls ſhould be the models of thoſe of the tribute. This was impoſing upon impracticable conditions, as the wild beaſts in the German foreſts were very large, and their cattle very ſmall. Finding it impoſſible to obey this new law, they firſt parted with their herds, then with their lands, and at laſt ſurrendered their wives and children to bondage, in payment of the rigorous exaction. When their remonſtrances were fruitleſs, they had recourſe to arms, and hung upon trees the ſoldiers who levied the tribute. Olennius made his eſcape, and the Friſians purſued him; but by the whole force of the 5th legion ſent out againſt them, they were at length repulſed. They remained, however, in arms for 20 years, till Corbulo, A.D. 47, conſtrained them to ſubmit peaceably to the Roman yoke, to give hoſtages, and to reſtrain themſelves within the limits of the territory, which he aſſigned them. He preſcribed their form of government, made their laws, gave them a ſenate and magiſtrates, and to keep them perfectly in fear, he built a fort in the middle of their country, and ſtrongly garriſoned it. In the reign of Nero, the Friſons took with them their wives and children to ſettle on the lands near the Rhine, which the Romans had reſerved for their ſoldiers and left uncultivated. They built huts, ſowed the ground, and uſed theſe lands as if they had been their own; but they were made to underſtand that the Romans would fall upon them, if they did not return to their old places of abode, or obtain the emperor's leave to ſettle there. The Friſians, not being able to conceive how any one could be jealous of the poſſeſſion of a country which was applied to no uſe, agreed to apply to the emperor. Two of their magiſtrates were ſent to Rome; and though they were treated with reſpect by the emperor, their requeſt was denied. The Friſons were obliged to leave the lands which they had occupied; and on their refuſing to obey, foreign troops were ſent who compelled them by force, and killed or made priſoners thoſe who perſiſted in their obſtinacy. We have already mentioned other particulars relating to this people under the article FRIESLAND, to which we refer.

FRIST, a term among *Merchants* for ſelling goods upon credit.

FRIT, or FRITT, in the *Glaſs Manufacture*, is the matter, or ingredients, whereof glaſs is to be made; when they have been calcined, or baked in a furnace.

A ſalt drawn from the aſhes of the plant kali, or from fern, or other plants mixed with ſand, or flint, and baked together, makes an opake maſs, called by glaſs-men frit; probably from the Italian *frittare*, to fry; or becauſe the frit, when melted, runs into lumps, like fritters, called by the Italians *fritelli*.

Frit, by the ancients, was called *hammonitrum*, or *ammonitrum*, of αμμος, *ſand*, and νιτρον, *nitre*: under which name it is deſcribed by Pliny thus: fine ſand from the Volturnian ſea, mixed with three times the quantity of nitre, and melted, makes a maſs called ammonitrum; which being re-baked, makes a pure glaſs. Hiſt. Nat. lib. xxxvi. cap. 26.

Frit, Neri obſerves, is only the calx of the materials which make glaſs; which though they might be melted, and glaſs be made, without thus calcining them, yet it would take up much more time. This calcining, or making, of frit, ſerves to mix and incorporate the materials together, and to evaporate all the ſuperfluous humidity. The frit, once made, is readily fuſed, and turned into glaſs.

There are three kinds of frits; the firſt, *cryſtal* frit, or that for cryſtal metal; made with ſalt of pulverine and ſand.

The ſecond, and ordinary frit, is made of the bare aſhes of pulverine, or barilla, without extracting the ſalt from them. This makes the ordinary white, or cryſtal metal.

The third is frit for green glaſſes, made of common aſhes, without any preparation. This laſt frit will require ten or twelve hours baking.

The materials in each are to be finely powdered, waſhed and ſearced; then equally mixed, and frequently ſtirred together in the melting pot. For the reſt, ſee GLASS, and CRYSTAL.

FRITBURG. See FRIBURGH.

FRITH, JOHN, in *Biography*, one of the earlieſt Engliſh martyrs to the principles of the Reformation, was born at Seven-oaks, in Kent, about the beginning of the ſixteenth century. He received his college education at King's college, Cambridge. Here he diſtinguiſhed himſelf by his application and proficiency, and when he was admitted to the degree of B. A. he had a high reputation as a firſt rate linguiſt, and well-informed general ſcholar. On this account he was made one of the junior canons of the New Inſtitution, now Chriſt-church, in the univerſity of Oxford. In 1525 he was incorporated at Oxford in the ſame degree which he had taken at Cambridge. Before this, however, he had become the friend and intimate of William Tyndale, by whoſe means he had obtained a thorough conviction of the corruptions and errors of popery, and had adopted the principles of the reformers. On this account he was confined priſoner ſome time, and afterwards went beyond ſeas, where he became confirmed in his opinions, and reſolved to return to his native country and devote himſelf to the propagation of them. In 1631 he embarked for England with this determination, leaving behind him a wife whom he had married; after this we hear no more of him till we find him wandering about from place to place reduced to great diſtreſs. So deplorable and mean was his appearance, that at Reading he was taken up by the magiſtrates, who, in thoſe days, not unfrequently looked upon poverty as a crime, and put into the ſtocks. In this ſituation, ſo unworthy a man of letters, he refuſed to give any account of himſelf, till preſſed by hunger he ſent for the ſchool-maſter of the town, with whom he converſed in the Latin language, and to whom he made known his wants, and exhibited thoſe evidences of erudition and talent which he poſſeſſed, and which ſhould have claimed, as they really merited, a very different treatment. Frith now, by the humane interference of the ſchool-maſter, was liberated, and his wants ſupplied. Afterwards he came to London, where, through an honourable zeal for the truth, he was found endeavouring to make proſelytes, and was ſeized by the emiſſaries of the lord-chancellor, ſir Thos. More, and committed to the Tower in the year 1533. Frith was not contented with pleading the cauſe of the reformation by converſation and diſcourſe, but drew up ſeveral tracts which he privately circulated among the converts to the new doctrines. Among theſe was a treatiſe on the Euchariſt, ſhewing that the belief of the corporal preſence of Chriſt was not a neceſſary article of faith. This was the firſt treatiſe written by the reformers of England on that ſide of the queſtion. It was anſwered by ſir Thos. More, who undertook alſo to reaſon with the author, but Frith was not eaſily changed: he wrote a reply to ſir Thomas which was not publiſhed till ſome years afterwards. When no conviction could be produced on the mind of this honeſt man by the way of argument, other means were adopted: he was brought before an epiſcopal commiſſion at St. Paul's cathedral, where he was interrogated on the ſubjects of tranſubſtantiation and purgatory, and many efforts were made to perſuade, or intimidate him to renounce the notions which he entertained reſpecting thoſe doctrines, and to conform to the creed of the catholic church. He was, however, unmoved, and perſiſted in maintaining the truth, nor could he be perſuaded to make any conceſſion; accordingly the biſhop of London, with much affected ſorrow and commiſeration, pronounced upon him ſentence of condemnation as an obſtinate heretic, and he was delivered over to the ſecular power. In purſuance of this ſentence a writ was iſſued for his execution, and he was in a few days burnt at Smithfield, maintaining his fortitude to the laſt, and charitably extending his forgiveneſs to a bigotted prieſt who endeavoured to perſuade the people that they ought no more to pray for him than for a dog. He was author of many pieces on the controverted points of theology which were originally printed ſeparately, and at different periods, but which were afterwards collected into a folio volume in 1573. Gen. Biog.

FRITH. See FRYTH.

FRITHGILD, was anciently the ſame with what we now call a *guild*, or a *fraternity*, or *company*. See GILD.

FRITILLARIA, in *Botany*, from *fritillus*, which ſome take for a cheſs-board, and which in that ſenſe alludes to the chequered nature of the petals. *Fritillus* however is uſed by Juvenal and Perſius for a dice-box, and is ſuppoſed to have expreſſed the rattling ſound of the dice.—Chequered Daffodil, or Snake's-head.—Linn. Gen. 164. Schreb. 219. Willd. Sp. Pl. v. 2. 90. Sm. Fl. Brit. 360. Ait. Hort. Kew. v. 1. 432. Mart. Mill. Dict. v. 2. Tourn. t. 201. Juſſ. 48. Gærtn. t. 17. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Coronariæ*, Linn. *Lilia*, Juſſ.

Gen. Ch. *Cal.* none. *Cor.* bell-ſhaped, ſpreading at the baſe, of ſix oblong parallel petals. Nectary a little cell in the baſe of each petal. *Stam.* Filaments ſix, awl-ſhaped, cloſe to the ſtyle; anthers vertical, erect, oblong, quadrangular, extending to the open part of the corolla. *Piſt.* Germen ſuperior, oblong, triangular, obtuſe; ſtyle ſimple, longer than the ſtamens; ſtigma three-lobed, ſpreading, obtuſe. *Peric.* Capſule oblong, obtuſe, three-lobed, of three cells, and three valves. *Seeds* numerous, horizontal, flat, rounded at the outer edge, ranged in two rows.

Obſ. *Fritillaria* of Tournefort has an oblong nectary, and an even capſule.

Corona Imperialis of Tournefort, t. 197, 198, has a hemiſpherical nectary, and a ſharp-edged capſule.

Eſſ. Ch. Corolla inferior, bell-ſhaped, of ſix petals, with a nectariferous cavity above the claw of each. Stamens nearly the length of the corolla. Calyx none. Seeds flat.

1. F. *imperialis*. Crown Imperial. Linn. Sp. Pl. 435. Curt. Mag. t. 194. 1215.—"Cluſter of many flowers, crowned with leaves, the ſtem naked below it."—Suppoſed to be a native of Perſia. It was brought from Conſtantinople to the gardens of Europe, where it is quite hardy. The *root* is a large ſcaly bulb. *Herb* of very quick growth, fœtid, two or three feet high, ſucculent, of a fine ſhining green, conſiſting of a thick, ſimple, ſtraight, leafy ſtem. *Leaves* ſcattered, linear-oblong, twiſted. *Flowers* drooping, large, orange or lemon-coloured. *Fruit* erect. There is a variety with variegated leaves, and one with a red ſtem.

2. F. *perſica*. Perſian Fritillary.—Linn. Sp. Pl. 436. (Lilium perſicum; Ger. em. 201.)—"Cluſter nearly naked. Leaves oblique."—Suppoſed alſo to be a native of Perſia. It was cultivated in England by Gerarde and Parkinſon, but is not very common, though quite hardy. The *herbage* is glaucous. *Flowers* numerous, dull purple, ſmaller than in any other ſpecies.

A variety with fewer but brighter flowers is given in Curt. Mag. t. 962. This is the β of Linnæus.

3. F. *verticillata*. Whorled Fritillary. Willd. Sp. Pl. v. 2. 91.—"Leaves whorled, linear-lanceolate. Stem ſingle-flowered."—Native of Siberia. *Stem* a foot high, erect. *Leaves* four or five in a whorl, ſeſſile, linear, very ſlender-pointed, the ends curled when dry, ſo as to reſemble tendrils. *Flower* terminal. *Willdenow*.

4. F. *obliqua*. Violet-flowered Fritillary. Curt. Mag. t. 857.—"Leaves very glaucous, ſcattered, twiſted. Flowers few, on terminal leafy ſtalks. Corolla obovate, connivent."—Country unknown. *Flowers* two to four, thrice as large as in *F. perſica*. A hardy early-flowering ſpecies. *Gawler*.

5. F. *pyre-*

5. F. *pyrenaica*. Pyrenean Fritillary. Linn. Sp. Pl. ed. 1, 304, excluding the quotation of Hort. Cliff. (which moreover ſhould be Hort. Upſal.) Sm. Prod. Fl. Græc. Sibth. v. 1. 228. Curt. Mag. t. 664.—"Leaves ſcattered, flattiſh; the lower ones broadeſt and bluntеſt. Petals recurved at the ſummit. Nectary roundiſh."—Native of the Pyrenean mountains. *Cluſius*. Of mount Parnaſſus. *Sibthorp*.—A ſpan high. *Leaves* five to ſeven, glaucous, thick and leathery, rather glaucous. *Petals* tawny-purple, yelloviſh internally, as well as at the extremity, which is dilated and recurved. The three outer ones are gibbous at the baſe.

6. F. *racemoſa*. Cluſter-flowered Fritillary. Curt. Mag. t. 952. 1216. (F. pyrenaica; Linn. Sp. Pl. ed. 2. 436). —Leaves linear, pointed, flattiſh. Cluſter leafy, of ſeveral flowers. Petals nearly erect, all gibbous at the baſe. Nectary oblong.—Native of Siberia, &c. It is not rare in gardens about London, and greatly reſembles the following, except in having more numerous and ſmaller *flowers*.

7. F. *Meleagris*. Common Fritillary. Linn. Sp. Pl. 436. Curt. Lond. faſc. 3. t. 20. Sm. Engl. Bot. t. 622. Fl. Dan. t. 972. Jacq. Auſtr. app. t. 32.—Leaves linear, pointed, keeled. Stem ſingle-flowered. Petals ſlightly incurved. Nectary linear.—Native of various parts of Europe, flowering in April. *Stem* a foot high, always ſimple, bearing one large pendulous *flower*, regularly chequered with purple, or with different whites. All the *petals* are gibbous at the baſe, their tips ſlightly inflexed.

8. F. *latifolia*. Broad-leaved Fritillary. Curt. Mag. t. 853. 1207. Redouté Lil. v. 1. t. 51.—Leaves elliptic-lanceolate, obtuſe; the upper ones crowded. Stem ſingle-flowered. Petals ſlightly incurved. Nectary oblong.—Native of Mount Caucaſus. The broad *leaves*, numerous at the top of the ſtem, diſtinguiſh this from the laſt. The *flower* alſo is rather larger, and leſs regularly chequered. The *leaves* are leſs glaucous. It is not rare in gardens.

FRITILLARIA, in *Gardening*, comprehends plants of the bulbous-rooted perennial flowery kind; of which the ſpecies moſtly cultivated are the common fritillary, or chequered lily (F. meleagris); the black fritillary (F. pyrenaica); the imperial fritillary, or crown imperial (F. imperialis); the Perſian fritillary, or Perſian lily, (F. Perſica).

Of the firſt of which there are numerous varieties, as the common purple; the blood red; the great purple or red; the white; the double bluſh; the purple yellow; the chequered yellow; the great yellow Italian; the ſmall Italian; the ſmall Portugal yellow; the black, and the Spaniſh black.

And of the third there are varieties with yellow flowers; with large flowers; and with double flowers; but that which has two or three whorls of flowers above each other makes the fineſt appearance, though it ſeldom produces its flowers after this manner the firſt year after removing it.

The laſt ſort has a variety which has a much ſhorter ſtem and ſmaller leaves; the ſtem branches out at the top into ſeveral ſmall peduncles, each ſuſtaining one dark-coloured flower, which is termed the dwarf Perſian lily.

Theſe plants are all of them highly deſerving of places in the flower-garden.

Method of Culture.—The common mode of propagation in all theſe plants is by off-ſets from the ſides of their roots, ſeparated every ſecond or third year; the proper time for which is when their flower-ſtalks decay, taking the whole roots up entirely, and ſeparating them into diſtinct roots, then planting the ſmaller off-ſets by themſelves in nurſery-beds, to remain a year or two, to acquire a flowering ſtate; and the larger roots, where they are to remain for flowering in the ſummer ſeaſon.

They are likewiſe capable of being propagated by ſeed; but this is principally practiſed for new varieties, and the proceſs is tedious; the fritillary and Perſian lily being three years, and the crown imperial ſometimes ſix or ſeven, before they flower in perfection. The ſeeds may be ſown in the beginning of autumn in large wide pots, or in boxes of ſimilar width, filled with light, mellow earth, each ſort ſeparate, covering them evenly with fine earth half an inch deep, placing the pots, &c. to have only the morning ſun all ſummer, or during hot, dry weather, and in the full ſun in winter and ſpring: the plants will appear in the ſpring, which after the firſt or ſecond year's growth, when the leaves decay in ſummer, may be taken up, and the whole planted immediately in nurſery-beds, in ſhallow drills, four inches aſunder, to remain till they flower in that ſituation.

They are all hardy, and highly ornamental plants for the borders, clumps, and other parts; the fourth ſort being ſet backwards, the third in the middle, and the others forwards, in order that they may make the fineſt appearance poſſible.

FRITZ, GASPARO, in *Biography*, a very agreeable performer on the violin, and compoſer for that inſtrument. He had ſtudied under the celebrated violiniſt, Somis, and in the year 1770, he had been reſident at Geneva 30 years. He was well known to all Engliſh travellers who had entered or quitted Italy, through Geneva, during that period. We heard him perform one of his own ſolos in 1770, which, though extremely difficult, was pleaſing; and notwithſtanding his time of life, he executed it with as much ſpirit as a young man of twenty-five; his bowing and expreſſion were admirable, and he muſt have been a *real* lover of his art to keep in ſuch high practice, with ſo few opportunities of diſplaying his talents, or of receiving their due reward. When he viſited Paris, about the middle of the laſt century, his ſtyle of compoſition was ſo much too good for the taſte which then prevailed in France, that he had the honour of being hiſſed at the concert ſpirituel, as Pugin, one of the beſt ſcholars of Tartini, was afterwards.

FRITZLAR, in *Geography*, a town of Germany, in the principality of Lower Heſſe; ſituated on the Eder; containing two colleges and a convent; 13 miles S.S.W. of Caſſel. N. lat. 50° 8′. E. long. 9° 13′

FRIULI, a province of Italy, bounded on the N. by Carinthia, on the E. by the county of Goritz, and the gulf of Trieſte; on the S. by the gulf of Venice, and on the W. by the Treviſan, the Feltrin, and the Belluneſe; about 52 miles from north to ſouth, and 45 from eaſt to weſt. This country was taken from the Lombards by Charlemagne, and has belonged to the Venetians from the year 1420. It is partly flat and partly mountainous; the hilly part toward Germany is the moſt ſterile and uninhabited, and forms part of the Alps which ſeparate Italy from Germany; and on the other ſide this country is interſected by another ridge of mountains. The roads through theſe mountains to Germany are in ſome parts ſo narrow, that it is dangerous to paſs them either on foot or on horſeback; and only the paſſes, Chiuſa di Venzone, Tolmino, and Lubiana, admit of waggons and artillery. The flat part of Friuli is very fertile, and the country produces a quantity of timber and fire-wood, game, all kinds of grain, fruit and good wine, among which is the famous "piccali." The breeding of cattle is a very conſiderable occupation of the inhabitants, and the culture of ſilk is ſo extenſive, that it produces yearly 1000 *cwt.* which is deemed ſome of the fineſt in Italy. The principal rivers are, the Tagliamento, the Meduna, Cellina, Stella, Torre, and Natiſone. The

inhabitants, denominated Furlani, ſpeak a dialect reſembling that of the ancient French language, differing widely from the Italian or German idiom: they are conſidered as the moſt hot-headed, indolent, and wild inhabitants of Italy. The whole province is divided into the dioceſes of Udina and Concordia, and contained, in the year 1795, 365,512 perſons, who live in 4 cities, 20 ſmall towns and boroughs, and 600 villages. By the peace of Luneville the whole country of Friuli was ceded to the emperor of Auſtria; but afterwards, agreeably to the peace of Preſburg, it was taken from Auſtria and annexed to the new kingdom of Italy.

FRIULI, or *Citta di Friuli*, a town of Italy, in a country of the ſame name above-deſcribed; the ſee of a biſhop, the ſuffragan of Aquileia. It is ſituated at the foot of the mountains, which ſeparate Friuli from Carniola, on the river Naiſonne, and is the ſecond capital of the province. Acroſs the river which riſes near the town is a bridge, with two arches, 220 feet in length, and 75 feet high. The town is well built, and contains a collegiate church, with a chapter; three monaſteries, 62 nunneries, and 4000 inhabitants. N. lat. 46° 10′. E. long. 31° 21′.

FRIZE, or FRIEZE, in *Architecture*, a part of the entablature of columns, more uſually written and pronounced *freeze*.

FRIZE, or *Freeze*, in *Commerce*, a kind of woollen cloth or ſtuff, for winter wear, being frized, or knapt, on one ſide; whence, in all probability, it derives its name.

Of frizes, ſome are croſſed, others not croſſed: the former are chiefly of Engliſh manufacture, the latter of Iriſh.

FRIZING *of Cloth*, a term in the *Woollen Manufactory*, applied to the forming of the knap of a cloth, or ſtuff, into a number of little hard burrs, or prominences, covering almoſt the whole ground thereof.

Some cloths are only frized on the back ſide, as black cloths; others on the right ſide, as coloured and mixed cloths, ratteens, bays, frizes, &c.

Frizing may be performed two ways; one with the hand, *i. e.* by means of two workmen, who conduct a kind of plank, that ſerves as a frizing inſtrument.

The other way is by a mill, worked either by water, or a horſe; or ſometimes by men. The latter is eſteemed the better way of frizing, becauſe the motion being uniform and regular, the little knobs of the frizing are formed more equably and regularly.

The ſtructure of this uſeful machine is as follows:

The three principal parts are, the frizer, or criſper; the frizing-table; and the drawer, or beam. The two firſt are two equal planks, or boards, each about ten feet long, and fifteen inches broad; differing only in this, that the frizing-table is lined or covered with a kind of coarſe woollen ſtuff, of a rough, ſturdy knap, and that the frizer is incruſtated with a kind of cement compoſed of glue, gum Arabic, and yellow ſand, with a little aqua vitæ, or urine. The beam or drawer, thus called becauſe it draws the ſtuff from between the frize and frizing-table, is a wooden roller, beſet all over with little, fine, ſhort points or ends of wire, like thoſe of cards uſed in carding of wool.

The diſpoſition and uſe of the machine are thus: the table ſtands immoveable, and bears or ſuſtains the cloth to be frized, which is laid with that ſide uppermoſt on which the knap is to be raiſed. Over the table is placed the frizer, at ſuch a diſtance from it as to give room for the ſtuff to be paſſed between them; ſo that the frizer, having a very ſlow, ſemi-circular motion, meeting the long hairs or knap of the cloth, twiſts and rolls them into little knobs or burrs, while, at the ſame time, the drawer, which is continually turning, draws away the ſtuff from under the frizer, and winds it over its own points.

All that the workman has to do while the machine is going, is to ſtretch the ſtuff on the table as faſt as the drawer takes it off, and, from time to time, to take off the ſtuff from the points of the drawer.

It has already been obſerved, that the frizing-table is lined with ſtuff of ſhort, ſtiff, ſtubby knap; the uſe whereof is to detain the cloth between the table and frizer, long enough for the grain to be formed, that the drawer may not take it away too readily; which otherwiſe muſt be the caſe, inaſmuch as it is not held by any thing at the other end.

It were needleſs to ſay any thing particular of the manner of frizing ſtuffs with the hand, it being the aim of the workmen to imitate, as near as they can, with their wooden inſtrument, the ſlow, equable, and circular motion of this machine. It needs only be added, that their frizer is but about two feet long, and one broad; and that to form the knap more eaſily, they moiſten the ſurface of the ſtuff lightly with water, mingled with whites of eggs, or honey.

FROBEN, JOHN, in *Biography*, an eminent printer, was born at Hammelburg in Franconia. He enjoyed the advantages of a liberal education, and acquired conſiderable reputation at Baſil. As the buſineſs of a printer was at that period connected with the profeſſion of letters, Froben was induced to learn it, and to ſet up a preſs in the city of Baſil, where he not only became eminent in the art, but ſupported its dignity and utility by a ſcrupulous choice in the authors that he printed. He never ſuffered improper writings to iſſue from his preſs, but devoted it to the ſervice of ſound and uſeful learning. The reputation of Froben was ſo high that Eraſmus ſettled at Baſil for the ſake of having his works printed by him. That great ſcholar ſoon became intimately connected with Froben, and always teſtified for him the higheſt eſteem and affection. From Froben's preſs iſſued the works of Eraſmus, in nine volumes folio, and alſo thoſe of St. Jerome and Auguſtine, which Eraſmus corrected and reviſed. Theſe are ſaid to be the moſt correct of Froben's editions. He intended printing the Greek fathers, but was prevented by his death, which happened in 1527. He was ſincerely lamented by Eraſmus, who wrote, on the occaſion, a Greek and Latin epitaph. Jerome Froben, ſon of John, and his ſucceſſor in the printing-office, in conjunction with Nicholas Epiſcopius, carried into effect the deſign of printing the Greek fathers. At the houſe of Jerome Froben Eraſmus died, after an eminently uſeful life. A catalogue of all the works printed at the Frobenian preſs was publiſhed in 1564. Moreri.

FROBENIUS's *Ætherial Spirit*. See ÆTHER and SPIRIT.

FROBERGER, JOHN, JACOB, in *Biography*, organiſt to the emperor Ferdinand III., who in his youth had been ſent to Rome to ſtudy under the celebrated Freſcobaldi, was regarded about the middle of the laſt century as the greateſt performer on the organ in Germany. He is much celebrated for his abilities by Kircher, who has inſerted a fantaſia of his compoſition in his "Muſurgia," upon the hexachord *ut, re, mi, fa, ſol, la*, accommodated to the organ. Few of his compoſitions were publiſhed in his life time; but, according to Walther, his pieces for keyed inſtruments were ſtill highly eſteemed among organiſts in 1732, and heard with admiration. Mr. Marpurg ſays, that his works will be always models for regular good fugues. (Art de la Fugue, Berlin, 1756.) His compoſitions for the harpſichord were publiſhed at Mayence in 1696. And ſo late as 1714, the moſt important of his works appeared, for the firſt time, at Francfort on the Mayne.

Diverſe

Strahan and Preſton,
New-Street Square, London.

"Diverſe ingegnoſiſſime, rariſſime et non mai più viſte curioſe partite, di toccaté, canzone, ricercate, allemande, correnti, ſarabande, et gighe, di cimbali, organi, iſtromenti, dal eccelentiſſimo, e famoſiſſimo organiſta, Giov. Giacomo Froberger, per la prima volta col diligentiſſimo ſtudio ſtampate."

FROBISHER, *Sir* MARTIN, was born near Doncaſter, Yorkſhire, and brought up for the ſea ſervice, in which he became one of the moſt eminent navigators of his time, and was the firſt Engliſhman that attempted to find out a north-weſt paſſage to China. It was long before he was enabled to make the trial. He applied to his friends, and the merchants in general, but they were unwilling to embark in ſo hazardous an enterprize: at length finding that there was no chance of ſucceſs from private encouragement, he boldly applied to the court of queen Elizabeth, and by this was enabled to fit out a ſmall equipment conſiſting of two barks of twenty-five tons burthen each, and a pinnace of ten tons. He ſailed from Deptford June 8th, 1576, and in about ſix weeks made the coaſt of Greenland. Here he ſpent ſome time in exploring and making ſuch obſervations as might be uſeful to himſelf and future navigators, and then, on Auguſt 11th, entered and ſailed up the ſtrait which has ever ſince borne his name. This is in N. lat. 62° 50', on the eaſtern ſide of New Greenland, which terminates to the ſouth at Cape Farewell. Having touched at various parts, he brought his veſſel to an anchor under Burcher's iſland, where they went on ſhore, and had ſome communication with the natives; but at the ſame time he had the misfortune to loſe five of his men, who were captured by the people. Having endeavoured in vain to recover his ſailors, he embarked for England, where he arrived ſafe on the 2d of October. He had taken poſſeſſion of the country in the name of queen Elizabeth, and in proof of the diſcovery and poſſeſſion, he ordered his men to bring him whatever they could find. One of them returned with a large piece of black ſtone, very heavy, but in other reſpects reſembling ſea-coal: it was probably a kind of pyrite, and was, upon trial, after their return, ſaid to contain a portion of gold. A new Peru was now anticipated, and a ſecond voyage determined on in the following ſpring. At this period of our mineralogical knowledge it is certain that the report of gold being found in this black ſtony ſubſtance muſt have proceeded from ignorance, or perhaps from the deſire of being ſo far patronized by public conſent, as to obtain means for proſecuting farther diſcoveries. The fraud, if it were a fraud, ſucceeded; the queen lent Frobiſher a ſhip of the royal navy, of two hundred tons, to which he added two ſmall barks. Volunteers, ſome from the firſt families in the kingdom, preſſed in from all quarters; but as the number was reſtricted to one hundred and forty, many were obliged to return diſappointed and uneaſy. Such was the deſire of gold, that the commiſſion under which Frobiſher ſet out in this voyage directed him "only to ſearch for ore, and to remit diſcovery till another time." He ſailed on the 31ſt of May, 1577, and proceeding to his former ſtrait, explored all its coaſts and bays, and landed on ſeveral iſlands, where the crews furniſhed themſelves with a quantity of the ſuppoſed ore. On their return the cargo was examined, and thought to promiſe much wealth: a third expedition was planned, and inſtead of three, fifteen veſſels were fitted out for the purpoſe of being laden, as they expected, with the precious mineral. This was the laſt of the expeditions, for the true nature and real value of the ſubſtances found in that bleak country were now properly appreciated. There is no account left us how Frobiſher ſpent his time from the termination of this expedition till the year 1585, when he was appointed to the command of the Aid in ſir Francis Drake's expedition to the Weſt Indies, which took St. Domingo in Hiſpaniola, Carthagena on the continent, and Santa Juſtina in Florida, three towns of conſiderable importance. In 1588 he bravely exerted himſelf in defence of his country againſt the famous Armada, having the command of the Triumph, one of three of the largeſt ſhips in the navy, and which had on board the greateſt number of men of any in the whole Engliſh fleet. For his ſervices on this important occaſion he received the honour of knighthood. He afterwards commanded ſquadrons againſt the Spaniards in 1590 and 1592, and took two very rich prizes. In 1594 he was ſent with four men of war to the aſſiſtance of Henry IV. king of France againſt a body of the leaguers and Spaniards, then in poſſeſſion of part of Bretagne; but in an attack upon a fort near Breſt he received a mortal wound from a ſhot, of which he died after his return home. He was buried at Plymouth. Sir Martin Frobiſher is ſaid to have had the roughneſs and violence which frequently characterize the profeſſion, and he was unqueſtionably a man of great and undaunted courage, and inferior to no one of his age in experience and conduct as a naval commander. Biog. Brit.

FROBISHER'S *Straits*, in *Geography*, a narrow ſea on the weſt of Davis's ſtrait, to the ſouth of cape Walſingham of Frobiſher. N. lat. 61° 50' to 63° 20. W. long. 65° to 70°.

FRODSHAM, a ſmall town in the hundred of Eddiſbury, and county of Cheſter, is pleaſantly ſituated on an elevated ſpot, at a ſhort diſtance from the confluence of the rivers Weaver and Merſey, two miles diſtant from Cheſter, and one hundred and ninety-three from London. Here was formerly a fortified manſion, called Maurice caſtle, which, together with the town, was granted by Edward I. to David, brother to Llewelyn, the laſt ſovereign prince of North Wales; with a view of ſeparating the former, in his affections and intereſt, from that of his family and country: in which unnatural attempt the king was moſt diſaſtrouſly foiled. It ſtood at the weſt end of the town, and was at one time the reſidenee of the Savages, earls Rivers; but having been conſumed by fire in 1642, its ſcite has ſince been occupied by a handſome modern houſe. The town conſiſts of two main ſtreets croſſing each other, and at the upper end of one, on an elevated ſpot called Overton, ſtands the church, an ancient and excellent ſtructure, repaired and beautified in 1790; and near it the free grammar ſchool, with a good houſe for the maſter; which has a cupola on the top intended for an obſervatory. Behind the ſchool is an eminence, where formerly a beacon was erected, thence denominated Beacon-hill, which is cut out into walks, gradually aſcending to the ſummit, and commanding a delightful proſpect of the eſtuaries of the Merſey and the Dee, with the diſtant parts of Lancaſhire and the ſurrounding country. The town is well ſupplied with water by ſeveral ſprings, one of which, uſed as a cold bath, is notable for its power, throwing out the immenſe quantity of 1700 gallons per minute. By the returns made to parliament in 1801, the number of houſes was 272, containing 1551 inhabitants, chiefly employed in the refining of rock-ſalt, and in a ſmall manufacture of coarſe cottons. It has a well ſupplied weekly market on Thurſdays, and two annual fairs. A graving dock and yard have lately been erected for building and repairing veſſels, which promiſes to be of conſiderable utility to the place.

The pariſh is of great extent, being thirty-one miles in circumference, containing ten ſmall villages, beſides the town, and is famous for the great quantities of potatoes cultivated in

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in it; the average annual amount of which, for ſome years paſt, has not been leſs than 100,000 buſhels, each weighing nearly one hundred weight: theſe are diſpoſed of to the numerous manufacturers in the adjoining county. This anciently formed part of an extenſive tract called the foreſt of De la Mere, which, in the time of Leland, abounded with red and fallow deer; but at preſent exhibits merely a bleak and dreary waſte in its general aſpect, conſiſting of a ſandy heath, tenanted by rabbits; and the chamber, or centre of the woodlands, is marked by a few ſtunted trees. Hiſtory of Cheſhire, in two volumes 8vo.

FROELICH, Erasmus, in *Biography*, was born at Gratz, in Styria, in 1700. He entered the ſociety of the Jeſuits when he was ſixteen years of age, and was ſo indefatigable and ſucceſsful in his ſtudies, that he was, in a ſhort time, appointed profeſſor of mathematics and belles lettres at Vienna. Here he purſued his ſtudies with great ardour, and made uſe of his ſituation in that city to purſue the medallic ſcience, on which he publiſhed various tracts, chiefly on particular medals. He died in 1758: his principal works are, "Quatuor Tentamina in Re Nummaria," 4to. 1737, and 1750: "Annales rerum et regum Syriæ," 1751, "De Figura Telluris," 4to. 1757.

FROELICHIA, in *Botany*, in honour of Dr. J. A. Froelich, member of the botanical ſociety of Ratiſbon, author of an octavo volume on Gentiana, publiſhed at Erlang in 1796. Willd. Sp. Pl. v. 1. 607. (Billardieria; Vahl. Eclog. v. 1. 13. t. 10.) Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Rubiaceæ*.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, permanent, with four ſlight teeth. *Cor.* of one petal, ſuperior, about an inch long, thick; limb in four linear-lanceolate, widely ſpreading, ſlightly recurved ſegments; thickened and triangular at the tips; acutely carinated above; flat from the middle to the baſe. *Stam.* Filaments four, very ſhort, inſerted into the lower part of the tube; anthers erect, linear, a little prominent. *Piſt.* Germen inferior, elliptical; ſtyle nearly as long as the limb of the corolla; ſtigmas two, oblong, compreſſed, bluntiſh, ſpreading, rather thick. *Peric.* Berry elliptical, dry, corky, hardiſh, ſlightly compreſſed, as long as the nail, crowned with the ſhort permanent tube of the calyx, within which is a ſmall convex calloſity. *Seed* ſolitary, the ſhape of the berry, clothed with a looſe arillus of a paper-like texture, without any diviſion.

Eſſ. Ch. Calyx ſuperior, with four teeth. Corolla tubular. Berry dry, with one ſeed, inveſted with an arillus.

1. F. *paniculata*. Native of the iſland of Trinidad. A ſhrub, with ſquare *branches*. *Leaves* oppoſite, elliptic-lanceolate, pointed, entire, ſmooth. *Panicle* terminal, with ſmooth purpliſh branches, divided and ſubdivided, bearing numerous flowers. This genus is nearly akin to *Coffea*, and is ſuſpected by Vahl to be ſcarcely diſtinct from Aublet's *Couſſarea*. The colour of the flowers is not mentioned, Vahl having ſeen dried ſpecimens only, but they are probably white.

FROG, in *Zoology*. See Rana. This creature bears the experiments of the air-pump better than moſt other animals. It will breathe ſome time after the extraction of the air, but at length the viſible motion of the throat will ceaſe, and the body ſwell a little. After three hours lying in this condition, when no farther ſign of life appears, if the animal be placed in the open air, a few hours will recover it to its former life and vigour. The ſame animal, put into a receiver exhauſted of the air, but nearly filled with water, will live many hours under the water, and ſeem to reſpire, but in five or ſix hours it will die. The larger and luſtier frogs live longer than the young ones in the receiver. Phil. Tranſ. N° 62.

The frog affords the curious in microſcopic obſervations a very beautiful view of the circulation of the blood; but the method of examining it to advantage was never hit upon till the contrivance of the late ingenious Dr. Stuart for that purpoſe. This he did by the ſolar microſcope in the following manner: The looking glaſs, tube, and convex lens, are the ſame in this as in the common ſolar microſcope; but inſtead of the little pocket microſcope of Wilſon, he uſed the belly-part of the common large reflecting one, fixed horizontally on a pedeſtal, juſt at an equal height with the tube. This ſtands on a little ſhelf made to ſupport it; and to its ſnout, which lies on a level with the tube, the magnifiers are ſcrewed: the object, being extended and faſtened with ſtrings and pins on a frame contrived for that purpoſe, is applied between the tube and the magnifier, whereby the ſun's rays, reflected from the looking-glaſs, through the tube, upon the object, paſs on through the magnifier, and exhibit upon the ſcreen an image of the object moſt prodigiouſly enlarged.

To view a frog with this apparatus, the ſkin of the belly is to be opened from near the anus to the throat, and then giving it a little ſnip ſide-ways both at the top and bottom, and ſticking a fiſh-hook into each corner of the ſkin, it was eaſily extended before the microſcope, and ſhewed on the ſcreen the moſt beautiful view imaginable of the veins and arteries of the ſkin, with the blood circulating through them. In the arteries thus viewed, the blood is ſeen to ſtop, and recede a little at every pulſation by the dilatation, and ruſh forcibly on again by the contraction of the heart; while in the veins it ever kept the ſame equable and uniform current, with a ſurpriſing rapidity; and when the ſcreen was removed farther back, and the object by that means more enlarged, the alternate expanſion and contraction of the ſides of the arteries were very viſible. After this, the abdomen of the frog being opened, and the muſcles of it being extended before the microſcope in the ſame manner as the ſkin was, the ſtructure of theſe muſcles is beautifully ſeen, being all made up of bundles of tranſparent ſtrings of fibres, all lying parallel to one another, and joined by a common membrane.

Theſe ſtrings or fibres appeared alſo through their whole length made up of roundiſh veſicles, and reſembled ruſhes divided longitudinally; but there is no certainty of any circulation being ſeen in theſe.

When this has been ſufficiently examined, a part of the creature's guts being pulled out and extended with the meſentery, there is ſeen the fineſt of all views of the circulation of the blood. Words are not able to deſcribe this wonderful ſcene. The blood is ſeen paſſing through numberleſs veſſels at one and the ſame inſtant, in ſome one way, and in others directly the contrary. Several of the veſſels are thus magnified to more than an inch in diameter, and the globules of the blood rolling through them appear nearly as large as pepper-corns; while in many of the minuteſt veſſels only ſingle globules were able to find their paſſage, and that too by changing their ſhape into an oblong ſpheroid. The pulſation and acceleration of the blood in the arteries are thus alſo very beautifully ſeen. As the animal under examination grows languid and near expiring, the blood in the arteries will often ſtop on a ſudden, and ſeem as if it were coagulating, and will then run back for ſome time; after which it will again recover its natural courſe with a great deal of rapidity. A due conſideration of theſe particulars may poſſibly account for the intermiſſions,

ſtarts,

ſtarts, and irregularities, in the pulſe of perſons near death. Baker's Microſcope, p. 132—136.

FROG, among *Farriers*, the ſame with fruſh. See FRUSH.

FROG's-*bit*, in *Botany*. See HYDROCHARIS.

FROG, *Bull*. See BULL-*frog*.

FROG-*fiſh*, in *Ichthyology*, an Engliſh name for the *rana-piſcatrix*, or *lophius*. See LOPHIUS *Piſcatorius*.

FROG-*fiſh of Surinam*, is produced by the transformation of a frog into a fiſh. The frog, in its firſt ſtate, is ſpotted with brown, yellow, and green, but paler on the belly; the hinder feet are webbed like thoſe of a gooſe, but the fore-feet are without webs: the firſt change this frog undergoes is by the growing out of a tail; after which it gradually acquires the ſhape of a fiſh, the two fore-feet decreaſing and periſhing by degrees, and then the hinder legs; and, at length, the frog is changed into a perfect fiſh. The Indians and Europeans of Surinam call theſe fiſhes jakies; they are cartilaginous, and of a ſubſtance like our muſtela, and very delicate food. A bone or cartilage runs down the back, with ſmall bones all over the body, which is divided into equal parts; they are adorned with beautiful ſcales, and are firſt of a darkiſh colour, and afterwards grey. See an account of the ſeveral transformations of this frog, illuſtrated with drawings, and of the transformation of fiſhes into frogs, in Phil. Tranſ. vol. li. p. 2. art. 60. p. 653, &c.

FROG, in *Geography*, a town of America, in the ſtate of Georgia; 6 miles W. of Tugeloo.

FROG, *Lake*, a lake of N. America, in N. lat. 53° 15'. W. long. 91° 50'.

FROG, *Petrified*, in *Natural Hiſtory*. Among the petrifactions found in the Stirling limeſtone, or ſwineſtone of Oering, frogs (ranæ) have been mentioned; but it does not appear that their perfect identity with the recent animal has been made out. Among the numerous inſtances of animals, like frogs and toads, ſaid to be found alive in ſtone, clay, and other mineral ſubſtances, ſeveral inſtances of which have been related to the writer of this by quarry-men and others of veracity, ſo that he can ſcarcely doubt the fact, at leaſt of animals not petrified or altered from their living ſtate, being thus found; it is to be lamented, that none of them have been ſubmitted to examination and diſſection by a competent anatomiſt, who might decide on their identity with the recent ſpecies, in the genus to which they ſeem referable. See TOAD.

FROHBURG, in *Geography*, a town of Germany, in the circle of Leipſic, ſituated on the Wichra; 15 miles S.S.E. of Leipſic. The inhabitants manufacture ſtuff and earthen ware. N. lat. 51° 5'. E. long. 12° 28'.

FROHNA, a town of Germany, in the circle of Erzgeburg; 8 miles N.W. of Chemnitz.

FROHNSDORF, a town of Germany, in the circle of Thuringia; 7 miles S.E of Weiſſenſee.

FROJAN, a town of Spain, in Galicia; 22 miles N.N.E. of Orenſe.

FROIDMONT, LIBERT, in *Biography*, was born in a country town, ſituated between Liege and Maeſtricht, in the year 1587. He was profeſſor of philoſophy in the univerſity of Louvain, and in 1633 was appointed dean of St. Peter's in that city. After this he was created doctor of divinity, and ſucceeded Janſenius, who was appointed biſhop of Ypres, as interpreter of the ſacred ſcriptures. He died in 1653, at the age of ſixty-ſix. His writings are proofs of his great learning on various ſubjects. He was author of "Diſſertatio de Cometa," Anni. 1618. "Meteorologicorum Libri V." "Brevis Anatomia hominis." Latin commentaries on the Acts of the Apoſtles, and on the epiſtles of St. Paul in folio, and on other works. The commentaries are in much repute, though they are, in a meaſure, abridged from the works of Eſtius. Moreri.

FROJERED, in *Geography*, a town of Sweden, in Weſt-Gothland; 70 miles E. of Uddevalla.

FROISSART, JOHN, in *Biography*, an early French hiſtorian and poet, was born at Valenciennes in 1337. The works of this writer have lately been reprinted, and obtained a moſt extenſive circulation; ſtill there is a great lack of materials for an account of his life. In ſome manuſcripts he is repreſented as a knight, in moſt as an eccleſiaſtic, and from a paſſage in his own works it is inferred that he was at one period a merchant. It is not known who was his father, but it is ſuppoſed that he was a herald painter, a circumſtance which would account for the attachment of the ſon to the heraldic ſcience, and to the manners of chivalry by which he is diſtinguiſhed. He began his hiſtory before he had attained to the age of manhood, and continued it till within a ſhort time of his death, the date of which has not been aſcertained, though there are facts which lead one to imagine that it did not happen till about 1420, and his hiſtory is brought down to the beginning of that century. A large portion of his life was employed in travelling from court to court, with a view of collecting materials for his "Chronicles." He was patronized by princes of oppoſite intereſts, and was perſonally acquainted with the chief actors in the ſcenes which he deſcribes. The mode which he adopted to obtain information was to procure admiſſion to the ſociety of thoſe who had borne a part in all the principal events of their times, and to live with them on terms of familiarity; and as he was well and kindly received by both parties, he had an opportunity of comparing the oppoſite accounts. Philippa, queen of Edward III. of England, was one of his earlieſt and beſt friends; he reſided long at her court, and travelled over the greater part of Europe at her expence. He was appointed ſecretary to this queen in 1361, and continued five years in her ſervice; during which period he viſited Scotland, and was entertained for ſome time by William earl of Douglas. In 1366 he was in Gaſcony with Edward the Black Prince, and afterwards viſited ſeveral of the Italian courts. In 1369, he loſt his kind patroneſs Philippa, and retiring to his own country, obtained a benefice in the dioceſe of Cambray. He ſeems however but ill qualified for the office of the cure of ſouls, as well from his love of pleaſure, as from his devotedneſs to hiſtorical reſearch and compoſition. He had already given conſiderable ſpecimens of his poetical talents, and now entered into the ſervice of the duke of Brabant, who was alſo a poet. From the compoſitions of his maſter, joined with ſome of his own, he formed a kind of romance, entitled "Meliador," relating to love and chivalry. After the deceaſe of the duke in 1384, he acquired the patronage of Guy earl of Blois, and travelled to the court of Gaſton earl of Foix, by whom he was received with great cordiality, and who liſtened with intereſt to the recital of his verſes. After ſome other travels he returned home, and continued his hiſtory. In 1395 he viſited England again, and was introduced to Richard II., a young man, by whom he was graciouſly and kindly received, and to whom he had the honour of preſenting a ſplendid copy of his "Meliador."

He returned to his own country, fixed his reſidence at Chimay, where he was appointed canon and treaſurer of the collegiate church. At this place he probably died, for the following verſes are found in the archives of the chapter of St. Monegunda, which are truly characteriſtic of the hiſtorian.

"Gallorum ſublimis honos at fama tuorum,
Hic, Froiſſarde, jaces, ſi modo forte jaces.
Hiſtoriæ vivus ſtuduiſti reddere vitam,
Defuncto vitam reddet at illa tibi."

Though Froiſſart was the author of thirty thouſand verſes, his poetical character is ſunk into oblivion, and he is celebrated only as an hiſtorian. In this capacity he is highly valued by thoſe who ſtudy ancient manners from original drafts.

His Chronicle, which is divided into four books, comprehends the period between 1326 and 1400, and it relates the events which took place not only in France, but in Flanders, Scotland, and Ireland, with numerous details reſpecting the papal courts of Rome and Avignon, and collateral particulars of the tranſactions in the reſt of Europe, in Turkey, and even in Africa. His reputation ſtands high as a faithful and diligent narrator of what he ſaw and heard. By the French he has been charged with groſs partiality towards the Engliſh; they bring againſt him the crime of making Edward, and his ſon, the Black Prince, the heroes of his hiſtory. But it cannot be denied that they were the heroes of the age in which they flouriſhed, and therefore an impartial hiſtorian was obliged to repreſent them in their true colours, and to make them the leading characters of the day. Mr. Johnes, in his edition of Froiſſart's Chronicles, has ſucceſsfully vindicated the character of the hiſtorian from the charge of partiality: throughout the whole work, he ſays, there is an evident diſpoſition to give praiſe to valour on whatever ſide it was employed. The hiſtorian mourns over the death of each valiant knight, exults in the ſucceſs of every hardy enterprize, and ſeems carried away almoſt by his chivalrous feelings, independently of party conſiderations. Till the publication of Mr. Johnes's tranſlation, the beſt edition of the "Chronicles" was that of Lyons in four volumes folio, 1559. The Engliſh reader is referred to Mr. Johnes's octavo edition of the Chronicle for farther particulars concerning Froiſſart: but in the "Memoirs of the Academy of Inſcriptions" there are many curious and intereſting particulars relative to his life and writings. Moreri. Johnes's edition of the Chronicles of England, France, &c. 8vo. 1805.

FROISSY, in *Geography*, a town of France, in the department of the Oiſe, and chief place of a canton in the diſtrict of Clermont; 5 miles S.S.W. of Breteuil. The place contains 663, and the canton 11,234 inhabitants, on a territory of 180 kiliometres, in 23 communes.

FROITZHEIM, a town of France, in the department of the Roer, and chief place of a canton in the diſtrict of Aix-la-Chapelle. The place contains 384, and the canton 8,156 inhabitants, in 30 communes.

FROLOIS, a town of France, in the department of the Côte d'Or; 21 miles N.W. of Dijon.

FROMAIL, a town of Walachia; 15 miles N.E. of Buchareſt.

FROMAGE, Peter, in *Biography*, diſtinguiſhed for his great exertions among the Catholic miſſionaries in the Eaſt, was born at Laon in the year 1678. In 1693 he entered the order of the Jeſuits, and on account of his ſubſequent proficiency he was ſelected by his ſuperiors to preſide over the claſſical ſtudies of their younger pupils. Having completed his theological courſe, he offered his ſervices as a miſſionary to the Levant; being approved, he was firſt ſent into Egypt, where he exerted all his powers in acquiring a knowledge of the Arabic language, nor was he leſs zealous in performing the duties attached to his different employments. He was afterwards ſent into Syria, where he ſpent the remainder of his life. Here he eſtabliſhed a printing preſs for the Arabic language, in the monaſtery of St. John, near Antura, a village in the chain of mountains diſtinguiſhed by the name of Anti-Libanus. Having procured the neceſſary types from Rome, he printed in Arabic a great number of theological and devotional pieces, which he took care to diſperſe through the country. Fromage was preſent at a ſynod of the Maronites held in 1736, and pronounced a diſcourſe at its opening, which is publiſhed with an account of the proceedings of the ſynod in the eighth volume of the "New Memoirs of the Miſſions of the Society of Jeſus in the Levant." Fromage died in the year 1740. Moreri.

FROME, in *Geography*, a river of England, in the county of Somerſet, which joins the Avon about 5 miles S.E. of Bath.—Alſo, a river of England, which runs into the Lug, near Hereford.—Alſo, a river of England, in the county of Dorſet, which paſſes by Dorcheſter, &c. and runs into the ſea in Poole harbour, a little below Wareham.—Alſo, a river of England, in the county of Glouceſter, which joins the Avon at Briſtol.—Alſo, a river of England, which runs into the Severn near Berkeley, in Glouceſterſhire.

Frome, or *Frome Selwood*, a large town in the hundred of Frome, Somerſetſhire, derives its firſt denomination from being ſituated on a river of that name, which riſing to the ſouth of the place, paſſes through it, takes a northerly direction, and falls into the Briſtol Avon, below Bradford, in the county of Wilts. The additional appellation it receives from the diſtrict which formerly conſtituted the extenſive and celebrated foreſt of Selwood. Leland deſcribes it as ſtanding upon the cliff of a ſtony hill, which is partially correct; for it is pleaſantly ſeated upon ſeveral abrupt hills, and at the bottom of one is the principal entrance by a good ſtone bridge of five arches over the river. The church is a handſome and ſpacious ſtructure, compriſing a nave, chancel, north and ſouth aiſles, chancel and four chapels, with a large ſquare embattled tower, ſurmounted by an octagonal ſpire, riſing 120 feet in height. Here are alſo ſix other places of worſhip for various denominations of proteſtant diſſenters. Near the bridge is a good free ſchool, and an alms-houſe for poor widows, erected by ſubſcription in 1720. Anciently in this pariſh a monaſtery was erected by Aldhelm, a monk, and biſhop of Sherborne; and ſubſequently a priory and nunnery, no veſtiges of which remain.

The town has greatly increaſed within a century paſt, and contains about 38 ſtreets, which are in general narrow, irregularly built of rough ſtones, and covered with heavy ſtone tile, dug in the adjacent quarries. By the returns made to parliament it appears that, in 1801, the town included 1653 houſes, and 8,748 inhabitants. But this eſtimate is glaringly defective. In 1724 it was conſidered as having more inhabitants than the city of Bath; and though it has not increaſed like that place of faſhionable reſort, yet, upon a moderate computation, one-third may be added to the number in the official return. Theſe are principally employed in the manufacturing of ſuperfine cloths and kerſeymeres, or in other branches of buſineſs connected with this ſtaple manufacture: the river affording facilities to the trade for the purpoſes of ſcouring, dying, erecting fulling and gig-mills, with other kinds of machinery. Frome was formerly governed by a bailiff, but at preſent the police is under the direction of the neighbouring magiſtrates, aided by two conſtables, annually choſen at the courts leet of the joint lords of the manor, the marquis of Bath, and the earl of Cork and Upper Oſſory. The latter nobleman has an elegant

ſeat at Marſton park, in the adjoining pariſh, and the country is embelliſhed with ſeveral handſome manſions in the vicinity. See Collinſon's Hiſtory of Somerſetſhire.

FROMERIES, a town of France, in the department of the Somme; 7 miles S.W. of Poix.

FROMIGUERE, a town of France, in the department of the Eaſt Pyrenees; 7 miles N. of Montlouis.

FROMISTA, a town of Spain, in the province of Leon; 18 miles N. of Palencia.

FROND, in *Botany*, (*Frons*, a leafy bough,) is a kind of ſtem which is at the ſame time a leaf, and bears the fructification. (See Caulis and Fructification.) The term is excluſively appropriated to plants of the claſs *Cryptogamia*. Sprengel, in his letters on Cryptogamous Plants, ſeems not to have been aware of this, when he objects to its uſe, becauſe ſeveral plants of the other claſſes bear their flowers on the leaf. Such indeed is the caſe in *Ruſcus*, *Phyllanthus*, *Xylophylla*, &c.; and even in *Turnera*, where the flower proceeds from the leaf-ſtalk. But theſe examples do not prove the impropriety of the term in Cryptogamous plants, to which alone it is now applied. The fern tribe, (ſee Filices,) are good examples of a frond, as each plant conſiſts of a ſtalked leaf, bearing the fructification either on its back, or in ſpikes or cluſters, which are evidently a metamorphoſis of ſome of its parts or lobes. Lichens alſo have a true frond, either in the form of a cruſt, a leathery leafy expanſion, or a branched ſhrubby ſubſtance, with each of which the fructification is intimately connected. Linnæus has erroneouſly uſed the term *frons* in the natural order of *Palmæ*, which, however lofty in their growth, have not the proper ſtem of a tree, but are genuine herbaceous plants, whoſe ſtalks or ſtems, not their leaves, bear the fructification, neither do they belong to the claſs *Cryptogamia*. This great obſerver is however thus far juſtified, that the depoſition of wood in palms is exactly like that of ferns, and betrays a ſtrong and peculiar affinity between them. Palms indeed are the connecting link between Ferns and the Liliaceous order.

FRONDES. See Leaf.

FRONDESCANTIA denotes the ſeaſon of the year when the leaves of plants are unfolded.

FRONSAC, in *Geography*, a town of France, in the department of the Gironde, and chief place of a canton, in the diſtrict of Libourne, ſeated on the Ille; two miles N. W. of Libourne. The place contains 1339, and the canton 13,348 inhabitants, on a territory of 165 kiliometres, in 22 communes. The fruitful tract at the junction of the Ille and Dordogne, oppoſite to Libourne, on which this town is ſituated, is called *Fronſaides*.

FRONT, the forehead, or that part of the face above the eye-brows.

The word is formed of the Latin *frons*; and that from the Greek φρονειν, *to think*, *perceive*; of φρην, *mens*, *the mind*, *thought*. Martinius, to make out this etymology, obſerves, that from the forehead of a perſon we perceive what he is, what he is capable of, and what he thinks of. Du Laurens chuſes to derive it from *ferre*, becauſe it bears the marks of what we have in our head.

Front is alſo uſed where ſeveral perſons, or things, are ranged ſide by ſide, and ſhew their front, or foreparts.

Front, in *Architecture*. The elevation of any of the exterior ſides of the walls of a building is denominated a front. Buildings being generally conſtructed of a rectangular form, have four fronts; the one that is beſt finiſhed is called the principal front, which is generally that through which the building is entered; and on this account is alſo called the entrance front. The oppoſite front to the entrance is called the rear front; and the fronts on the ſides are denominated flanks, which, in towns where the houſes join each other, are called party-walls.

Front, in *Fortification*. See Face and Tenaille.

Front *of a Regiment*, in *Military Language*, denotes the foremoſt rank of a battalion, ſquadron, or any other body of men.

To front every way, is when the men are faced to all ſides. See File-*leaders*.

Front *of a Camp* is the line that determines its extent, and in which are placed the colours and ſtandards of the troops that occupy the *camp*; which ſee.

Front, in *Perſpective*, a projection or repreſentation of the face, or fore-part of an object, or of that part directly oppoſite to the eye; called alſo, and more uſually, orthography.

Front, *Line of the*. See Line.

Front *Scale*. See Scale.

Front *Royal*, in *Geography*, a town of America, in Frederick county, Virginia, at the foot of the Blue Ridge, eight miles E. of Shenandoah river, and 20 miles S. of Winchester. It contains about 90 houſes, a Preſbyterian church, and another for Methodiſts. A reſpectable German ſchool is kept here.

FRONTAL, in *Architecture*, a little fronton or pediment, ſometimes placed over a ſmall door or window.

Frontal, *Frontlet*, or *Brow-band*, is alſo uſed in ſpeaking of the Jewiſh ceremonies.

This frontal conſiſts of four ſeveral pieces of vellum, on each whereof is written ſome text of ſcripture; they are all laid on a piece of black calf's leather, with thongs to tie it by. The Jews apply the leather with the vellum on their foreheads in the ſynagogue, and tie it round the head with the thongs.

FRONTALE Os, in *Anatomy*. See *Os* Frontis.

Frontale, or *Frontal*, in *Medicine*, an external form of remedy, applied on the forehead and temples with a bandage, for the cure of the head-ache, megrim, vapours, defluxions on the eyes, &c. Frontals are compoſed of roſes, elder flowers, betony, marjoram, lavender, camphire, &c. wrapped in a linen cloth, and applied over the forehead and temples.

There are alſo frontals, in manner of liniments, made of unguentum populeum and extract of opium, or of paſtes, powders, ſeeds, &c.

In frontals applied to eaſe the violence of the head-ache, in the heights of fevers, they frequently mix the kernels of cherries.

FRONTALIS, in *Anatomy*, a name given to ſeveral parts ſituated about the frontal bone; as two hollows in the ſubſtance of the bone, a nerve, an artery, and a vein.

FRONTANA, in *Geography*, a town of Spain, in Catalonia; 25 miles S. E. of Urgel.

FRONTATED, a term uſed by *Botaniſts* to expreſs that the petalum, or leaf of a flower, grows broader and broader, and at laſt, perhaps, terminates in a right line, in oppoſition to *cuſpidated*, which expreſſes that the leaves terminate in a point.

FRONTE, in *Geography*, a town of France, in the department of the Po, on the Marlon; 11 miles N. of Turin.

FRONTEAU, John, in *Biography*, was born at Angers in the year 1614, and was educated by a pariſh prieſt in that neighbourhood, by whoſe inſtructions he profited ſo well, that before he was thirteen years of age he could, with the utmoſt

utmoſt facility, tranſlate his native language into the Latin and Greek. At the college of La Fleche he went through a courſe of philoſophy and his other advanced ſtudies, and in the year 1631 he took the habit of a canon regular in the houſe of All Saints at Angers. At St. Genevieve, in Paris, he was appointed to teach philoſophy, and in 1639 was appointed profeſſor of divinity, which he taught with high reputation for 12 years. In 1648 he was appointed chancellor of the univerſity of Paris, and obtained other valuable church preferments. He once incurred the diſpleaſure of the court on ſuſpicion of being a defender of, and attached to the Janſeniſts; but his ſubſequent conduct, and his readineſs to ſign the required teſt, raiſed him again into favour. He died in 1662, not many days after he was inducted into the priory of St. Magdalen of Montargis. He was author of many learned works, and a collection of his letters was publiſhed after his death. He was an able and diligent ſcholar; beſides the Latin and Greek languages, he was maſter of moſt of the modern, and all the oriental tongues. "He kept up," ſays Du Pin, "a large correſpondence, not only with the learned, but alſo with the moſt conſiderable perſons in the kingdom, and particularly with the moſt conſiderable men of the long robe, who honoured him with their friendſhip. In his works he knew how to adorn his profane reading by the eccleſiaſtical, and always enlivened the ſubject with ſome paſſages of the fathers, or with ſome curious hiſtorical notes and obſervations." Moreri. Du Pin.

FRONTEIRA, in *Geography*, a town of Portugal, in the province of Alentejo; ten miles N. of Eſtremos.

FRONTEITTEN, a town of Germany, in the duchy of Stiria; 14 miles N. N. W. of Gratz.

FRONTENHAUSEN, a town of Bavaria; 14 miles E. of Landſhut.

FRONTEVAUX, *Order of*. See FONTEVRAUD.

FRONTIER, the border, confine, or extreme of a kingdom, or province; which the enemies find in front, when they would enter the ſame. Thus we ſay, a frontier town, frontier province, &c. Frontiers were anciently called *marches*.

The word is derived from the French *frontiere*, and that of the Latin *frontaria*; as being a kind of front oppoſed to the enemy. Skinner derives frontier from *front*; inaſmuch as the frontier is the exterior, and moſt advanced part of a ſtate; as the front is that of the face of a man.

FRONTIGNAN, in *Geography*, a town of France, in the department of the Herault, and chief place of a canton in the diſtrict of Montpellier; 12 miles S.W. of Montpellier. This little town is ſituated on lake Maguellone, called alſo lake Thau, and is famous for its wine, generally called Frontigniac. The place contains 1,420, and the canton 3,032 inhabitants, on a territory of 205 kiliometres, in five communes.

FRONTIGNIAC WINE, is ſo called from a town of Languedoc, in France, mentioned in the preceding article, remarkable for producing it.

FRONTINAC, in *Geography*, a county of Upper Canada, bounded on the E. by the county of Leeds, on the S. by lake Ontario, on the W. by the townſhip of Erneſt, running N. 24° W. until it interſects the Ottawa or Grand river, and thence deſcending that river until it meets the northweſternmoſt boundary of the county of Leeds.

FRONTINAC, *Fort*, a fortreſs in Canada, at the head of a fine bay or harbour, on the N.W. ſide of the outlet of lake Ontario, where veſſels of all ſorts may ride in ſafety. It is a league from the mouth of the lake, and at a ſhort diſtance S. of Kingſton, and about 300 miles from Quebec. The ſoil is ſo well cultivated about this place as to produce all ſorts of European and Indian corn and fruits. See ONTARIO.

FRONTINUS, SEXTUS-JULIUS, in *Biography*, an eminent Roman, and city prætor A.D. 70. He was afterwards a ſupplementary conſul, and diſtinguiſhed himſelf by his military talents as a commander in Britain. He is noticed by the younger Pliny and other writers for the benefit which his country derived from his talents. Under the emperor Nerva he was appointed to the ſuperintendance of the waters, and in this capacity he brought the water of the Anio to Rome by means of a ſplendid aqueduct. He wrote two books on the conſtruction of theſe works, by the emperor's expreſs order. He wrote likewiſe upon military ſtratagems, a work which is ſtill extant. The beſt edition of his works is that printed at Lyons 1731 and 1779. A work on agriculture, which has been aſcribed to him, was probably compoſed by a later writer. When Frontinus died he forbade the erection of a monument to his memory, ſaying that it was a ſuperfluous expence; for his name would live if he had done any thing to merit the honour. Gen. Biog.

FRONTIS, Os, in *Anatomy*, one of the bones of the head. See CRANIUM.

FRONTISPIECE, in *Architecture*, the portrait or principal face of a fine building.

The word is formed of the Latin *frontiſpicium*, q. d. *frontis hominis inſpectio*.

The frontiſpiece of the Louvre is the fineſt piece of architecture in France.

Hence, alſo, by a figure, we ſay, the frontiſpiece of a book, meaning an ornament, with an engraven title on the firſt page.

FRONTLET. See FRONTAL.

FRONTLET *Aim*, in *Gunnery*, is a piece of a plank three inches thick, a foot long, and ſeven or eight inches high, with a round cavity underneath to fit the outſide of the gun, and having a ſmall ſlit to ſee the object through it. It is placed upon the vent field of the gun, when it is pointed in a battery.

FRONTON, in *Architecture*, a French word uſed to expreſs an ornament over a door or a pediment. See PEDIMENT.

FRONTON, in *Geography*, a town of France, in the department of the Upper Garonne, and chief place of a canton in the diſtrict of Toulouſe; 15 miles N. of Toulouſe. The place contains 2,149, and the canton 11,708 inhabitants, on a territory of 247½ kiliometres, in 20 communes.

FROOGARDE, a town of Norway, in the dioceſe of Drontheim; 60 miles S.S.E. of Drontheim.

FROOKABOO, a town of Africa, in Bambarra. N. lat. 12° 45'. W. long. 5° 20'.

FROSASCO, a town of Italy, in the department of the Po; 13 miles S.W. of Turin.

FROSCHGRUN, a town of Germany, in the principality of Culmbach; 5 miles S.E. of Lichtenberg.

FROSCHIUS, JOHN, in *Biography*, a doctor in theology, and a prior of the order of Carmelites, at Augſburg; publiſhed in 1535 a treatiſe, entitled "Rerum Muſicarum Opuſculum rarum ac inſigne, totius ejus negotii rationem mira induſtria et brevitate complectens, jam recens publicatum, Joan Froſchio autore." Argentorati, 1535.

This work is divided into nineteen chapters, of which the firſt fourteen are chiefly employed in diviſions of the ſcale and theory of ſound, according to the doctrines of the ancients. Chap. 15. explains the notes in uſe during the early part of the ſixteenth century, as placed on lines and ſpaces; the

the characters for time and their proportions; perfection, imperfection, prolation, &c. There is but one chapter, the nineteenth and the laſt, on the ſubject of compoſition, or the practice of harmony. The work is terminated with examples of counterpoint in four and ſix parts; but being printed ſeparately, in old notation, and not regularly barred, they are ſomewhat difficult to ſcore.

FROSE, in *Geography*, a town of Germany, in the duchy of Magdeburg; 10 miles S. of Magdeburg

FROSO, a ſmall iſland on the E. ſide of the gulf of Bothnia. N. lat. 63 34'. E. long. 22 14'.

FROSON, a town of Sweden, in Jamtland, ſituated in an iſland in lake Storſio, containing a ſchool and poſt-office. N. lat. 63° 10'. E. long. 15°.

FROSSAY, a town of France, in the department of the Lower Loire; 4 miles S.E. of Painbœuf.

FROST, in *Meteorology*, ſignifies that ſtate of the atmoſphere in which the thermometer is below 32°, and water becomes congealed.

When the ſun paſſes to the ſouth of the equator, the northern hemiſphere gradually loſes of its temperature, its expenditure of heat being greater than the ſupply. After ſome time a rapid diminution of temperature is obſerved as we paſs over the ſucceſſive parallels of latitude from the equator to the North pole. As far as the action of the ſun's rays is concerned, this decreaſe of temperature ſhould be regular; that is, it ſhould be in ſome proportion to the diſtance from the equator, and to the progreſs of the ſeaſon. We find however from experience, that ſuch regularity does not take place. In any given northern latitude the temperature is more eſpecially deſultory in the winter ſeaſon. Some other cauſe therefore muſt operate to produce this irregularity. This cauſe is the winds. Not only are the winds more violent in the winter ſeaſon, but they induce a greater change of temperature, all other circumſtances the ſame, than in any other ſeaſon, by reaſon of the contiguous climates being then more diſproportionate than uſual in their temperature. See WIND and TEMPERATURE.

Mr. Kirwan remarks, that "it ſcarce ever freezes in latitudes under 35°, unleſs in very elevated ſituations." It is known indeed, that ice and ſnow are perpetual, even under the equator; but then it is in very elevated and almoſt inacceſſible ſituations. Above the latitude of 35°, froſt is gradually more prevalent in the winter ſeaſon, as we approach the pole. In Britain, froſt commonly appears in the courſe of October and diſappears in April; but the ſeverity of it is confined to December, January, and February. Such however is the uncertainty of froſt in this country, that ſome winters paſs over with ſcarcely a week of keen froſt, and the thermometer never lower than 20°; whilſt in other winters we have 10 or 12 weeks of froſt with little interruption, and the thermometer ſometimes as low as the zero of Fahrenheit, or lower. This difference of ſeaſons ariſes from the wind being accidentally confined principally to the S.W. or to the N.E. direction, the former current coming from the equatorial, and the latter from the polar regions. It is obſervable that Britain, from its inſular ſituation, is leſs liable to extreme cold than the correſponding latitudes on the continent; but then its temperature is probably more fluctuating.

There are certain phenomena attending the natural congelation of water in ordinary froſts that deſerve notice. Small portions of water, inſulated, or cut off from the ſurface of the ground, are moſt liable to be frozen. Becauſe the ground is comparatively a good conductor of heat, no body in contact with it can be frozen till the temperature is reduced all around. Air is generally the medium that poſſeſſes the freezing temperature; therefore the more completely any body is ſurrounded with air, and the leſs the connection it has with the earth, the more readily it is frozen. Ice is formed firſt over ſhallow pools of water, then over ponds, and laſtly over lakes. The reaſons are various. Earth has a leſs capacity for heat than water; it is therefore ſoon reduced and deprived of the heat which it ſhould impart to the water in the firſt caſe. But in deep waters the tardy congelation is principally owing to another cauſe, in combination however with the former. Water is a liquid which increaſes in ſpecific gravity as its temperature diminiſhes down to 36°. Now as it muſt be cooled to 32° before it can freeze, it follows that the cooling of water at its ſurface cannot effect its congelation till the whole maſs is made to approximate the freezing temperature; becauſe the cooled water immediately tends downwards, and warmer water aſcends.

Another reaſon for the ſlow congelation of water is quite of a different kind from thoſe already mentioned. It is a change of capacity of the water for heat. During congelation water loſes as much heat as would, if added, be ſufficient to raiſe its temperature 140°. Of courſe it requires a long continued application of a cooling cauſe to deprive the water of ſo much heat. This fact was diſcovered by Dr. Black; he called the heat ſo diſengaged *latent*, becauſe it did not affect the thermometer. The importance of this change of capacity of water in checking the ſeverity of winter, has been well elucidated by different authors, particularly by Crawford in his Eſſay on Animal Heat, and by count Rumford in one of his Eſſays on heat.

Springs of water are obſerved to remain unfrozen for a great length of time, and to emit a ſmoke or vapour. This is owing to their riſing from a great depth, and conſequently partaking of the internal temperature, which is nearly uniform throughout the year, and the mean annual temperature. The water, comparatively warm, ſends off ſteam, which the cold air ſoon condenſes into a miſt. See EVAPORATION and FOG.

Froſt does not penetrate ſo deep into the ground as might be expected. In Britain it ſeldom ſinks 10 or 12 inches; though in a very long froſt it has been found 18 inches deep or more. In high northern latitudes, where the cold is more ſevere, it does not penetrate proportionally; the reaſon is, the ground is generally covered with ſnow, which defends it from the action of the air. See SNOW.

The force with which water expands in the act of freezing is wonderful. Very ſtrong veſſels have been burſt by the freezing of water within them. Mr. Boyle relates that a gun-barrel filled with water, then cloſed and frozen, was burſt the whole length. By a ſimilar experiment Huygens burſt a cannon. Major Williams made many experiments on the expanſive force of freezing water at Quebec in 1784 and 1785. He filled iron bomb-ſhells of various ſizes with water, then plugged the fuze-hole cloſe up, and expoſed them to a ſtrong froſt. The plugs were always thrown out with force, ſometimes to the diſtance of 400 or 500 feet, or the ſhells burſt, the ice at the ſame time bolting out. Hence the effects of froſt in ſplitting rocks, burſting pipes, &c. are not ſo much to be wondered at.

In ſome countries, particularly Ruſſia, meat is preſerved for ſeveral months by means of froſt.

A chronological record of ſome of the moſt remarkable froſts is ſubjoined. See Hutton's Math. and Philoſ. Dict.

In the Year

220. Froſt in Britain that laſted 5 months.
250. The Thames frozen 9 weeks.
291. Moſt rivers in Britain frozen 6 weeks.
359. Severe froſt in Scotland for 14 weeks.

In the Year

508. The rivers in Britain frozen for two months.
558. The Danube quite frozen over.
695. The Thames frozen 6 weeks; booths built on it.
759. Froſt from October 1ſt, till February 26th, 760.
827. Froſt in England for 9 weeks.
859. Carriages uſed on the Adriatic ſea.
908. Moſt rivers in England frozen 2 months.
923. The Thames frozen 13 weeks.
987. Froſt laſted 120 days; began December 22d.
998. The Thames frozen 5 weeks.
1035. Severe froſt on June 24th; the corn and fruits deſtroyed.
1063. The Thames frozen 14 weeks.
1076. Froſt in England from November till April.
1114. Several wooden bridges carried away by ice.
1205. Froſt from January 14th till March 22d.
1407. Froſt that laſted 15 weeks.
1434. From November 24th to February 10th, Thames frozen down to Graveſend.
1683. Froſt for 13 weeks.
1708-9. Severe froſt for many weeks.
1715. The ſame for many weeks.
1739. One for 9 weeks; began December 24th.
1742. Severe froſt for many weeks.
1747. Severe froſt in Ruſſia.
1754. Severe one in England.
1760. The ſame in Germany.
1776. The ſame in England.
1788. Thames frozen below bridge; booths on it.
1795. Severe froſt in England.

Frost, in *Phyſiology*, or as it regards the animal and vegetable kingdoms, is of great conſideration. Clear froſty weather is accounted ſalubrious, when the cold is not extreme, and a due portion of exerciſe is taken. Extreme cold is ſometimes known to freeze the parts of the body expoſed. Loſs of ſenſation in the parts is the conſequence, and if not ſpeedily attended to, mortification enſues. Rubbing the affected parts with ſnow is ſaid to be the beſt remedy. It is remarkable that perſons expoſed to great cold are ſtrongly inclined to ſleep; this ſymptom therefore ſhould be conſidered as alarming, and due care ſhould be taken by keeping the fatal conſequence in view.

Frost, in *Agriculture* and *Gardening*, is beneficial in the winter ſeaſon. It expands the ſoil, renders it more looſe and friable, and adapts it for tillage; it deſtroys grubs and other inſects which are injurious to vegetation. On the other hand, in an early ſpring, when vegetation has advanced too rapidly, the effects of froſt have ſometimes been highly deleterious. What are called *blights* are moſt frequently occaſioned by froſt. It often happens, that warm weather in April and May is accompanied with thunder, and this is ſucceeded by a week or two of cold froſty weather. After ſome nights more ſeverely cold, when the thermometer has been at or near freezing, the blight appears. It has been aſcribed in ſuch caſes to the lightning; but it is clearly an effect from an oppoſite cauſe. Experienced gardeners inform us that the beſt remedy for blights in vegetation, ſuch for inſtance as in the young ſhoots of potatoes, is to cut off the part affected, which otherwiſe, like a gangrene, ſpreads the diſorganization. See Blight.

Frost, *Hoar*, is the dew frozen on the graſs, on trees, or on the ſurface of any other body. This phenomenon, which is conſtantly obſervable in froſty weather, is notwithſtanding more particularly an object of notice in autumn. The reaſon is, it is more abundant then, and frequently unaccompanied with other ſigns of froſt, as ice and ſnow. Vapour at that ſeaſon is copious, and dews ſtrong. The cold is not yet ſufficiently powerful to freeze a body of water in contact with the earth; but the dew, being ſmall drops of water inſulated, or reſting lightly on the graſs, requires leſs cold to congeal it. There is a remarkable appearance of hoar-froſt when a thaw commences after a long froſt. Houſes, walls, &c. which during the froſt ſeemed unaffected, are ſuddenly covered with a thick coating of hoar-froſt. It is the walls, which retaining the previous temperature for ſome time, condenſe the vapour introduced by the thaw into hoar-froſt.

Frost, *Effects of, on Land, Plants, Trees*, &c. The operation of freezing is found to have conſiderable effects not only in breaking down, reducing, and mellowing the particles of ſtiff, adheſive, heavy ſoils, but alſo on the juices, fruits, and other parts of plants and trees.

It is conſequently obvious, that wherever lands are of an obſtinate, harſh, ſtiff, clayey quality, much advantage may be derived from the practice of laying them up in ridges, in order that they may be expoſed to the action and influence of froſt during the winter ſeaſon. The work of ploughing them up ſhould be performed late in the autumnal ſeaſon, juſt before the froſt uſually ſets in, that they may afford their fulleſt effects. In many caſes a fine tilth may be obtained in this way without any ſpring ploughing, the ground being merely reduced by the ſcuffler at the time of putting in the ſeed, which is a great ſaving of both labour and expence.

The action of froſt is ſeldom much wanted on the light, ſandy friable ſoils, as it may render them too open and porous for producing good crops, and thereby do great miſchief. It is very ſeldom that corn crops are in any way injured by hard winters, eſpecially where the land has been perfectly drained, and is in any degree covered with ſnow. But they are highly deſtructive of great numbers of different kinds of inſects, grubs, and other ſorts of vermin; while, at the ſame time, by leaving the earth in a fine, looſe, powdery ſtate, they fit it in the beſt manner for the ſpreading of the roots, by which, as the warmth of the ſpring approaches, ſtrong healthy plants are produced, and of courſe abundant crops. On the contrary, when frequent rain falls in the winter ſeaſon without froſt, the earth is ſoddened, ſo as to produce afterwards little or nothing of good grain, but plenty of blades, which are liable to be ſoon deſtroyed by the hoar froſts of the ſpring, by inſects, or by the choaking of weeds; or which, if they eſcape, yield ſtraw in the place of grain.

The caſe in which the greateſt danger is to be apprehended from froſt, is where the ground is inclined to be wet, and where there is no covering of ſnow upon it. For inſtance, where a ſharp froſt ſets in after a ſudden thaw, the fibres of the roots are liable to be burſt or broken by the expanſion which is produced by the too abundant moiſture of the plants, and perhaps that which ſurrounds them.

Froſt is found to have much power in the ripening of grain and fruits of different kinds. It has been ſtated by the author of "Minutes of Agriculture," for the year 1785, that the barley had not ripened perceptibly for ſome weeks before the ſharp froſts, ſince which it has ripened daily. There are, it is continued, twice the number of ripe ears now there were a week ago; they are not only changed as to colour, but the corn is obviouſly plumper. Before the froſts, the heads ſeemed ſlender and puny; ſo much ſo, that he had conſigned the whole to the miller; now he begins to hope that ſome of it may, this year of ſcarcity, be fit for the maltſter. And it is added, that it was a general obſervation in this country, that in the ſame year, (a wet backward

backward ſummer,) the late ripe crops did not ripen until froſt came; even wheat was out in December. It is aſked, how this is to be explained? Froſt can, it is ſuppoſed ſcarcely to be doubted, compreſs the ſap-veſſels of vegetables, and probably force the ſap out of them back to the earth, as is commonly ſuppoſed; but perhaps the natural receptacles of the plants are firſt ſupplied. It is readily obſervable, that fruits ripen, leaves fall, and that lattermath ſhrinks by the action of froſt.

And it has been noticed by Dr. Darwin, that the ripening of fruit and ſeed is often delayed from the want of a due evaporation of their perſpirable matter, and that of ſolar light in cloudy weather; hence, in the northern parts of the iſland, the oats are found to ſeldom ripen before the froſt commences, with the dry ſeaſon that uſually attends it.

Though the effects of froſts on trees and other vegetable productions have long been known, the differences between ſuch as take place in ſevere winters, and thoſe which happen in the mornings during the ſpring ſeaſon, were never fully underſtood, till explained in the Memoirs of the Academy at Paris by M. Du Hamel, and M. De Buffon.

The froſts of ſevere winters have been found much more powerful in deſtroying all ſorts of tender vegetable productions, though they occur much more rarely, than thoſe of the ſpring, which are, nevertheleſs, very injurious, by the conſtancy and frequency of their happening. The principal difference with reſpect to trees is, that the froſts of ſevere winters affect the wood of the trunks and large branches, while thoſe of the ſpring are chiefly hurtful to the buds and other tender parts.

Beſides, the common winter froſts taking place at a time of the year when moſt of the trees in woods and other places have neither leaves, flowers, nor fruits upon them, and when their buds are in ſuch a ſtate of torpor as not to be eaſily injured, eſpecially when the preceding ſummer has not been over-moiſt, they ſeldom, under common circumſtances, prove in any high degree deſtructive to them. It is only the ſevere froſts that happen late in the winter that do great miſchief, even to ſuch trees as they do not wholly deſtroy. The injuries which trees are ſtated to receive in this way are, long cracks in the direction of the fibres, portions of dead wood incloſed by ſuch as is yet in a living ſtate, and that affection which is known to woodmen under the title of the double blea, which is a perfect circle of blue or ſoft white wood, that, when the tree is afterwards cut down, is found to be covered by a circle of hard ſolid wood.

The blea, in its natural ſtate, is an outer circle of white and imperfect wood encompaſſing the hard and more perfect wood of the tree, and ſurrounded by the bark, being eaſily diſtinguiſhed in moſt ſpecies from the hard wood or heart of the tree, by its different colour, and want of hardneſs or ſolidity. See ALBUMEN.

The celebrated M. Reaumur made long ſince a great number of obſervations on the blea in trees of different parts of France, all which tended to ſhew the falſe blea under the ſame number of annual circles of the after-growth of the trees, which, on being counted, proved exactly as many as the number of years ſince 1709; whence he naturally concluded, that all the falſe blea he found throughout the kingdom was the effect of the ſeverity of this one hard winter.

It is alſo further ſuppoſed evident, that this falſe blea is that part of the tree which, in the above year, was the true and natural blea, and which the ſeverity of the froſts of that winter prevented from ever becoming ſound and ſolid wood, leaving it to become more weak and defective for a ſucceſſion of years; during which the ſeveral annual circles of ſupervening blea all became ſound and perfect wood in their natural courſe. And it is ſufficiently obvious, that the blea muſt be that part of the wood which is moſt expoſed to ſuffer, in conſequence of its being the outer wood of all, and that which forms a covering for the inner part. It may likewiſe be added, that it is naturally of a much leſs compact texture, and is much more replete with juices for the froſt to exert its action upon.

The ſplitting of trees in the direction of their fibres often takes place with a very loud crack or report. It is far from being uncommon in large foreſts to meet with trees that have ſuffered in this way, and which having outlived the ſeverity of the winter's froſt that produced them, are found to have a long ſort of ridges or ribs, marking the places where the cracks originally were, and forming a kind of cicatrices or ſcars over them. Theſe cicatrices or ribs are, however, only ſuperficial, as wherever they are, the cracks are ſtill found remaining under them in the trees; for though the bark and blea can unite and conſolidate in this manner, ſo as to conſtitute coverings for them, the fibres of the ſolid wood, when once broken and ſeparated, never cloſe again. Woodmen are moſtly of opinion, that all ſuch cracks in timber are produced by froſts; and it is eaſy to conceive this to be the caſe from the conſideration of the vaſt expanſive form which they cauſe in all frozen liquids. See FREEZING.

It is not, however, by any means aſcertained, that all the different cracks in trees of the timber kind are the effects of froſt: it is not improbable but that ſome of them may depend upon other cauſes, as a redundance of ſap, &c.

With reſpect to the difference of the expoſures of trees, in regard to the effects of froſt, there has been a variety of opinions held forth, but probably without having any foundation in juſt obſervation. A great number of perſons ſuppoſe that the effects of froſt are the more ſevere on ſuch as have a northern expoſure, while others imagine a ſouthern or weſtern aſpect to be the moſt powerfully affected by it. There can be little doubt but that northern expoſures are the moſt cold; but ſtill it is not to be concluded, that the effects of froſts on trees, in ſuch aſpects, are the greateſt and moſt injurious to them; on the contrary, there are numerous proofs that ſhew it to be on the ſouthern ſides that trees in general are the moſt cut and injured by them; and it is well known, from repeated trials, that there are particular accidents or conditions under which a more moderate froſt may do greater injury to trees and other vegetables, than the moſt ſevere one that may happen to them, when under more favourable circumſtances.

Early peas, and ſome other forward crops, are frequently, in moſt ſituations, the moſt expoſed to danger, where they have eaſtern expoſures, and where there are alternate froſts and thaws, as the winds from that quarter are apt, in ſuch caſes, to bring with them a portion of muriatic acid, which readily turns the crops black, and wholly deſtroys them.

It was alſo found from the reports of the injuries which trees received during the ſevere froſts of the year 1709, that they were by far the greateſt where repeated falſe thaws took place and were ſucceeded by a repetition of new froſts. And ſpring froſts alſo afford numerous inſtances of the ſame thing. The experiments of M. de Buffon likewiſe inconteſtibly ſhew, that it is not the ſevereſt cold, or the moſt fixed froſt that proves the moſt injurious to vegetable productions. This, however contrary to the commonly received opinion, is not by any means the leſs true or leſs conſiſtent with reaſon. It has been found by numerous experiments

that it is principally humidity that renders froſt ſo fatal and deſtructive to vegetables; conſequently, every thing that has a tendency to produce this ſtate in them muſt neceſſarily expoſe them to its injurious effects; while ſuch things as can prevent, or take off, an over proportion of moiſture in them, as every thing that has the tendency of drying them, whatever the increaſed degree of cold produced may be, muſt prevent or preſerve them from its injurious influence and operation. There is a variety of facts that tend to prove this. It is well known that vegetables conſtantly experience the effects of froſt, the moſt ſeverely in low, damp ſituations that are ſubject to fogs. Plants which ſtand by the ſides of rivers are frequently found deſtroyed by ſpring froſts as well as thoſe in autumn, while ſuch of the ſame kinds as ſtand in drier ſituations ſuffer little, if at all, by them. The low and wet parts of foreſts are likewiſe well known to produce worſe wood than the high and ſuch as are drier; and coppice wood in low, moiſt places of common woods, though it may puſh out more vigorouſly at firſt than that of other parts, never comes to ſo good a growth, as the froſts in the ſpring kill theſe early top-ſhoots, and oblige the lower parts of the trees to throw out lateral branches; the ſame thing likewiſe happens, in a higher or lower degree, to ſuch coppice wood as grows under cover of larger trees in foreſts; as in this caſe the vapours, not being carried off either by the ſun or wind, ſtagnate and freeze, deſtroying the young ſhoots in exactly the ſame manner as the fogs and damps of marſhy places. It has been long a common remark with horticulturiſts, that froſt is never hurtful to the late ſhoots of the vine, or to the flower-buds of trees, except when it immediately ſucceeds heavy dews or a long continued rainy ſeaſon, in which caſes it ſeldom or ever fails to do great miſchief, though ever ſo ſlight. The injurious effects of froſt are likewiſe conſtantly found to be more ſevere on the crops in newly cultivated lands, than under the contrary circumſtances, which is probably owing to the greater exhalation of moiſture from the ſurface. Such trees alſo as have been recently cut, are found to ſuffer more than others by the ſpring froſts, in conſequence probably of their ſhooting out more vigorouſly.

It has not unfrequently been remarked that the ſide ſhoots of trees are more liable to periſh by ſpring froſts than thoſe from the tops. Indeed M. de Buffon, who examined this point with great accuracy and minuteneſs, conſtantly found the effects of ſpring froſts to be much greater near the ſurface of the ground than elſewhere. The ſhoots within a foot of it were quickly deſtroyed by them; while thoſe at two or three feet in height bore them far better, and ſuch as were at four feet and upwards often wholly eſcaped unhurt, at the time that the lower ones were completely deſtroyed.

The whole of the facts on this ſubject tends, therefore, to ſhew, that it is not ſo much the ſeverity of froſts that proves injurious to trees and other vegetable productions, as that of their being replete with moiſture at the time it occurs. It is on this principle that the great damages done by ſevere froſts on the ſouth ſide of trees are to be explained, though that ſide may all the while have been expoſed to leſs cold than that of the north. Great injury is often done to the weſtern ſides of trees and plantations, as ſhewn in the Memoirs of the Academy of Sciences at Paris for the year 1737, when after a rain with a weſt wind, that wind turns to the north at ſun-ſet, as is not unfrequently the caſe in ſpring; or when an eaſt wind blows upon a thick fog before the ſun riſes.

Frost-*ſplit*, in *Agriculture*, is a term employed by farmers to denote certain effects of froſt on trees, ſuch for inſtance as thoſe of producing large cracks and fiſſures in their trunks and branches, which render them unfit for ſuch uſes as they would otherwiſe have been ſuitable for, and conſequently greatly deteriorate and leſſen their value as timber. Though it may have been contended by ſome that theſe effects on trees proceed from other cauſes than froſt, there are innumerable well authenticated inſtances of its power, when ſevere, of injuring the ſtrongeſt trees in this way. And there can be little doubt, when its very powerful expanſive action is conſidered, of ſuch rents and cracks really ariſing from froſt. See Frost.

FROTH, a white, light ſubſtance, formed on the ſurface of fluids by vehement agitation.

Froth conſiſts wholly of little ſpherules, or globules; and, accordingly, may be defined, an aſſemblage of aqueo-aereal bubbles.

Froth, in the *Manege*, is a moiſt white matter that oozes from a horſe's mouth, otherwiſe called foam. A horſe that by champing on his bridle, throws out a great deal of froth, is judged to be a horſe of mettle and health, and to have a cold freſh mouth.

Froth-*ſpit*, or *Cuckow-ſpit*, a name given to a ſort of white froth, or ſpume, very common in the ſpring and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field-lychnis, or catch-fly, thence called by ſome *ſpatling-poppy*. All writers on vegetables have taken notice of this froth, though few have underſtood the cauſe or origin of it, till of late. Many imagined it an exhalation from the earth; ſome have eſteemed it, as its name expreſſes, the ſaliva of the cuckow; others, the extravaſated juices of the plant, and ſome a hardened dew. But all theſe are erroneous opinions, and the account of it is, that it owes its origin to a ſmall inſect, called by ſome the flea-graſs-hopper, which applies its anus cloſe to the leaf, and diſcharges upon it a ſmall drop of a white viſcous fluid, containing ſome air in it, and, therefore, ſoon elevated into a bubble. Before this is well formed, it depoſits ſuch another drop, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form this froth. See Cuckow-*ſpit*.

FROUARD, in *Geography*, a town of France, in the department of the Meurthe, ſeated on the Moſelle; four miles N. N. W. of Nancy.

FROULAY-TESSE, a town of France, in the department of the Orne; ſeven miles S. E. of Domfront.

FROUNCE, in the *Manege*, a diſeaſe in horſes, when ſmall warts or pimples ariſe in the midſt of the palate, which are very ſoft and ſore, and ſometimes breed in the lips and tongue.

This diſorder is occaſioned many ways; ſometimes by eating wet hay, whereon rats or other vermin have diſcharged urine; by drawing frozen duſt into their mouths among the graſs, &c.

As to the method of treatment, it conſiſts in letting them blood in the two largeſt veins under the tongue, and waſhing the ſores with vinegar and ſalt, or with ale and ſalt, till they bleed.

Frounce, in *Falconry*, a diſeaſe incident to hawks, ariſing from moiſt and cold humours falling down to the palate and root of the tongue; by which means they loſe their appetite, and cannot cloſe their clap. Waſhing with alum-water, lemon-juice, &c. is held good for it.

FROUQUIE, in *Geography*, a ſmall iſland in the Engliſh channel, about one mile from the W. coaſt of the iſland of Jerſey.

FROW-Fish, in *Ichthyology*, the Cyprinus *orpus*, which ſee.

FROWARD, Cape, in *Geography*, a cape on the

N. coaſt of the ſtraits of Magellan. S. lat. 54° 3'. W. long. 7 59.

FROWER, an edged tool, uſed in cleaving wood into laths.

FROWEY Timber, is that which is of the ſame degree of texture throughout, and that which works freely.

FROWSACK Channel, or the gut of Canſo, in *Geography*, a ſtrait between Nova Scotia and Cape Breton iſland, five French leagues long, and one broad.

FROYEN, an iſland in the North ſea, near the coaſt of Norway, about 35 miles in circumference. N. lat. 63° 45'. E. long. 9'.

FROZELIN, a ſmall town of France, in the department of the Creuſe, N. W. of Gueret, at the conflux of the Great and Little Creuſe.

FROZEN, or Frigid *Zone*. See Zone.

Frozen, or *Northern Ocean*, *Mare Hyperboreum*, or *Mare Scythicum*, extends from 52° or 53° N. lat. to the polar region. Between the eaſtern coaſts of Great Britain and the coaſts of Denmark and Norway, northward to the Shetland iſlands, it forms a gulf called the "German ſea." At the ſouthern extremity of Norway, an arm of that ſea almoſt environs Denmark; ſtretching eaſt and north-eaſt, it is called the "Baltic," (which ſee,) and extends from ſouth to north 300 leagues, including the gulf of Bothnia. The ſmall gulfs of Finland and Livonia lie to the eaſtward; and the former, by means of the Ladoga and Onega lakes, has a communication with the White ſea. Theſe gulfs receive the Oder, the Viſtula, the Niemen, and the Dwina, together with many rivers which deſcend from Lapland and Sweden, Finland and Livonia. An inland gulf, eaſtward from Ruſſian Lapland, is called the "White Sea," (which ſee,) into which 12 or 13 conſiderable rivers diſcharge themſelves. At the N.W. extremity of Ruſſia, the ſtrait of Waygatz in 70° N. lat., was long conſidered by geographers as a paſſage into the ſea, or gulf, that lies eaſtward along the coaſt of Grand Tartary; but the navigation of this ſtrait is now found to be impracticable, on account of the ſhoals of ice floating in thoſe parts. To paſs into the eaſtern ocean by the north of Nova Zembla is equally impoſſible, becauſe an immenſe field of ice precludes all acceſs, in this way, from Europe to the Eaſt Indies.

From North Cape in Lapland the frozen ocean ſtretches weſtward along the coaſt of Greenland; repelled by the coaſt of Labrador, it turns northward to form an immenſe gulf, large tracts of which are diſtinguiſhed by different names, as Hudſon's Bay, Davis's Strait, and Baffin's Bay.

The diſtance between North Cape, and the N. E. extremity of Tartary, is about 155 degrees or 3300 Engliſh miles. A line from that extremity acroſs the Caſpian and Red ſeas, to the Cape of Good Hope, as Mr. Buffon obſerves, is about 3,600 Pariſian leagues; and no other line of equal extent is to be found in the old continent. From North Cape to the ſouth extremity of Africa are 2,500 leagues.

The frozen ſea was, by the Goths, called Gandawyk, by the Cimbrians Mare Maruſa, and by the Latins, Mare Sarmaticum, and Mare Scythicum. The Ruſſians now call it Ledovitoë Mare; by the Swedes it is denominated Is-Hafoet, and by the Norwegians Leberſec. It borders the whole of the northern part of the Ruſſian empire from the confines of Lapland to the Tſchukotſkoy Noſs; that is, from 50 to 205 degrees of longitude, and conſequently waſhes the ſhores of the governments of Archangel, Tobolſk, and Irkutſk. Several conſiderable bays are formed by this vaſt ocean; the greateſt of which is the "White ſea," already mentioned, extending from N. to S. within the land, from 69° to 63° N. lat., and containing a multitude of petty iſlands. Of the numerous iſlands in this ocean the moſt conſiderable are Nova Zembla and Kalgueva; both uninhabited or frequented only by fiſhermen and hunters. In this great ſea, conſidered as the boundary of the Ruſſian empire weſtward, there are only three harbours whence at this time any navigation is purſued, *viz.* Kolâ, Archangel, and Meſen: but that of Archangel is the moſt famous. The ſhores in many places, more eſpecially thoſe of the White ſea, are beſet with rocks; in other parts low, with ſhoals which, in a manner, forbid acceſs, and the adjacent country is very marſhy. The water in this ſea is proportionally not very ſaline, though near Archangel it is ſo briny, that ſome quantities of common ſalt are prepared from it. The ebb and flow are moderate, and in the parts lying moſt to the north ſcarcely perceptible. The fiſhery is very conſiderable, particularly of ſtock-fiſh, herrings, whales, morſes, porpoiſes, ſea-dogs, &c. See Ocean.

Frozen *Water*. See Water.

FROZES, in *Geography*, a town of France, in the department of the Vienne; 5 miles W. of Poictiers.

FRUCHILAN, a ſmall iſland, near the Weſt coaſt of Scotland. N. lat. 58° 3'. W. long. 5° 10'.

FRUCTIFEROUS properly denotes any thing that produces fruit; but in a more large and figurative ſenſe, is uſed by lord Bacon, and others, for ſuch experiments in natural philoſophy as prove advantageous to the experimenter in point of gain or profit.

FRUCTIFICATION, in *Botany*, is uſed not only to expreſs the ſtate of a plant bearing flowers or fruit, but alſo for all the parts collectively deſtined to the production of ſeed. Theſe organs are therefore, though temporary, and often very tranſitory, of the moſt eſſential importance. By them "each ſpecies is perpetually renewed without limits, ſo far at leaſt as the obſervation of mankind has reached; while all other modes of propagation are but the extenſion of an individual, and ſooner or later terminate in its total extinction." See Linnæus on the Sexes of Plants, p. 45, note, and Smith's Introduction to Botany, 240. "The fructification," ſays Linnæus in *Philoſophia Botanica*, 52, "is a temporary part of vegetables, deſtined for the reproduction of the ſpecies, terminating the old individual and beginning the new." He juſtly conſiders the herbage, or external form of all plants, as merely a ſort of maſk or clothing, by no means indicative of their true nature or character, which are developed in the flower and fruit. Pliny had already obſerved that "bloſſoms are the joy of trees, in bearing which they aſſume a new aſpect, vyeing with each other in the luxuriance and variety of their colours." This idea is juſtly extended by Linnæus to all plants in general, and hence he deduces the importance of the parts of fructification for the purpoſes of ſcientific arrangement, a principle firſt ſuggeſted by the celebrated Conrad Geſner towards the middle of the 16th century, and which all ſyſtematic botaniſts have ever ſince kept in view. Without it the ſcience of botany would long ago have relapſed into utter barbariſm.

Linnæus diſtinguiſhes ſeven parts of fructification, ſome of which are eſſential to the very nature of a flower or fruit, others not ſo indiſpenſably neceſſary, and therefore not univerſal. Beginning at the external part of a flower, and proceeding inwards, theſe ſeven parts preſent themſelves in the following order. *Calyx*, *Corolla*, *Stamen*, or *Stamina*, *Piſtillum* or *Piſtilla*, *Pericarpium*, *Semen*, and *Receptaculum*.

1. *Calyx*, the Calyx or flower-cup, generally reſembles the leaves in texture and colour, and conſtitutes the external covering of the bloſſom. It is not always preſent, not being eſſential to a flower, whoſe neceſſary functions are independent of it. See CALYX.

2. *Corolla*, the Corolla, compoſed of one or more petals, always internal with reſpect to the calyx, and uſually more delicate in texture, and more beautifully or variouſly coloured than that part, as well as differently ſcented. This organ, however, is not more univerſal or eſſential than the foregoing. See COROLLA.

3. *Stamen* or *Stamina*, the Stamen or Stamens, which are the male organs, and therefore eſſential to every plant. Theſe are commonly of a ſlender or thread-like form, ranged internally with reſpect to the corolla, and often inſerted upon it, each bearing ſome kind of cellular body called the anther, which is the only important part, as producing the pollen or impregnating matter. See FECUNDATION *of Plants*.

4. *Piſtillum* or *Piſtilla*, the Piſtil or Piſtils, ſituated in the centre of the flower, which are the female organs, and therefore no leſs eſſential than the ſtamens, though not always ſtationed in the ſame individual flower with them. They conſiſt of the germen, or rudiments of the fruit, the ſtyle or ſtyles, and the ſtigma or ſtigmas; the firſt and the laſt only being neceſſary, as the ſtyle, ſerving merely to elevate the ſtigma more or leſs, is frequently diſpenſed with.

5. *Pericarpium*, the Seed-veſſel, of a pulpy, woody or leathery texture, when preſent encloſes and protects the ſeeds, but is wanting in many tribes of plants.

6. *Semen*, the Seed, to the formation and perfection of which all the other parts are ſubſervient.

7. *Receptaculum*, the Receptacle, baſis, or point of connection. This muſt be preſent in ſome form or other, and in compound flowers eſpecially is very remarkable.

The nature and phyſiology of theſe parts will be found under ſeveral heads in their proper places, where alſo the varieties of ſtructure in each will be explained.

Linnæus rightly calculates that the various combinations of which theſe ſeven parts are capable, muſt be ſufficient to afford generic characters for all the genera of plants which have been, or can be, diſcovered; eſpecially if we take into conſideration the peculiarities of ſtructure by which one or other of them is, in many caſes, diſtinguiſhed, and which afford the moſt deciſive and eſſential marks. The fructification therefore is our only reſource for the diſtinctive characters of genera, as well as of claſſes and orders, whether natural or artificial. It alſo frequently affords diſcriminating characters of ſpecies in a natural genus, though for theſe laſt the infloreſcence and the herbage are, for the moſt part, more conveniently reſorted to. Botaniſts of the old French ſchool more eſpecially, and others who have not ſufficiently cultivated the principles of true Linnæan ſcience, are frequently tempted to have recourſe to the infloreſcence in their generic characters, and even Linnæus was miſled by his friend Artedi to commit the ſame fault in the arrangement of the natural order of *umbellatæ*. This has not yet been well corrected, though ſome of his adverſaries have pointed it out. We are perſuaded that the proper parts of fructification are in themſelves all-ſufficient, though it may, in many inſtances, require great acuteneſs to detect what is moſt certain and natural for the deſired purpoſe, and to avoid prolixity in our definitions, while we indicate all that is eſſential.

The fructification of ſome natural orders of plants was ſo obſcure at the time when Linnæus wrote, that he was obliged to found his claſs *Cryptogamia* in order to give them any place in his ſyſtem. This is ſtill the caſe with ferns more eſpecially, (ſee FILICES,) as well as with the aquatic *Algæ*. The fructification of moſſes and lichens is now better underſtood, as will be explained in the proper place of each order.

FRUCTISTÆ. See BOTANY.

FRUGA, in *Geography*, a town of Africa; 20 miles S.S.E. of Morocco.

FRUGES, a town of France, in the department of the ſtraits of Calais, and chief place of a canton in the diſtrict of Montreuil; 12 miles S.W. of Arras. The place contains 2,700, and the canton 12,843 inhabitants, on a territory of 185 kiliometres, in 25 communes.

FRUGIVOROUS BIRDS, are ſuch as feed on fruits; either wholly or in part.

The frugivorous, according to Mr. Willughby, are a ſpecies of terreſtrial birds, ſome of which have crooked bills and claws, yet are of gentler nature, and not rapacious. Such are the parrot kind; which, though ſometimes carnivorous, yet feed likewiſe on fruit.

FRUGONI, CARLO-INNOCENZO, in *Biography*, was born of a noble family at Genoa in 1692. At the age of ſixteen he was perſuaded, but much againſt his will, to enter into a monaſtic life. He taught claſſical literature for many years in ſeveral of the cities of Italy, and at the age of thirty-five, through the interference of cardinal Bentivoglio, he was liberated from his vows, which never ſat eaſy on him, by pope Clement XII. He now obtained the patronage of the houſe of Farneſe, who gave him an honourable aſylum in Parma. When the duke eſtabliſhed an academy of Fine Arts, Frugoni was employed to draw up its ſtatutes, and was made the perpetual ſecretary. He was alſo appointed court-poet, and inſpector of theatrical exhibitions, and penſions and honours were liberally beſtowed on him. He died at Parma in the winter of 1768. He is diſtinguiſhed in Italian hiſtory as a conſiderable poet, and he maintained his reputation for vivacity and the fire of genius to a very advanced age. He excelled in various ſtyles and modes of compoſition; his printed works conſiſt of ſonnets, odes, canzoni, elegies, ſatires, eclogues and epiſtles. He had, in almoſt all he did, a ſtyle and manner peculiar to himſelf, but his lyric poetry is the moſt highly eſteemed, and in this he was ſcarcely ever ſurpaſſed by any of his countrymen. His works were collected and publiſhed in nine volumes 8vo. in the year 1779. In private life he was open and undiſguiſed, cheerful and pleaſant in converſation, but ſometimes ſarcaſtical, and more diſpoſed to talk of himſelf than to praiſe others. In ſome of his features he is ſaid to have reſembled the immortal Taſſo.

FRUHITAN, in *Geography*, an iſland near the W. coaſt of Ireland; 3 miles W. of Maſa point.

FRUIT, in its general ſenſe, includes whatever the earth produces for the nouriſhment and ſupport of animals; as herbs, grain, pulſe, hay, corn, flax, and every thing expreſſed by the Latins under the name *fruges*.

In the *civil law*, they diſtinguiſh three kinds of fruits, *viz.*: *natural*, which the earth produces ſpontaneouſly, and without any culture; as thoſe of trees; *fruits of induſtry*, which, though natural, require ſome culture to perfect them; and *civil*, which are only fruits in the eye of law; as rents, ſalaries, wages, &c.

In the *canon law*, fruits include every thing whereof the revenue of a benefice conſiſts; as glebe-land, tythes, rents, offerings, mills, &c.

FRUIT, *Fructus*, in *Botany* and *Vegetable Phyſiology*, that part

part of the fructification of plants which follows the flower, and comprehends the ſeed. All the parts of the flower are ſubſervient to the formation, impregnation, and perfection of the fruit, which is deſtined to be the ſource of a new progeny, and moſtly formed ſo as, by various means, to promote its diſperſion. All fruits are ſo conſtructed as, in the firſt place, to protect the young embryo, to nouriſh its growth, and to convey to it, by appropriate veſſels, the influence of the pollen by which it is impregnated. When the ſeed is arrived at maturity, the very ſame parts undertake a new and even contrary office, either expoſing it and letting it go, or ſerving by their own ſtructure and altered nature to convey it far away from its place of birth. The ſtricteſt connections are all diſſolved, and even mechanical force employed to accompliſh the great ends of its formation.

The fruit conſiſts of the *Pericarpium* or Seed-veſſel, and the ſeed which it contains. Some botaniſts contend that there is no ſuch thing as a ſeed truly naked, or deſtitute of a *pericarpium*, which is the opinion of M. Richard in his *Analyſe du fruit*, publiſhed at Paris in 1808, by M. Duval. This is ſo far true in a phyſiological ſenſe, that every ſeed muſt have an external coat or covering; but this coat is not more decided nor complex in what are commonly termed naked ſeeds, as thoſe of graſſes and the order *Gymnoſpermia* of Linnæus's 14th claſs, than in ſeeds encloſed in a true *pericarpium*. For botanical diſtinctions the difference between naked and covered ſeeds is uſually clear and eaſy, though in ſome inſtances the Linnæan generic definitions may be incorrect in this point, as taking a dry berry or drupa for a naked ſeed. Analogy, or a regard to natural affinities, will commonly prove ſufficient to guard us againſt this error. If any ſeeds may be ſaid to be truly naked, they are thoſe of the natural order of graſſes in general. To theſe M. Richard ſeems to allude, p. 25. "Among ſeeds preſumed to be naked," ſays he, "ſome have a pericarp very diſtinct from the proper integument of the ſeed; in others theſe two parts adhere ſo firmly together, that they appear to conſtitute one ſimple covering. The firſt may very eaſily be arranged in the ſeries of fruits, but the miſtake reſpecting the latter will be ſo much the more difficult to remove, as it is protected by an obſcurity of connection in the parts, almoſt impenetrable to a mere botanical examination. If however we have recourſe to phyſiological anatomy, and eſpecially to natural affinities, this error may be attacked with advantage, being condemned by reaſon, though excuſed by the ſenſes." He then lays down as a rule that "every thing in a ripe fruit which is external to the proper integument of a ſeed belongs to the pericarp." This no one can controvert, the only queſtion being what is ſuch integument. In graſſes nothing can be more ſimple than this part, and we cannot but reſt content with that evidence of the ſenſes which tells us a grain of wheat has no real *pericarpium*. We are nevertheleſs aware of the importance of a maxim, too much neglected in the Linnæan ſchool, that in many caſes the true nature and ſtructure of a fruit can be known only by examining it in two or more progreſſive ſtates of growth. By this means we attain a knowledge of the real number of cells, in ſome *Jaſmineæ* for inſtance, which are beſt determined in the germen, ſome of them, perhaps all but one, being obliterated in the fruit. This happens in ſome ſpecies of *Chionanthus*, which ripen but one of their four ſeeds, while others ripen two, or perhaps the whole four. Hence this genus has been improperly ſubdivided by thoſe who have examined the ripe fruit only. In general all fruits that finally become pulpy are beſt underſtood by examination when half grown, while thoſe of a capſular nature ſhew their true ſtructure as they advance towards maturity.

It is frequently difficult to diſtinguiſh between a ſimple fruit and a compound, or rather aggregate one. M. Richard juſtly obſerves, that "every ſimple fruit muſt be the produce of one ſimple flower," and that "a fruit of one cell from its earlieſt origin, independent of abortion, muſt neceſſarily be ſimple." We can ſcarcely, however, aſſent to his next poſition, "that every fruit originating from a germen with one ſtyle ought to be conſidered as ſimple." This aims at the order of *Contortæ*, in which ſurely it is offering too great violence to the ſenſes, and even to reaſon, to ſay the two pouches often ſeparate from the very beginning and totally unconnected when ripe, are one ſimple fruit, though the ſtyles are incorporated into one. "Every fruit whoſe cells are completely, and up to the ſtyle, diſtinguiſhed by true partitions, is ſimple." Of this the *Ciſtus* may ſerve for an example. "Every flower with ſeveral piſtils diſtinct throughout, muſt be allowed to have a natural plurality of fruits, though all but one piſtil may prove abortive." Of this *Caltha* and its allies are examples; and even *Delphinium*, though ſome of its ſpecies cannot, even in their earlieſt ſtate, be found to have more than one piſtil or germen. "Every fruit which, forming one ſimple maſs, preſents on its ſurface ſeveral ſcattered and diſtinct ſcars, each of which originally bore a ſtigma, is an aſſemblage of ſuch a number of fruits conſolidated into one." This is the nature of the *Anona*, and others.

As all true botaniſts have conſidered the fructification of plants as affording the only certain characters for their ſcientific diſtribution, ſo the moſt correct of theſe are generally impreſſed with a conviction of the ſuperior importance of the fruit in compariſon with the flower. The ſyſtems of Cæſalpinus, Ray, and their numerous followers, are founded on the fruit, and are infinitely preferable to thoſe of Rivinus and Tournefort, eſtabliſhed on the flower. Amongſt more modern writers Gærtner is pre-eminent for his attention to this part, and for his elaborate illuſtrations of it in about a thouſand genera. Still, as every philoſopher has a bias in favour of the leading object of his purſuit, the author laſt mentioned is juſtly thought to have ſometimes laid too much ſtreſs upon the fruit in eſtabliſhing new genera, without an enlarged and philoſophical contemplation of the whole parts of fructification, thus running counter to the excellent Linnæan law, that the "genus ought to give the character, not character the genus." We are, on the other hand, ready to admit that Linnæus, for want of an acquaintance with, or a ſufficient attention to, the fruit of ſeveral plants, has not unfrequently united what ought to be eſteemed ſeparate genera. See GENUS, PERICARPIUM, CAPSULE, FOLLICLE, DRUPA, &c.

As to the uſe of fruit, beſides the pleaſure and advantage they afford men, &c. they are of ſervice in guarding, preſerving, and feeding the ſeed incloſed; in filtrating the coarſer, more earthy, and ſtony parts of the nutritious juice of the plant, and retaining them to themſelves; and ſending none to the ſeed but the pureſt, moſt elaborated, and ſpirituous parts, for the ſupport and growth of the tender, delicate embryo, or plantule, contained therein.

So that the fruit does the ſame office to the ſeed, that the leaves of the flower do to the fruit.

The uſe of fruits with us might, under proper regulations, be rendered much more extenſive than it is. Many fruits which do hurt when eaten raw, would make wines equal in flavour to many of thoſe now obtained at great prices from abroad; and lands which will not bear corn yet would bear

trees

trees and ſhrubs producing ſuch fruits; and the conſequence of this method of culture would be, that much ground, at preſent lying waſte, would be occupied, and great employment found for the numerous poor of ſome of our counties, where the quantities of waſte land are proportionably ſo great, that there is not employment for the people of one half of the county. Cherries properly managed make an excellent wine, and that in very large quantities; and plums alſo make a very agreeable kind, but that it has an auſtereneſs, which muſt be taken off by mixing a little ſugar with it when in the glaſs, not before it is drawn off

A coarſe plum, ſomewhat larger than a damſon, is the beſt kind for this wine. There is a ſort of plum that grows wild in ſome of our hedges. It will ſucceed on any ground, the pooreſt that can be imagined, and it produces a great abundance of fruit. The wine that is made from it is of a very conſiderable ſtrength, and affords a pleaſant brandy by diſtillation in conſiderable quantities. Our common garden currants afford a very agreeable wine; and our gooſeberries are not ſecond to any thing. All theſe produce fruit in great abundance; and the planting and taking care of them is very cheap, and the operation very eaſy. The common way of making theſe wines yields very good ones; but when the art of the experienced Vigneron is employed in it, the liquors will prove much better. Phil. Tranſ. N° 124.

Fruits are diſtinguiſhed by gardeners into ſtone-fruit and kernel-fruit; ſummer-fruit and winter-fruit; wall-fruit and dwarf-fruit, &c.

M. Quintinie obſerves, that cold, heavy moiſt lands, produce the faireſt and largeſt fruit; but the hotter, drier, and lighter, the more delicious and rich-taſted.

FRUIT *Stalk*. See PEDUNCULUS.

FRUIT, in *Gardening*, the produce of various ſorts of trees uſed as food, either in a raw or prepared ſtate by fire.

All ſorts of fruit ſhould be gathered from the trees or plants when perfectly dry, and never when in a dewy or wet condition. In many of the finer and more delicate fruits, it is of advantage not to permit them to remain on the trees till they are over-ripened. In gathering them, the bloom ſhould always be preſerved upon them as much as poſſible. In the almond, peach, and plum, and finer cherry kinds, it is uſual to depoſit them, as ſoon as gathered, in ſhallow ſieves or baſkets, ſpread over with leaves, or ſome other ſimilar material.

In the gathering of apples and pears, (as thoſe which are ſhaken or beaten from the trees never keep well,) Mr. Forſyth adviſes that they ſhould be all hand-picked, by means of a ſtage or ſteps contrived for the purpoſe, and other apparatus neceſſary for receiving and conveying them away; ſome dried ſhort cut graſs being employed to prevent their being bruiſed on being depoſited in them.

It is likewiſe further obſerved, that great attention ſhould be paid to their ripening, never gathering them at any particular period or ſeaſon, as is often the caſe, on account of their becoming ripe at different times according to circumſtances, but to be regulated by the ſound fruit, where the trees are healthy, coming off into the hand without any force, on being taken hold of; it ſhould be picked off the trees and laid in the baſkets and other places in a careful manner, ſo as to prevent burſting. When it is ſuffered to remain till it begins to fall itſelf, ſome well-dried ſhort graſs mowings, peaſe-haum, barley-ſtraw, or other ſimilar dry material, is recommended to be ſpread over the ſurface of the ground, to prevent the fruit being bruiſed by falling. But the fruit collected in this way ſhould conſtantly be laid up ſeparately, and made uſe of before that which was gathered by the hand; all ſuch as are bruiſed being laid aſide for immediate uſe in the family.

After all the fruit has been gathered, the hay or ſtraw ſhould be raked up and removed from the place.

When the fruit is wholly collected, it muſt be depoſited in the ſtore or fruit-room, ſome of the dried ſhort graſs being previouſly ſpread over the middle part of the floor. It ſhould be carefully laid in heaps from the baſkets upon the dried graſs, each ſort ſeparate; the heaps being from two to three feet in height, according to the quantity of fruit. When the heaps have been formed, they ſhould be covered with the ſame material as was laid on the floor, to the thickneſs of two inches or more, in order that they may ſweat. When they have remained in this ſtate a fortnight, they ſhould be opened and turned over, wiping each with a woollen cloth often dried, carefully removing thoſe that were at the tops to the middle. After having continued eight or ten days more covered as before, the watery material will be ſufficiently expended, when the fruit muſt be again looked over and wiped as in the former caſe, rejecting all ſuch as are in the leaſt degree injured by being bruiſed or otherwiſe.

While the proceſs of ſweating is going on, the windows of the room ſhould be kept open, when the weather is not moiſt, to promote the exhalation of moiſture. When the ſweating is very conſiderable, it will be neceſſary to turn and wipe the fruit during the time the proceſs is going on.

Wheat ſtraw has been commonly made uſe of in laying up this ſort of fruit; but Mr. Forſyth has found, that when any of the fruit begins to decay, if it be not quickly removed, the ſtraw imbibes the moiſture iſſuing from it, and communicates an unpleaſant taſte to ſuch as is ſound and unaffected.

When fruit is ſtored upon ſhelves in the rooms, it is recommended to have the bottoms covered with thin coarſe canvas, at about eight-pence or ten-pence the yard, and to place them upon it in ſingle layers, after being wiped quite dry, care being taken not to lay them upon each other. They ſhould then be covered with a piece of the ſame canvas, old news, or whited brown paper, to exclude the action of the air, guard againſt froſt, and preſerve the ſmoothneſs on the ſkin of the fruit. It ſhould be turned two or three times in the courſe of the winter, to guard againſt rotting on the under ſide, all the damaged fruit being carefully removed each time.

In ſtoring it in this manner, the earlieſt ſorts ſhould be placed on the lower ſhelves or drawers according as they come in, in this order; the non-ſuch, golden-rennet, and jenneting apples, and the burgamot and burro pears; as the jargonelle is found to keep beſt on the tree, rotting almoſt immediately on being gathered. In this way a proper ſucceſſion of fruit may be provided.

As it requires much time in ſtoring in this way where there is much fruit, it may be done in wet weather, and the evenings, when the men can be better ſpared than in the day-time.

Where there are not proper fruit-rooms, this ſort of fruit may be kept in ſtore-houſes in baſkets or hampers, placing ſoft paper in the bottoms and round the edges to prevent bruiſing them, laying a layer of fruit and a layer of paper alternately, covering the top with paper three or four times folded, to guard againſt the air and froſt, which are liable to injure them.

All the different ſorts of fruit ſhould be packed ſeparately, and have labels faſtened to them, ſo as to know their names, and the times of their being in a proper ſtate for uſe in the family.

But

But the beſt way of keeping fruit is, however, Mr. Forſyth thinks, by packing it up in glazed earthen pans or jars. In doing which, the fruit ſhould be firſt ſeparately wrapped in ſoft paper, then a little well-dried bran applied over the bottoms of the jars, above which a layer of fruit ſhould be placed, continuing them alternately, till the jars are quite full, when they ſhould be ſhaken, and a little more bran added, covering the whole over with bladders to exclude the air, putting on the covers, which ſhould fit in a cloſe manner. The rooms in which theſe are placed ſhould be capable of admitting a fire in moiſt weather, in order to dry up the dampneſs.

In the buſineſs of packing fruit for carrying, Mr. Forſyth thinks ſtrong deal boxes of different ſizes the moſt convenient and uſeful. Thoſe which he employs are two feet long, having the breadth and depth of fourteen inches; and one foot nine inches long, with one foot in breadth and depth. They are conſtructed of inch-deal, well ſecured by cramps at the corners, having a ſmall iron handle at each end to ſecure them by. In theſe, melons, currants, cherries, pears, peaches, nectarines, plums, grapes, and other ſimilar ſorts of fruit may be carried; the heavieſt fruit of each ſort being put at the bottom, the firſt ſort wrapped up in ſoft paper, and all the others, except the currants and cherries, firſt in vine-leaves, and then ſoft paper. The other two may be conveyed in flat tin boxes, about fourteen inches in length, ten in breadth, and four in depth, with perfect ſafety.

In packing them, for the melons, a layer of fine moſs and ſhort, ſoft, dry graſs, well blended together, is placed at the bottom of the deal box, and then the melons packed in with it in a light manner, in every direction, chooſing them as much of the ſame ſize as poſſible; when the melons are put in, a thin layer of moſs and graſs is placed over them, upon which the tin box, having the currants and cherries packed in it by intervening layers of fine dry moſs, ſo as to be quite full, is packed firmly in with graſs and moſs all round, to prevent its moving; over which another thin layer of moſs is ſpread, and the pears, packed in cloſely in the ſame manner as the melons, proceeding in the ſame way with the other fruits, ſo as to cloſe with the grapes, filling up with moſs, ſo as that the lid of the box may ſhut down quite tight, and prevent rubbing. Each box ſhould be provided alſo with a lock and two keys, to ſerve the whole, one for the packer, and another for the emptier. When the boxes are locked down they ſhould be well corded and kept ſteady.

FRUIT *Garden*, that ſort of garden which is principally planted with trees, for the purpoſe of affording fruit of different kinds. The ſituation of this ſort of garden ſhould be warm, ſheltered, and open to the ſouth, or ſouth-weſt, in order that it may enjoy the benefit of the ſun, and of courſe ripen the fruit in the beſt and moſt perfect manner. See GARDEN and ORCHARD.

FRUIT *Room*, an erection conſtructed for the purpoſe of ſtoring up different ſorts of fruit. Theſe rooms are formed of different dimenſions according to circumſtances, being lined with thin boards, and fitted up with ſhelves, bins, boxes, drawers and other conveniences for the reception of fruit; all of which, as well as the floors, ſhould be of white deal, as Mr. Forſyth remarks, that when red deal is made uſe of for theſe purpoſes, it is liable to give a diſagreeable reſinous taſte to the fruit, and ſpoils its flavour on this account; under other circumſtances he adviſes covering the ſhelves with canvas, &c. as mentioned in the preceding article FRUIT.

FRUIT *Tree*, is that ſort of tree which produces eatable fruit, either for the table, or culinary uſes, or both.

There are many fruit-trees, fruit-bearing ſhrubs, and ſhrubby plants that ripen their fruit perfectly in this climate, with their ſeveral ſpecies and numerous varieties; the principal ſorts of which are thoſe of the almond kind, as the almond, peach, and nectarine trees; the plum ſort, containing different kinds of plums, apricot, and cherry trees; the pear kind, comprehending various ſorts of pears, apples, and quince trees; the vine, containing many ſorts of grape trees; the fig, comprehending many ſorts of fig trees, the ſeveral ſorts of medlar trees, the different kinds of mulberry trees, the cheſnut, and walnut trees; the common nut kind, containing many ſorts of filberts, and other nut trees; the currant, gooſeberry, and raſpberry trees, with many others; the nature and management of each of which will be fully explained under their reſpective genera and heads.

All ſorts of fruit trees require conſiderable attention in ingrafting, planting, tranſplanting, training, pruning, thinning, and other ſorts of management. See GRAFTING, TRAINING, PRUNING, &c. See alſo ORCHARD-GARDEN, ORCHARD, and NURSERY.

FRUIT and TREES, *ſtealing of*. By ſtat. 4 Geo. II. c. 32. to ſteal, damage, or deſtroy underwood or hedges, or the like, to rob orchards, or gardens of fruit growing therein, to ſteal, or otherwiſe deſtroy any turnips, potatoes, cabbages, parſnips, peaſe, or carrots, or the root of madder, when growing, are puniſhable criminally, (by ſtats. 43 Eliz. c. 7. 15 Car. II. c. 2. 31 Geo. II. c. 35. 6 Geo. III. c. 48. 9 Geo. III. c. 41. 13 Geo. III. c. 32.) by whipping, ſmall fines, impriſonment, and ſatisfaction to the party wronged, according to the nature of the offence. Moreover, the ſtealing by night of any trees, or any roots, ſhrubs or plants to the value of 5*l.* is, by ſtatute 6 Geo. III. c. 36, made felony in the principals, aiders, and abettors, and in the purchaſers thereof, knowing the ſame to be ſtolen. And by ſtats. 6 Geo. III. c. 48. and 13 Geo. III. c. 33. the ſtealing of any timber-trees, therein ſpecified (*viz.* oak, beech, cheſnut, walnut, aſh, elm, cedar, fir, aſp, lime, ſycamore, birch, poplar, elder, larch, maple, and hornbeam), and of any root, ſhrub, or plant, by day or night, is liable to pecuniary penalties, for the two firſt offences, and for the third, is conſtituted a felony, liable to tranſportation for ſeven years. See LARCENY.

FRUITS, *Summer*, *Fructus horæi*, in the *Materia Medica*, comprehend ſtrawberries, cherries, currants, mulberries, raſpberries, and ſuch like. They poſſeſs a ſweet, ſubacid taſte, and are exhibited as dietetic auxiliaries, as refrigerants, antiſeptics, attenuants, and aperients. They were formerly adminiſtered medicinally in the cure of putrid affections, and to promote the alvine and urinary excretions. As an article of diet, they afford little nouriſhment, and are apt to produce flatulencies. To perſons of a bilious conſtitution and rigid fibres, and whoſe habit is naturally, or from extrinſic cauſes, diſpoſed to an inflammatory or putreſcent ſtate, the moderate and even plentiful uſe of them is ſalubrious; but perſons of a cold, inactive diſpoſition, with lax veſſels, languid circulation, and weak digeſtion, ſhould uſe them ſparingly. The juices extracted from theſe fruits by expreſſion, contain their active qualities freed from their groſſer, indigeſtible matter. On ſtanding, the juice ferments, and changes to a vinous or acetous taſte. By the proper addition of ſugar, and by boiling, their fermentative power is ſuppreſſed, and their medicinal qualities preſerved. The juices of theſe fruits, purified from their feculencies by ſettling and ſtraining, may be made into ſyrups, with a due proportion of ſugar in the uſual way.

FRUIT, in *Natural Hiſtory*, denotes the laſt production of a tree,

a tree, or plant, for the propagation or multiplication of its kind; in which ſenſe fruit includes all kinds of ſeeds, with their furniture, &c.

FRUITS, *petrified*, (*Carpolithi*) are a numerous family of the organic remains or relics of a former ſtate of the globe; according to early writers, who have deſcribed a great number of different fruits, found in a petrified ſtate in the earth; many of theſe are enumerated by Mr. Parkinſon, (Organic Remains, letter 48, vol. i.) and ſhewn to be mere miſtakes, as all of them undoubtedly are. The enumeration of theſe kinds of bodies, which we propoſe to give under their moſt common or vernacular names, will point out theſe miſtakes, and refer the foſſils to their proper claſs, when it can be done; with particular reference to the authors who have deſcribed them, which will, we truſt, contribute much to diſſipate the cloud of error which ſtill, and for a long time, without ſuch an expoſition, muſt continue to hang on the minds of thoſe unacquainted with the laborious details of natural hiſtory, reſpecting the real nature of the reliquia found entombed in the earth, which knowledge now appears to have an important uſe and application, in identifying the ſtrata, and trying the validity of the different geological ſyſtems which have been framed to account for the many aſtoniſhing appearances which the earth preſents.

FRUITS, *Colours from*. The red juices of fruits, as of currants, mulberries, elder-berries, morello, and black cherries, when inſpiſſated and dried, may be again diſſolved in water, to which they give nearly the ſame red colour as they do when freſh. Rectified ſpirit extracts the tinging particles, and acquires a brighter colour than the watery ſolution; becauſe much of the mucilage is left undiſſolved by the former. The red ſolutions, and the juices, are ſometimes made dull, and ſometimes more florid, by acids, and are generally rendered purpliſh by alkalies. The colours of theſe juices are generally periſhable. They reſiſt the power of fermentation, but quickly decay, when the jucies are ſpread thinly on any ſubſtance, and dried in open air. The bright lively reds are ſooneſt changed; the dark, dull, red ſtain of the black cherry is conſiderably durable. The bright red fruit of the opuntia, or prickly pear, is an exception to the above rule; as it gives, according to Labat, a beautiful red dye. The ripe berries of buckthorn ſtain paper of a green colour; from theſe is prepared the ſubſtance called ſap-green; which is a pigment ſufficiently durable, ſoluble in water, but not miſcible with oil. The berries, when green, yield a yellow, and, when over-ripe, a purple pigment. Woollen cloth, prepared with alum and tartar, receives, on being boiled with the berries, a periſhable yellow dye. Neumann's Chem. with Dr. Lewis's Notes, p. 433. See AVIGNON *Berry*, ANNOTTO, or ROUCOU, and TURNESOL.

FRUITS, *Preſervation of*. See FRUIT, in *Gardening*, *Preſervation of* FLOWERS, and *Preſervation of* VEGETABLES.

For the early ripening of fruits, ſee FORCING and RIPENING.

FRUIT, *Bread*. See BREAD.

FRUITS, with regard to commerce, are diſtinguiſhed into *recent*, or *freſh*, and *dry*.

FRUITS, *recent*, are thoſe ſold juſt as they are gathered from the tree, without any further preparation; as are moſt of the productions of our gardens and orchards, ſold by the fruiterers.

FRUITS, *dry*, are thoſe dried in the ſun, or by the fire, with other ingredients ſometimes added to them to make them keep; imported chiefly from beyond ſea, and ſold by the grocers.

Such are raiſins, currants, figs, capers, olives, cloves, nutmegs, pepper, and other ſpices; which ſee under their reſpective articles.

Under the denomination of dry fruits are alſo frequently included apples, pears, almonds, filberts, &c.

FRUITS, *polypyreneous*. See POLYPYRENEOUS.

FRUITS *current for Coins*. See COIN.

FRUITS, *Firſt*. See FIRST *fruits*, ANNATES, and PRIMITIÆ.

FRUIT-*flies*, a name given by gardeners, and others, to a ſort of ſmall black flies, found in vaſt numbers among fruit-trees, in the ſpring ſeaſon, and ſuppoſed to do great injury to them.

Theſe are a ſpecies of ſmall black fly. Mr. Leewenhoek preſerved ſome of them for his microſcopical obſervations. He found that they did not live longer than a day or two, but that the females in this time uſually laid a great number of longiſh eggs. The gardeners, who ſuppoſe that theſe flies wound the leaves of the trees, are miſtaken: it is true that they feed on their juices, but they have no weapons with which to extract this themſelves; they feed on ſuch as is naturally extravaſated, and when there is not enough of this for their purpoſe, they haunt thoſe places where the pucerons reſort, and feed on the juices which theſe little creatures extravaſate by means of the holes they bore in the leaves with their trunks. Theſe pucerons are a ſmall ſort of inſect very common in our fruit-trees, and other plants and trees; they are of a greeniſh colour, and are commonly called tree-lice. Phil. Tranſ. No. 262.

FRUIT-*ſtones*. The miſchiefs ariſing from the bad cuſtom of many people ſwallowing the ſtones of plums and other fruit are very great. The Philoſophical Tranſactions give us an account of a woman who ſuffered violent pains in her bowels for thirty years, returning once in a month, or leſs. At length a ſtrong purge being given her, the occaſion of all theſe complaints was driven down from her bowels to her anus, where it gave a ſenſation of ſtoppage and diſtenſion, and produced a continual deſire of going to ſtool, but without voiding any thing. On the aſſiſtance of a careful hand in this caſe there was taken out with a forceps an oblong ball of an oval figure, of about ten drams weight, and meaſuring five inches in circumference: this had cauſed all the violent fits of pain ſhe had been ſo many years afflicted with, and after the taking it out ſhe became perfectly well. The ball extracted looked like a ſtone, and felt very hard, but it ſwam in water; on cutting it through with a knife there was found in the centre of it a plum-ſtone, round which ſeveral coats of this tough and hard matter, reſembling a ſtone, had gathered. Another inſtance given in the ſame papers is of a man, who dying of an incurable colic, which had tormented him many years, and baffled the effects of medicines, was opened after death; and in his bowels was found the cauſe of his diſtemper, which was a ball of the like nature with that juſt mentioned, but ſomething larger, being ſix inches in circumference when meaſured, and weighing an ounce and a half; in the centre of this, as of the other, there was found the ſtone of a common plum, and the cuts were of the ſame matter with thoſe of the former. Theſe, and ſeveral other inſtances mentioned in the ſame place, ſufficiently ſhew the folly of that common opinion, that the ſtones of fruits are wholeſome.

For

For though by nature the guts are ſo defended by their proper mucus, that people very ſeldom ſuffer by things of this kind, yet if we conſider the various circumvolutions of the guts, their valves and cells, and at the ſame time conſider the hair of the ſkins of animals we feed on, the wool or down on herbs and fruits, and the fibres, veſſels, and nerves of plants, which are not altered by the ſtomach, it will appear a wonder that inſtances of this ſort of miſchief are not much more frequent. Cherry ſtones, ſwallowed in great quantities, have occaſioned the death of many people, and there have been inſtances even of the ſeeds of ſtrawberries, and kernels of nuts, collected into a lump in the guts, and cauſing violent diſorders, which could never be cured till they were carried off. Phil. Tranſ. No. 282. p. 1282.

FRUITERY, a place for the laying up and keeping of fruit. See GRANARY.

The fruitery ſhould be inacceſſible to any thing of moiſture, or even froſt.

FRUITFULNESS, the quality of bearing plenty of fruit, called alſo *fertility*, or *fecundity*.

FRUMENTACEOUS PLANTS are thoſe which produce geniculated or knotted ſtalks, with reed-like leaves; and whoſe ſeed growing in ſpikes or jubæ, is uſeful to make pultege, or bread.

The word is formed from *frumentum*, a general name comprehending all ſorts of corn, or grain, for bread. Hence the Italians, who follow the Latins, uſe *grano* and *frumento* for the ſame.

Wheat, barley, rye, millet, &c. are frumentaceous plants. Some authors uſe frumentaceous in a narrower ſenſe, reſtraining it to plants which bear a conformity to wheat, either in reſpect of their fruits, leaves, ears, or the like.

But this ſeems founded on a miſtaken notion of *frumentum*, as if it denoted only *wheat*, which is rather the ſenſe of the word *triticum*.

FRUMENTARII, in *Antiquity*, a kind of ſoldiers or archers, under the Weſtern empire.

St. Cyprian relates, in one of his letters, that ſome of theſe frumentarii were ſent to take him.

The firſt time we read of frumentarii, as officers, is in the time of the emperor Adrian. Spartian, in his life of that prince, aſſures us, that he made uſe of them to inform himſelf of what paſſed.

Before this time, the name frumentarius was only given to the corn-merchants, or meaſurers of corn.

Theſe frumentarii did not make any particular corps, diſtinct from the other forces, but there was a certain number of them in each legion, as, among us, there is a certain number of grenadiers in each battalion. Accordingly, in ancient inſcriptions, we meet with frumentarii of this or that legion. It is ſuppoſed they were originally a number of young perſons, diſpoſed by Auguſtus throughout the provinces, particularly on all the grand roads to advertiſe the emperor, with all expedition, of every thing that happened.

In order to this they had a kind of intendance of all the carriages, and on this account came to be employed for the conveyance of corn, *frumentum*, to the armies; whence their appellation

Afterwards they were incorporated into the troops themſelves, where they ſtill retained their ancient name.

Their principal office was the giving intelligence, in which they agreed with thoſe called *curioſi*, with whom they were frequently joined. See CURIOSUS.

The function of theſe ſoldiers at firſt was to diſtribute to their comrades the meaſures of corn allotted to each man; and as their miniſtry gave them an opportunity of knowing all the ſoldiers of a cohort, or a legion, they were directed to examine into their characters, and give an account of ſuch as they ſhould believe to be ſeditious, and capable of raiſing diſturbance. Their commiſſion was afterwards enlarged, and they were authoriſed to obſerve, not only in the legion, but in the cities and provinces, every commotion, every ſuſpicion of revolt, and to give notice of it to the court. Thence aroſe perpetual informations, and frequent calumnies againſt innocent people, many of whom periſhed upon falſe accuſations of treaſon, always too readily liſtened to by princes. Theſe public ſpies were ſuppreſſed by Diocletian, for which popular act he was univerſally applauded. However, either he or his ſucceſſors eſtabliſhed in their room agents or officers, who ſoon became equally formidable and pernicious.

FRUMENTATION, FRUMENTATIO, among the *Romans*, a largeſs of corn beſtowed on the people. This practice, of giving corn to the people, was a very ancient cuſtom among the Romans, and frequently uſed to ſoothe the turbulent humour of the populace.

At firſt the number of thoſe to whom this largeſs was given, was indeterminate, till Auguſtus fixed it at two hundred thouſand.

FRUMENTIUS, in *Biography*, a ſaint in the Roman calendar, entitled the "Apoſtle of Ethiopia," was a native of Tyre, and flouriſhed in the fourth century. He was educated under Meropius, a chriſtian philoſopher, who embarked in a voyage to India, and was accompanied by Frumentius and another ſcholar named Ædæſius, but having the misfortune to touch on the coaſt of Ethiopia, Meropius was inhumanly murdered by the natives, and his ſcholars ſent up the country to be ſlaves to the emperor. This prince conferred upon them poſts of honour about his perſon, and in his houſhold; ſhewed them marks of his favour, and a little before his death gave them their liberty. They now propoſed to return to their native country, but at the earneſt ſolicitations of the queen, they conſented to remain ſome time longer to ſuperintend the education of the young prince. In this confidential ſituation they were enabled to perform many kind actions; and among others they obtained liberty for the Roman merchants reſiding in the ports of Ethiopia, who were chriſtians, to aſſemble together for the worſhip of God, and they ſucceeded in making many converts, among the courtiers, to chriſtianity. As ſoon as their pupil had taken on himſelf the management of the government, they, after much difficulty, were allowed to return home. Frumentius repaired to Alexandria, acquainted Athanaſius, who was biſhop of that city, with the progreſs that had been made in introducing Chriſtianity into Ethiopia, and pointed out to him what proſpects there were of farther ſucceſs. Frumentius, at the ſolicitation of Athanaſius, was ſoon after conſecrated a biſhop, and appointed on a miſſion to Ethiopia. This was in the year 331; he entered upon his labours at Axuma, the capital of the country, and was ſo ſucceſsful, that in a ſhort time the emperor, and a great body of his people, were converted to the chriſtian faith, and numerous churches were eſtabliſhed throughout the empire. Moreri.

FRUMENTUM SARACENICUM, in *Botany*, a name by which ſome authors expreſs the fagopyrum, or buck-wheat. See POLYGONUM.

FRUMENTUM *Indicum*, *Indian corn*, a name given by our American planters to *Maize*, which ſee.

FRUMENTY, popularly *Furmety*, a kind of pottage, the baſis whereof is wheat, boiled up with milk, ſugar, and ſometimes ſpice.

Pliny tells us, that in his time they mixed chalk among it.

Galen deſcribes it as a very nutritious food made of corn, or pulſe, boiled with water, wine, and oil.

The Latins called it *alica*, which Feſtus derives *ab alendo*, as being very nouriſhing. But then it muſt be obſerved, they made it of any kind of corn.

Ours being reſtrained to wheat, we have given its denomination accordingly, from *frumentum*. An emulſion, wherein wheat was an ingredient, would be a kind of frumenty.

FRUMGYLD, in our *Old Writers*, is the firſt payment made to the kindred of a perſon ſlain, towards the recompence of his murder. L. L. Edmund.

FRUMO, in *Geography*, a ſmall iſland on the weſt ſide of the gulf of Bothnia. N. lat. 65° 23'. E. long. 21° 37'.

FRUMSTOL, in our *Old Writers*, the chief ſeat or manſion-houſe, which is called by ſome the *homeſtal*. Leg. Inæ, cap. 38.

FRUNDELE, in *Agriculture*, the name of a dry meaſure, which conſiſts of two pecks, or half a buſhel. It is only uſed in particular diſtricts.

FRUR, or NOBFLEUR, or *Tavem*, in *Geography*, a ſmall iſland in the Perſian gulf. N. lat. 26° 10'. E. long. 54° 20'.

FRUSH, or FROG, in the *Manege*, is a ſort of tender horn which ariſes in the middle of the ſole, and at ſome diſtance from the toe of a horſe; it divides into two branches, running towards the heel, in form of a fork.

FRUSINUM, in *Ancient Geography*, a town of Italy, in the country of the Volſci, on the confines of that of the Hernici, at the 54th mile from Rome on the Latin way; 7 miles from Ferentinum, and 14 from Fregellanum, near the ſmall river Coſa. In the year of Rome 450 it was taken by the Romans; but in proceſs of time, they rebuilt its walls, planted in it a colony, and diſtributed the adjacent land among the victors. It is now *Fraſinone*, in the Campagna; 25 miles E. of Veletri. N. lat. 41° 40'. E. long. 13° 13'.

FRUSSURA, in our *Old Writers*, a breaking down; alſo a ploughing or breaking up. *Fruſſura domorum* is houſe-breaking; and *fruſſura terræ*, new broken land.

The word comes from the French, *froiſſure*, a bruiſe; and that from the verb *froiſſer*, to bruiſe or break.

FRUSTUM, in *Mathematics*, a piece cut off or ſeparated from a body.

FRUSTUM of a pyramid, or cone, is that part which remains when any part next the vertex, cut off by a plane parallel to the baſe, is taken away.

The fruſtum A B C D E F A (*Plate* VII. *Geometry*, *fig.* 88.) of any pyramid having a triangular baſe, is equal to a whole pyramid, of the ſame baſe and altitude, together with two other pyramids that are in proportion to it; the one, as any ſide B D of the upper baſe B C D, is to its correſpondent A E of the ſame baſe A F E, and the other, as the ſquare of the former ſide is to the ſquare of the latter.

In the planes of the three ſides, draw the diagonals B E, B F, and F D; then will the part B C D of the fruſtum, cut off by a plane extended by F B and F D, be a pyramid on the baſe B C D, having the ſame altitude with the fruſtum itſelf, both ſolids being contained between the ſame parallel planes A F E, B C D. Moreover, the remaining part F A B D E of the fruſtum, if a plane be extended by F B and F E, will be divided into the two pyramids F B D E, F A B E, having the ſame ratio, one to the other, as their baſes B E D, A B E, or as B D to A E. But the latter of theſe pyramids B A F E, taking B as its vertex, has the ſame baſe and altitude with the fruſtum given; and the pyramid F B C D is in proportion to it as the baſe B C D to the baſe A F E, that is, the baſes being ſimilar, as BD^2 to AE^2.

Hence it follows, that ſince of the three ſolids, F A B E, F B D E, F B C D, into which the fruſtum is divided, the ratio of the firſt and third is the duplicate of that of A E to B D, or of the ratio of the firſt to the ſecond, theſe three ſolids are proportional. Whence it appears, that the fruſtum of any triangular pyramid is equal to two whole pyramids of the ſame altitude on baſes, equal to the two oppoſite baſes of the fruſtum, and to a third pyramid, which is a mean proportional between the two former. And beſides, whatever is demonſtrated in relation to triangular pyramids, muſt hold equally in all pyramids and cones; becauſe every ſuch ſolid is equal to a triangular pyramid of equal baſe and altitude; and every fruſtum of the one is alſo equal to the correſponding fruſtum of the other. See PYRAMID.

From the propoſition above demonſtrated we may deduce a method of finding the content of any fruſtums of pyramids and cones. Firſt, Let the fruſtum M N be that of a pyramid; then, having found the content of a whole pyramid, of the ſame given baſe and altitude (ſee PYRAMID); ſay, as any ſide A of the lower end or baſe is to its correſpondent B of the upper, ſo is the ſaid content to a fourth proportional; and as A is (again) to B, ſo is the quantity laſt found to another proportional; which two proportionals, added to the content firſt determined, will give the true content of the fruſtum. That theſe quantities anſwer to the conditions of the propoſition will appear from the following ſtatement, P being the whole pyramid; thus, $A : B :: P : D$ and $A^2 : B^2 :: P : C$, which is equal to a fourth proportional to A, B, and D; for, in the one caſe, $C = \frac{B^2 \times P}{A^2}$, and in the other, $C = \frac{D \times B}{A}$, becauſe $D = \frac{B P}{A}$; and therefore $C = \frac{B^2 \times P}{A^2}$.

When the oppoſite baſes of the fruſtum are ſquares, the rule will be more ſimple, and put on a better form: for then the area of the baſe being A^2, the content of a whole pyramid on that baſe, of the ſame altitude with the fruſtum, will be equal to the parallelepipedon $C \times A^2$; C being $\frac{1}{3}$d of the given altitude of the fruſtum. But $A : B :: C \times A^2 : C \times A \times B$ (ſee PARALLELEPIPEDON); and $A : B :: C \times A \times B : C \times B^2$; therefore, $C \times A^2 + C \times A \times B + C \times B^2 = C \times A^2 + A \times B + B^2$, the content required. Hence we obtain the following rule for finding the content of the fruſtum of any ſquare pyramid: Add the product of the two ſides of the lower and upper ends to the ſum of their ſquares, and then multiply the aggregate by $\frac{1}{3}$d of the pyramid's height. Secondly, from the content now found, that of any conical fruſtum P Q (*fig.* 90) is readily obtained; being in proportion to the content $C \times A^2 + A \times B + B^2$ of the fruſtum of a ſquare pyramid circumſcribing it, as the baſe of the former is to the baſe of the latter; or, as the fraction ,7854 is to unity; this being the proportion of the area of the circular baſe to the ſquare on the diameter: thus, $PQ : C \times A^2 + A B + B^2 :: ,7854 : 1$; therefore $P Q = ,7854 \times C \times A^2 + A B + B^2 =$ (calling the altitude *a*) $,7854 \times \frac{1}{3} a \times A^2 + A B + B^2 = ,2618 \times a \times A^2 + A B + B^2$ or $= E \times A^2 + A B + B^2$, by taking $E = ,7854 \times C =$ the ,2618th part of the whole given altitude. Hence, for finding the content of any fruſtum of a cone, we have the following rule: Add the product of the diameters of the two ends to the ſum of their ſquares; then multiply the aggregate by the fruſtum's height, and the product, again, by the fraction ,2618.

Thirdly.

Thirdly. For finding the content of any ſegment I A K (*fig.* 91.) of a ſphere, a rule may be deduced in the following manner. It appears from the property of the ſphere (ſee SPHERE,) that the ſegment propoſed, I A K, is equal to the difference between a conical fruſtum F C D H, and a cylinder E C D G of the ſame altitude, ſtanding upon a baſe, whoſe radius C A is equal to that A O of the ſphere itſelf; the cone being $\frac{1}{3}$d of a cylinder of the ſame baſe and altitude; and the difference of the cone and cylinder being $\frac{2}{3}$ds of the latter or equal to the ſphere, and like parts being as their wholes. But the content of the fruſtum F C D H, if the two diameters C D and F H be repreſented by A and B, and the ,2618th part of the altitude D by E, will be $= E \times \overline{A^2 + A \times B + B^2}$ (that is, equal to a parallelepipedon whoſe altitude is E and baſe $= \overline{A^2 + A \times B + B^2}$.) And the content of the cylinder E C D G will be $= 3\,E \times A^2$, or $E \times 3\,A^2$; becauſe $3\,E = 3 \times ,2618\,D = ,7854 \times D$; and the content of the cylinder = the area of the baſe multiplied by its height (ſee CYLINDER); but the area of the baſe is, from the property of the circle, $= ,7854 \times A^2$, and the height $= D$: therefore $3\,E \times A^2 = ,7854 \times D \times A^2 =$ the content of the cylinder. Conſequently, the difference, or the content of the ſegment I A K, will be $= E \times 3\,A^2 - E \times \overline{A^2 + A\,B + B^2} = E \times \overline{2\,A^2 - A \times B - B^2}$. But $2\,A^2 - A \times B - B^2$ is compoſed of $A^2 - A \times B$ and $A^2 - B$; the former part of which $A^2 - A \times B$ is $= \overline{A - B} \times A = 2\,D \times A$ (becauſe A − B, or C D − F H = E F + H G = 2 A B or 2 D, becauſe the triangle E F C, being equiangular with C O A, is iſoſceles); and the latter part $A^2 - B^2 = \overline{A - B} \times \overline{A + B} = 2\,D \times \overline{2\,A - 2\,D}$; $\overline{A - B}$ being equal C D − F H = 2 D, and $\overline{A + B} = \overline{E\,G + F\,H} = E\,G + \overline{E\,G - 2\,D} = 2\,A - 2\,D$. Whence the ſum of both parts will be $= 2\,D \times \overline{3\,A - 2\,D}$; and the content of the ſegment itſelf $= E \times 2\,D \times \overline{3\,A - 2\,D} = ,2618\,D \times 2\,D \times \overline{3\,A - 2\,D} = ,5236 \times D^2 \times \overline{3\,A - 2\,D}$. Hence we have the following rule for finding the content of any ſegment of a ſphere: Multiply the ſquare of the ſegment's height by the exceſs of thrice the ſphere's diameter above the double of that height; and then multiply by the fraction ,5236. See SEGMENT.

Otherwiſe. To find the ſolidity of the fruſtum of a pyramid; add into one ſum the areas of the two ends and the mean proportional between them, and then multiply the ſaid ſum by the perpendicular height, and $\frac{1}{3}$d of the product will be the ſolidity. *E. G.* If A be the area of the greater end, a that of the leſs, and h the height; then $\overline{A + a + \sqrt{A\,a}} \times \frac{1}{3}\,h$ will be the ſolidity. Hence, 1. If the ends be regular polygons, the rule will be more eaſy, and it is this, as we have above ſtated it; add together the ſquare of a ſide of each end of a fruſtum, and the products of thoſe ſides; multiply the ſum by the height, and the product by the tabular area anſwering to the particular figure of the ends; and $\frac{1}{3}$d of the laſt product will be the content. Or, divide the difference of the cubes of the ſaid ſides by their difference, and multiply the quotient by the height, and the tabular area, and take $\frac{1}{3}$d of the product. 2. If the ends be circles, the fruſtum will be that of a cone, and then multiply ,2618, *viz.* $\frac{1}{3}$d of ,7854, by the height, and the product either by the quotient ariſing from the diviſion of the difference of the cubes of the diameters by the difference of the diameters, or by the ſum ariſing from the addition of the ſquare of each diameter and the product of the diameters, or by the ſum ariſing from the ſquare of the half difference of the diameters added to triple the ſquare of the half ſum. The principles from which theſe rules are deduced will appear under the article PYRAMID.

To find the ſolidity of the ſegment of a ſphere. Rule 1. To three times the ſquare of the radius of its baſe, add the ſquare of its height; multiply the ſum by the height, and the product by ,5236 for the ſolidity. (See *fig.* 92.) Thus, if r = D E the radius of its baſe, and h = G E the height: then $,5236\,h \times \overline{3\,r\,r + h\,h}$ = the ſolidity of the ſegment D G F. Rule 2. From three times the diameter of the ſphere, ſubtract twice the height of the fruſtum; multiply the difference by the ſquare of the height, and the product by ,5236 for the ſolidity. That is, if d = G H the diameter of the ſphere, and h = G E, the height of the fruſtum; then $,5236\,h^2 \times \overline{3\,d - 2\,h}$ = the ſolidity of D G F.

To find the ſolidity of a fruſtum or zone of a ſphere. Add together the ſquares of the radii of the ends and $\frac{1}{3}$d of the ſquare of their diſtance, or of the height: multiply the ſum by the ſaid height, and the product again by 1,5708 for the content. That is, $\overline{R^2 + r^2 + \frac{1}{3}\,h^2} \times \frac{1}{2}\,p\,h$ = the ſolidity of the fruſtum whoſe height is h, and the radii of its ends R and r, p being 3,1416. For the reaſons of theſe rules, ſee SPHERE, or Hutton's Menſuration, p. 206.

To find the content of the fruſtum of a ſpheroid; its ends being perpendicular to one of the axes, and one of them paſſing through the centre. Rule 1. To the area of the leſs end, add twice that of the greater: multiply the ſum by the altitude of the fruſtum; and $\frac{1}{3}$d of the product will be the content. That is, $\overline{2\,D^2 + d^2} \times \frac{1}{3}\,a\,n$ = the fruſtum whoſe ends are perpendicular to the fixed axis; where D is the diameter of the greater end, d that of the leſs, a the altitude, and n = ,785398. And $\overline{2\,T\,C + t\,c} \times \frac{1}{3}\,a\,n$ = the fruſtum whoſe ends are parallel to the fixed axis; where T and C are the tranſverſe and conjugate axes of the greater end, and t and c thoſe of the leſſer end. Here it is evident that the double of the fruſtum will give the content of the zone, or ſpheroidal caſk. Rule 2. From three times the ſquare of the ſemi-axis perpendicular to the ends of the fruſtum, ſubtract the ſquare of the height of the fruſtum; then multiply the difference by $\frac{1}{3}$d of the height, and the product by 3,14159, &c.; and call the laſt product P: then, 1. If the ends be parallel to the fixed axis, ſay, as the revolving axis is to the fixed axis, ſo will P be to the content of the fruſtum. 2. When the ends are perpendicular to the fixed axis, ſay, as the ſquare of the fixed axis is to the ſquare of the revolving axis, ſo is P to the content of the fruſtum. That is, $\frac{3\,f\,f - h\,h}{3\,f\,f} \times p\,h\,r\,r$ will be the fruſtum whoſe ends are perpendicular to the fixed axis: and $\frac{3\,r\,r - h\,h}{3\,r} \times p\,h\,f$, the fruſtum whoſe ends are parallel to the fixed axis; f being the fixed, and r the revolving ſemi-axis, h the height, and p = 3,14159, &c. For the reaſons of theſe rules, ſee SPHEROID, and Hutton, ubi ſupra.

We have a general theorem in Mr. Maclaurin's Treatiſe of Fluxions, concerning the fruſtum of a ſphere, cone, ſpheroid, or conoid, terminated by parallel planes, when compared with a cylinder of the ſame altitude, on a baſe equal to the middle ſection of the fruſtum made by a parallel plane. The difference between the fruſtum and the cylinder is always the ſame in different parts of the ſame,

or of ſimilar ſolids, when the inclination of the planes to the axis, and the altitude of the fruſtum, are given.

In the parabolic conoid this difference vaniſhes, the fruſtum being always equal to a cylinder of the ſame height, upon the ſection of the conoid that biſects the altitude of the fruſtum, and is parallel to its baſes.

In a ſphere, the fruſtum is always leſs than the cylinder by one-fourth part of a right-angled cone, of the ſame height with the fruſtum, or by one half of a ſphere of a diameter equal to that height; and this difference is always the ſame in all ſpheres, when the altitude of the fruſtum is given.

In the cone, the fruſtum always exceeds the cylinder by one-fourth part of the content of a ſimilar cone that has the ſame height with the fruſtum.

In the hyperbolic conoid this exceſs is the ſame as in the cone generated by a triangle $o\,c\,e$, (*fig.* 93) formed by the axis $o\,c$, the aſymptote $o\,e$, and a perpendicular $c\,e$, the altitude of the fruſtum and the inclination of the axis to their baſes being the ſame in both.

In the ſpheroid (*fig.* 94.) the cylinder exceeds the fruſtum; and the difference between them is the ſame as in the cone C D $r\,d$, the plane D $r\,d$, or B $k\,b$, being ſuppoſed parallel to thoſe which terminate the fruſtum. In different inclinations of thoſe planes, when the altitude of the fruſtum is given, that difference is reciprocally as the cube of the diameter B b, which is the conjugate of C A, the axis of the fruſtum. But if the altitude of the fruſtum be alſo varied ſo as to be reciprocally proportional to the diameter B b, then the difference between the fruſtum and cylinder will be always of the ſame magnitude in the ſame ſpheroid or conoid.

When the inclination of the axis of the ſolid to the planes that terminate the fruſtum is given, the difference between the fruſtum and cylinder, in the ſame, or in ſimilar bodies, is as the cube of their common altitude. Maclaurin's Fluxions, Introd. p. 24, 25.

The rules above given, and others of the ſame kind, are of uſe in the menſuration of timber, and alſo in gauging. We ſhall ſubjoin a few examples of their application.

1. How many ſolid feet are there in a tree, whoſe baſes are ſquares, each ſide of the one being 15 inches, and each ſide of the other 6, and the length along the ſide meaſuring 24 feet? (*fig.* 95.)

Here $15 \times 15 = 225$, the greater baſe, and $6 \times 6 = 37$; the leſs, and $15 \times 6 = 90$, their mean. Their ſum is 351, and $\frac{1}{3}$d of it is 117. But A B $-$ D E $= 7\frac{1}{2} - 3 = 4\frac{1}{2}$ $=$ A F, and $\sqrt{\text{A D}^2 - \text{A F}^2} = \sqrt{\overline{24 \times 12}^2 - 4\frac{1}{2}^2}$ $= 287{,}9649$ inches $=$ D F, the perpendicular. Conſequently, $117 \times 287{,}9649 = 33691{,}8933$ inches $= 19{,}49762$ feet $=$ the ſolidity.

2. If a caſk, conſiſting of two equal conic fruſtums joined together at the baſes, have its bung-diameter 28 inches, its head-diameter 20 inches, and length 40 inches; how many gallons of wine will it hold?

Here $20^2 \times {,}7854 = 314{,}16$ = the area at the end,

And $28^2 \times {,}7854 = 615{,}7536$ = the area of the bung circle,

And $20 \times 28 \times {,}7854 = 439{,}824$ = their mean proportion.

Their ſum is 1369,7376

And its third part is 456,5792

which multiplied by 40, the length of both fruſtums together produces 18263,168 ſolid inches, which divided by 231, the inches in a wine gallon, thus,

$$231 = 3 \times 7 \times 11 \left\{ \begin{array}{r} 3) \ 18263{,}168 \\ 7) \ 6087{,}7226 \\ 11) \ 869{,}6746 \end{array} \right.$$

gives 79,0613 wine gallons.

Or, $20^2 + 28^2 + 20 + 28 \times 40 \times 0{,}2618 = 1744 \times 10{,}472 = 18263{,}168$, the ſolidity as before.

3. What is the ſolidity of each of the frigid zones of the earth: the axis being $7957\frac{3}{4}$ miles, and half the breadth, or arc D A, (*fig.* 92.) of the zone being $23\frac{1}{2}$ degrees?

By rule 2. As 1 = tabular radius : $3978\frac{3}{4}$ = radius of the earth, : : ,0829399 = tab. verſed ſine of $23\frac{1}{2}$ degrees : 330,0074946, the verſed ſine or height of the ſegment. Then $,5236\,b^2 \times \overline{3d - 2b} = ,5236 \times 330{,}0074946^2 \times 23213{,}2350108 = 13236797\text{10}$, the content.

By rule 1. As 1 : $3978\frac{3}{4}$: : ,3987491 = tabular ſine of $23\frac{1}{2}$ degrees : 1586,57282526, the radius of the baſe. Then $,5236\,b \times \overline{3r^2 - b^2} = ,5236 \times 330{,}0074946 \times 7660544{,}936 = 1323680299{,}69$, the ſolidity.

4. What is the ſolidity of the fruſtum of a ſphere, the diameter of whoſe great end is four feet, the diameter of the leſs three feet, and the height $2\frac{1}{2}$ feet? Here $\overline{R^2 + r^2 + \frac{1}{3}b^2} \times 1{,}5708\,b = \overline{2^2 + 1{,}5^2 + \frac{1}{3} \times 2{,}5^2} \times 1{,}5708 \times 2\frac{1}{2}$ $= 8\frac{1}{3} \times 3{,}927 = 32{,}725$, the ſolidity of the fruſtum required.

5. What is the ſolidity of each temperate zone of the earth, extending from $23\frac{1}{2}$ degrees to $66\frac{1}{2}$ degrees of latitude, and the diameter of the earth being $7957\frac{3}{4}$ miles? The radius of the top appears by the third example to be 1586,57282526; and as 1 : $3978\frac{7}{8}$: : ,9170601 = tabular ſine of $66\frac{1}{2}$ degrees : 3648,86750538, the radius of the baſe. Alſo the height is 2062,2955. Then $\overline{R^2 + r^2 + \frac{1}{3}b^2} \times 1{,}5708\,b = 17249136 \times 2062{,}2955 \times 1{,}5708 = 55877778668$, the ſolidity of each temperate zone. Otherwiſe; ſince the radii of the ends of this zone are the ſines of $23\frac{1}{2}$ and $66\frac{1}{2}$ degrees, which are complements the one of the other, the ſum of the ſquares of theſe radii will be equal to the ſquare of the radius of the ſphere; and therefore $\overline{\frac{1}{4}dd + \frac{1}{3}bb} \times 1{,}5708\,b = 17249136 \times 2062{,}2955 \times 1{,}5708 = 55877778668$, the content as before.

6. There is a caſk in the form of the middle fruſtum, or zone, of an oblong ſpheroid; the bung-diameter is 30, the head-diameter 18, and the length of the caſk 40 inches; what is the content in ale and wine gallons? Here D $= 30$, $d = 18$, and $a = 40$. Therefore $\overline{2\,\text{D}^2 + d^2} \times \frac{1}{3}\,an = \overline{2 \times 30^2 + 18^2} \times {,}2618 \times 40 = 2124 \times 10{,}472 = 22242{,}528$ = the content in inches. Then, ſince the ale gallon meaſure contains 282 cubic inches, and the wine gallon 231, we have $22242{,}528 \div 231 = 96{,}288$ wine gallons.

7. If the axes of an oblong ſpheroid be 50 and 30, required the content of a fruſtum whoſe ends are perpendicular to the fixed axis, and one of them paſſing through the centre, the height of the fruſtum being 20 inches. Here $\frac{3ff - bb}{3ff} \times phrr = \frac{3 \times 25^2 - 20^2}{3 \times 25^2} \times 3{,}14159 \times 20 \times 15^2 =$ $1475 \times 3{,}14159 \times \frac{12}{5} = 11121{,}23799$ = the content required. For a variety of other examples we refer to Hutton's Menſuration, part iii. § 5. See GAUGING and TIMBER.

FRUTEX. See SHRUB.

FRU-

FRUT ... *Stalks of Plants* are thoſe of a hard, woody ſubſtance.

FRUTIG... *Geography*, a ſmall town of Switzerland, in the canton of Berne, terminating a rich valley, parallel to that of Lauterbruennen, and commencing that of Kander, watered by a river of the ſame name, and bounded by mount Kander. Frutigen gives name to a bailiwick, that was formerly governed by lords of its own, and eſteemed one of the moſt beautiful places in Switzerland, eight miles S. of Spietz, and 30 S. E. of Friburgh.

FRY, in *Ichthyology*, ſignifies the ſpawn, or rather the young of fiſh. See FISH.

FRY's *Bay*, in *Geography*, a bay on the S. W. coaſt of the iſland of Antigua; two miles S. of Reed point.

FRY, *Cape*, a cape in Hudſon's bay. N. lat. 64°. W. long. 88°.

FRYBERG, a town of Bohemia, in the circle of Bechin; nine miles W. of Roſenberg.

FRYBURGH, a poſt town of America, pleaſantly ſituated in York county, Maine, in a bend of Saco river; incorporated in 1777, having a flouriſhing academy, and containing 447 inhabitants. This is the ancient village Pigwaket, through which the upper part of Saco meanders; 60 miles from the ſea, and 120 N. by E. from Boſton. N. lat. 44° 2'. W. long. 70 47 30'.

FRYDUFFRIN, a townſhip of America, in Cheſter county, Pennſylvania.

FRYING-PAN, a dangerous ſhoal, ſo called from its form, lying at the entrance of Cape Fear river in North Carolina; the S. part of it being in N. lat. 33° 32'. W. long. 75°; ſix miles from Cape Fear Pitch, and 24 S. E. by S. from the light-houſe on Bald Head.—Alſo, an iſland in Muddy Lake, Upper Canada, to the northward of Pointe de Tour.

FRYKERYD, a town of Sweden, in Warmeland; 10 miles N. W. of Philipſtadt.

FRYKSANDE, a town of Sweden, in Warmeland; 35 miles N. W. of Philipſtadt.

FRYSOYTA, a town of Germany, in the biſhopric of Munſter; 64 miles N. of Munſter. N. lat. 52° 17'. E. long. 7° 46'.

FRYTH, or FRITH, is explained, by ſir Edward Coke, as a plain between two woods, or a lawn.

Camden uſes it for an arm of the ſea, or a ſtrait between two lands, from *fretum*.

Frith, from the Saxon *frid*, *peace*, is alſo uſed for a wood; becauſe the Engliſh Saxons held woods to be ſacred, and uſed them as ſanctuaries.

FUAGE, or FOCAGE, a tax or impoſition laid on hearths or chimneys, *i. e.* on fire-places, or families, from which was probably derived the *hearth-ſilver*, and *chimney-money*. This duty was repealed by 1 William and Mary, ſeſſ. 1. cap. 10.

Edward the black prince, having Aquitain granted him, laid an impoſition of fuage, or focage, upon the ſubjects of that dukedom, *viz.* one ſhilling for every fire-place. After his example, Charles V. of France laid a tax of a franc for each fire-place, for one year only. His ſucceſſor Charles VI. augmented it under the ſame name. Charles VII. rendered it perpetual, and called it *taille*.

By an ordonnance of Humbert II. dauphin of Viennois, the impoſition of focage, or feuage, was then laid per feu, *i. e.* per fire, or family, *ſeu per lares focum habentes*. In Latin it was called *focagium*, q. d. *pro ſingulis focis*. Sometimes it was alſo called *fournage*, on account of the oven or furnace: in Greek καπνικον or καπνος, *fumus*, *ſmoke*. In Will. Tyr. De Bello Sacro, it is called *foagium*: for it was impoſed by the kings of Jeruſalem. The counts and other lords likewiſe impoſed it on the feudatories, or vaſſals. Zonaras aſſures us, that the general Nicephorus firſt eſtabliſhed it among the Greeks. See CHIMNEY-*money*, and FUMAGE.

FUCA, in *Ichthyology*, a name given by Gaza, and ſome other writers, to the fiſh called phycis by Ariſtotle, Ælian, and other writers; and *tinca marina*, by Salvian and Rondeletius. It is in the Linnæan ſyſtem the BLENNIUS *phycis*. See PHYCIS.

FUCA, *Juan de*, in *Geography*. See JUAN *de Fuca*.

FUCCAGE, a town of Japan, in the iſland of Ximo; 30 miles E. of Nagaſaki.

FUCECCHIO, a town of Etruria, on a lake; 22 miles W. of Florence.

FUCHS, or FUCHSIUS, LEONHARD, in *Biography*, a diſtinguiſhed phyſician and botaniſt of Germany, particularly celebrated for his figures of plants, was born at Wembding, in Bavaria, in the year 1501. He loſt his father when five years old, but his mother, who is repreſented as a woman of very ſuperior talents and virtues, took great care of his education, and was rewarded by the ſucceſs and celebrity of her ſon. After ſtudying the claſſics at Hailbrun and Erfort, he took his firſt degree at the age of 17, with great credit, in the univerſity laſt mentioned. In his 19th year he removed to Ingoldſtadt, in order to profit by the inſtructions of Capnius, and Ceporinus, two profeſſors eminent for their ſkill in the learned languages, and ſtill more for the zeal and honeſty by which, in the dawn of the reformation, they made themſelves obnoxious to the monkiſh faction, by expoſing the corruptions of the church, and promoting a liberal and enlarged ſcheme of education. Fuchſius attached himſelf cloſely to theſe able and enlightened teachers, and while he made a great progreſs in Greek and Latin literature by means of their inſtructions, he imbibed their liberal ſpirit and chriſtian piety. He received the degree of maſter of arts, Jan. 17, 1521, and having ſubſequently applied himſelf with great diligence to the ſtudy of medicine, he was made doctor of phyſic in March 1524, being then about 23 years of age. He had in the mean while become a zealous follower of Luther, and an aſſerter of the authority of the holy ſcriptures alone, in oppoſition to papal power and corruption. Hence he was doubtleſs one of thoſe who gave occaſion to the charge, ſtill renewed from time to time as circumſtances may require, that phyſicians are prone to atheiſm; by which has generally been meant that they are hoſtile to certain impoſitions and corruptions, in which they have no intereſt, but which cannot be entirely concealed from them in the courſe of a learned education. This charge the excellent ſir Thos. Brown and others have thought it worth while, in dark and troubled times, to repel. Happy would it have been had the conduct or character of no phyſician or profeſſed philoſopher, at a more enlightened period, given freſh ſtrength to a calumny that ought to have fallen by its own abſurdity.

Fuchſius ſettled firſt as a phyſician at Munich, where he ſoon after married a young lady of good birth and education, named Anna Fridperger, who bore him four ſons and ſix daughters, and with whom he enjoyed great conjugal felicity till Feb. 1563, when ſhe died. He afterwards married a widow, who ſurvived him. He removed to Ingoldſtadt in May 1526, where he became profeſſor of medicine, but found himſelf ill at his eaſe with reſpect to religion. This induced him to accept the invitation of George, Margrave of Bayreuth, to ſettle at Onoltzbach, about two years afterwards, where he received a handſome ſalary from his patron, who treated him with ſingular reſpect. He was particularly ſucceſsful in the practice of medicine, eſpecially

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in the treatment of the ſweating ſickneſs, which in 1529 began to rage in Germany. In the courſe of his five years' reſidence at Onoltzbach, Fuchſius publiſhed a Compendium or Introduction to the Practice of Phyſic; the ſixth book of Hippocrates on epidemic diſeaſes, tranſlated from the Greek into Latin, with an ample commentary; an Apology againſt Triverius, a phyſician of Louvain, recommending bleeding on the right ſide in inflammations of the viſcera, eſpecially in pleuriſy; three books of Medical Paradoxes, in which many errors of the Arabian and more recent phyſicians are refuted.

At length, the management of the univerſity of Ingoldſtadt was committed, by William duke of Bavaria, to Leonhard Eccius, a celebrated lawyer, who, knowing the merit of Fuchſius, procured his return to his former profeſſorſhip there in 1533. But he had made himſelf too conſpicuous as a proteſtant, and was too little diſpoſed to aſſimilate his opinions, his manners, or his principles of education to thoſe of the ruling powers, to remain at peace; inſomuch that, notwithſtanding the ſteady patronage of Eccius, he returned in Auguſt of the very ſame year to Onoltzbach, taking refuge for a year afterwards at Culmbach, with the family of the margrave, on account of the peſtilence.

At this period Ulric duke of Wirtemberg, having embraced the reformed religion, was very anxious to induce the moſt learned profeſſors of that faith to eſtabliſh themſelves at his univerſity of Tubingen, in order to render that ſchool an aſylum for all ſuch as were diſpoſed to ſhake off and to expoſe the papal uſurpations. Fuchſius was invited among the reſt, and, on ſettling there in 1535, received an ample ſtipend, as well as the moſt diſtinguiſhed favour from the ſovereign and his ſon prince Chriſtopher. Here he continued in great fame and ſucceſs for 35 years. At length, in his 65th year, he was ſeized with an acute diſeaſe attended with great watchfulneſs, which proved fatal on the 10th of May 1566. He died in the arms of his wife and children, full of faith and fortitude, having in the courſe of his illneſs been obſerved to experience no relief from his ſufferings, but while converſing with his friends on the ſubjects of religion and a future ſtate, which made him forget every thing elſe, and he expreſſed himſelf with all his uſual energy and perſpicuity. He was interred, the day after his death, in a burying ground adjoining to the town, where his firſt wife had been depoſited but little more than three years before.

Some botanical remarks of Fuchſius, relating principally to the Arabian writers, are found in the 2d volume of the *Herbarium* of Brunfelſius. But the work on which his reputation in this line of ſtudy chiefly reſts, is his *Hiſtoria Plantarum*, publiſhed at Baſil in 1542. It conſiſts of one volume in folio, with numerous wooden cuts. A German edition appeared the following year. In this work he chiefly copies Dioſcorides, adding a few remarks of his own, and falling, as Haller obſerves, into the common error of the writers of his time, who expected to find, in their own cold countries, the plants of thoſe more genial climates where the antients ſtudied botany and medicine. The publication of Fuchſius, though nearly on a par with thoſe of other learned men of his time, would probably have been long ſince forgotten, were it not for the tranſcendent merit of its wooden cuts, inferior to thoſe of Brunfelſius alone in execution, and far exceeding them in number. They chiefly indeed conſiſt of pharmaceutical plants, not of rare or difficult ſpecies like the works of Cluſius; but though mere outlines, they are juſtly celebrated for their fidelity and elegance. Theſe original editions are become very rare; but copies and tranſlations of them, various in merit, are common throughout Europe. Amongſt the pooreſt of theſe is a French duodecimo, printed at Lyons, under the title of Le Benefice Commun, in 1555, for which our author is certainly not reſponſible, and it is rather hard in Linnæus to claſs him, on account of ſome ſuch ſpurious editions, under the heads of *monſtroſi* and *rudes* in his *Bibliotheca Botanica*, though indeed he there properly ſtands amongſt the *uſitatiſſimi* with reſpect to his original edition. By ſome of his writings, eſpecially his *Cornarus furens*, publiſhed in 1545 againſt Cornarus, who had attacked his *Hiſtoria Plantarum* in a work entitled *Vulpecula excoriata*, he appears to have been vehement in controverſy, which perhaps is to be attributed more to the temper of the times in which he lived, and the example of the theologians, to whom, nevertheleſs, mankind are ſo much obliged, than to any original malignity of diſpoſition. In any caſe the chief reproach muſt reſt with the aſſailant who uſes ſuch vile weapons, and not with the party who merely defends himſelf; though certainly it is always more magnanimous and politic to repel them in ſilence with the invulnerable ſhield of conſcious ſuperiority. In his general character and deportment Fuchſius is ſaid to have been dignified and amiable, with a fine manly perſon, and a clear ſonorous voice. His piety, temperance, and indefatigable deſire to be uſeful, were alike exemplary. As a lecturer he was peculiarly admired and followed, eſpecially in his anatomical courſes. The famous Veſalius was preſent at one of his lectures, in which he found himſelf criticized. He afterwards familiarly addreſſed the profeſſor, ſaying "why do you attack me who never injured you?" "Are you Veſalius?" exclaimed Fuchſius. "You ſee him before you" replied the former. On which great mutual congratulations enſued, and a ſtrict friendſhip was formed between theſe learned men. Fuchſius was ſo famous throughout Europe, that the great Coſmo duke of Tuſcany invited him, with the offer of a ſalary of 600 crowns, to become profeſſor of medicine at Piſa, which he declined. The emperor Charles V. alſo bore teſtimony to his merit, by ſending him letters with the inſignia of nobility, which honour Fuchſius was ſo far from ſeeking, that he for ſome time declined it. He was indifferent to money, as well as to all other than literary fame. His great ambition was, whenever he undertook in his turn the rectorſhip of the univerſity, to promote good order, induſtry and improvement among the ſtudents, whom he governed with paternal aſſiduity and affection. Two colleges were always under his immediate care, one of them founded by duke Ulric for ſtudents of divinity alone, and more amply endowed by his ſon and ſucceſſor.

Fuchſius left behind him ſeveral unpubliſhed botanical manuſcripts, which received corrections and additions to the lateſt periods of his life, as well as many notes to the medical works he had formerly printed.—Melch. Adami, Vitæ Germ. Med.—Haller. Bibl. Bot. S.

FUCHSIA, in *Botany*, named by Plumier in honour of Leonhard Fuchs, or Fuchſius, of whom an account is given in the preceding article. Plum. Gen. t. 14. Linn. Gen. 53. Schreb. 255. Willd. Sp. Pl. v. 2. 339. Mart. Mill. Dict. v. 2. Dryand. in Ait. Hort. Kew. v. 2. 8. Juſſ. 320. Lamarck, t. 282. (Skinnera; Forſt. Gen. t. 29. Quelusia; Vandell. Fl. Luſit. et Braſil. Specim. 23. t. 2. f. 10. Nahuſia; Schneevoogt, Ic. t. 21.) Claſs and order, *Octandria Monogynia*. Nat. Ord. *Calycanthemæ*, Linn. *Onagræ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, funnel-ſhaped, coloured, four-cleft, its ſegments equal, acute, deciduous. *Cor.* Petals four, rarely wanting, equal, inſerted into the rim of the calyx, alternate with its ſegments, and ſhorter. Nectary a notched gland, crowning the germen. *Stam.* Filaments.

Filaments eight, longer than the tube of the calyx, and inſerted into its baſe, thread-ſhaped, four of them uſually ſhorter than the reſt; anthers vertical, two-lobed. *Piſt.* Germen inferior, oval, with four furrows; ſtyle thread-ſhaped, about the length of the ſtamens; ſtigma obtuſe, with four notches. *Peric.* Berry oval, ſucculent, with four furrows and four cells. *Seeds* numerous, ſmall, ovate, ranged vertically in two rows upon the columella in each cell.

Eſſ. Ch. Calyx ſuperior, coloured, four-cleft, bearing the corolla. Petals four. Berry of four cells. Seeds numerous.

Obſ. Linnæus, relying on Plumier's figure, has miſtaken the calyx for a corolla, which he therefore deſcribes as having eight marginal ſegments, and, owing to a further inaccuracy in the delineations of his original author, or at leaſt in the engraved copies of them, he was induced to refer the genus erroneouſly to his fourth claſs inſtead of the eighth. Hence the real *Fuchſia* being widely miſunderſtood, ſome of its congeners have been eſtabliſhed, by various names, as diſtinct genera; witneſs the above ſynonyms. We ſhall attempt a more complete enumeration and diſcrimination of the ſpecies than have hitherto been given. They are among the moſt elegant of all plants, though, as far as we know, not enriched with any fragrance, nor with any valuable medicinal or economical properties.

1. F. *triphylla*. Linn. Sp. Pl. 159. (F. triphylla, flore coccineo; Plum. Ic. t. 133. f. 1.)—Cluſter terminal, naked. Leaves entire. Stem ſimple, erect.—Native of the Weſt Indies, but it ſeems to be very rare. Plumier does not mention where he found this ſpecies, nor has any other perſon, as far as we can diſcover, met with it, except Thierry de Menonville, a ſpecimen from whom, gathered in Hiſpaniola, was given by Thouin to the younger Linnæus, along with about 1200 of the fineſt and rareſt plants, gathered by various French voyagers. The *ſtem* of this, the original ſpecies of *Fuchſia*, appears to be ſimple, herbaceous and erect. The *leaves* are three together in a whorl, ſeſſile, oblong, about two inches in length, roughiſh, nearly entire, turned of a greyiſh brown by drying. *Flowers* in a ſimple, terminal, upright cluſter, their calyx about an inch and half long, ſcarlet as well as the petals, which colour remains in the dried ſpecimen. *Berry* almoſt globular, rather larger than a common black currant.

2. F. *ſimplicicaulis*. Ruiz and Pavon Fl. Peruv. v. 3. 89. t. 322. f. *a*.—Umbel terminal, of four flowers. Involucrum ſomewhat downy, four-leaved. Leaves lanceolate, toothed, ſmooth. Stem ſimple, drooping. Native of the woods of Munna in Peru, flowering in Auguſt and September. *Stem* rather ſhrubby, four feet high, ſimple, except now and then a radical ſhoot or two, leafy, drooping at the ſummit. *Leaves* four in a whorl, nearly ſeſſile, linear-lanceolate, ſlightly toothed, drooping, very ſmooth. *Stipulas* intrafoliaceous, minute, deciduous. *Flowers* four together, drooping, forming a terminal umbel, with an involucrum of four ovate, pointed, toothed, rather downy, leaves. The umbel is ſometimes proliferous. *Calyx* roſe-coloured, downy, rather larger than in the former, and with longer teeth. *Petals* ſcarlet.

3. F. *apetala*. Ruiz and Pavon Fl. Peruv. v. 3. 89. t. 322. f. *b*.—Flower-ſtalks corymboſe, terminal and axillary. Leaves ſcattered, ovate, entire. Petals wanting.—Plentiful in the woods of Huaſſahuaſſi and Munna in Peru, flowering in October and November. *Stem* ſhrubby, paraſitical on the trunks of trees, downy, branched. *Leaves* alternate or ſcattered, ſtalked, ovate, entire, ſomewhat wavy, ſoft, and tender, ſcarcely an inch and half long. *Flowers* large, drooping, remarkable for having no petals. *Calyx* red, three inches in length. *Berry* red.

4. F. *roſea*. Ruiz and Pavon Fl. Peruv. v. 3. 88. "Flower-ſtalks axillary, ſingle-flowered. Leaves faſciculate, unequal and alternate, lanceolate, entire."—Found on precipices at the port of Valparaiſo in Chili, flowering in October and November. *Stem* ſhrubby, 10 or 12 feet high, erect, round, branched. *Branches* brittle. *Leaves* eight from one centre, unequal, ſtalked, lanceolate, entire, ſmooth; the upper ones alternate. *Flowers* drooping, with roſe-coloured petals and calyx. Of this no figure is given in the *Flora Peruviana*, ſo we can only copy the deſcription as above.

5. F. *ferratifolia*. Ruiz and Pavon Fl. Peruv. v. 3. 86. t. 323. f. *a*.—Flower-ſtalks axillary. Leaves three or four in a whorl, ovate, ſtalked, ſerrated, ſmooth above, as long as the flowers.—Found in moiſt ſhady places at Munna in Peru, flowering from June to September, when it makes a very ornamental appearance. The *ſtem* is ſhrubby, two or three ells high, not much branched. *Leaves* either oppoſite, or three or four in a whorl, three to five inches long and one or two broad, ſpreading, ſlightly downy beneath, with numerous red veins, and red ſtalks. *Flowers* pendulous from each axilla, rather ſmaller than thoſe of *F. apetala*, with a roſy-red, rather downy calyx, and ſcarlet petals. The tips of the calyx however are green. *Berry* purpliſh, elongated.

6. F. *denticulata*. Ruiz and Pavon Fl. Peruv. v. 3. 87. t. 325. f. *b*.—Flower-ſtalks axillary, reaching beyond the branches. Leaves three in a whorl, ſtalked, elliptic-lanceolate, toothed, ſhorter than the flowers.—Native of ſunny precipices and banks at Huaſſahuaſſi and Cheuchin in Peru, blooming beautifully from March to October. This is a *ſhrub* about the ſize of the laſt, from which it differs in the toothed, not ſerrated, *leaves*, and in the extenſion of the *flowers* beyond the ends of the branches, their ſtalks proceeding from the boſoms of ſome of the upper leaves only. The *calyx* is purple. *Petals* rounded, ſcarlet. *Stamens* and *ſtyle* purple, not ſcarlet like the former. *Berry* purple.

7. F. *ovalis*. Ruiz and Pavon Fl. Peruv. v. 3. 87. t. 324. f. *a*.—Flower-ſtalks in leafy whorls, on ſimple axillary branches. Leaves oppoſite or three together, ſtalked, elliptical, wavy, downy on both ſides. Calyx hairy. Native of the woods of Munna in Peru, flowering from June to Auguſt. A *ſhrub* about ſix feet high, upright and branched. The *leaves* are three inches long, broadly elliptical, acute, on downy ſtalks. *Flowering branches* ſhorter than the leaves, round, ſimple, downy, each bearing two or three whorls of ſmall downy leaves, with a correſponding number of axillary ſimple flower-ſtalks. The *calyx* is not above an inch long in the tube, ſcarlet, hairy externally, like the germen and ſtalk. *Petals* ſcarlet, acute.

8. F. *corymbiflora*. Ruiz and Pavon Fl. Peruv. v. 3. 87. t. 325. f. *a*.—Cluſter terminal, leafy, drooping. Leaves elliptic-lanceolate, nearly entire, downy. Calyx downy. Native of ſhady groves at Chincao and Munna in Peru, flowering in Auguſt and September.—A downy *ſhrub*, ſix feet high, but little branched. *Leaves* oppoſite, ſtalked, ovate or elliptic-lanceolate, pointed, very obſcurely toothed, two or three inches long. *Flowers* about the ſize and colour of the firſt ſpecies, and, as in that, forming a whorled cluſter, but drooping, downy, and accompanied at the baſe of each partial ſtalk with a ſmall, ovate, downy leaf or bractea. *Berry* purpliſh-red, hairy.

9. F. *coccinea*. Dryandr. in Ait. Hort. Kew. v. 2. 8. Willd. Sp. Pl. v. 2. 340. Curt. Mag t. 97. (F. macroſtema; Ruiz

Ruiz and Pavon Fl. Peruv. v. 3. 88. t. 324. f. *b.* Nahuſia coccinea; Schneevoogt Ic. t. 21. T'hilco; Feuillée Voy. v. 3. 64. t. 47.)—Flower-ſtalks axillary, longer than the leaves, drooping. Leaves oppoſite or whorled, ſtalked, ovate, toothed, ſmooth. Teeth of the calyx as long as its tube.—Native of Chili, in mountainous marſhy ſituations, flowering from June to April. A *ſhrub* from three to ſix feet high, ſmooth in all its parts, very much branched. *Leaves* two or three, rarely four, together, ſcarcely above an inch, or inch and half, in length, rather diſtantly toothed; paler and ſhining beneath. *Flower-ſtalks* longer than the leaves. *Calyx* ſcarlet, with a much ſhorter tube than any of the preceding. *Petals* violet, obovate and blunt. *Stamens* and *ſtyle* ſcarlet, hanging far out of the flower. *Berry* dark purple. The flowers are reported to be ſometimes five-cleft and decandrous, of which we have never ſeen an inſtance, and we much doubt whether it be not an error, originating with Feuillée. The people of Chili call this ſhrub T'hilco and Chilco, and uſe it, in decoction or infuſion, as a cooling medicine in inflammatory fevers. The wood is excellent for dyeing black. A plant of this ſpecies, apparently in a dead ſtate, was brought by Captain Firth in 1788 to Kew garden, from Liſbon, and it was ſaid to have come from the Brazils. As the ſpring advanced, it began to ſprout, and ſoon put forth its exquiſitely beautiful flowers, to the admiration of all who beheld it. It is now become very common, being eaſily encreaſed by cuttings, and thriving equally well in a ſtove, green-houſe or frame. The root ſtands our winters in the open ground, though the ſtems periſh, but as they ſhoot up again, and flower with peculiar luxuriance in the ſummer and autumn, this is perhaps the beſt mode of treatment. When gathered, this plant ſoon withers, its evaporation being very rapid.

10. F. *decuſſata.* Ruiz and Pavon Fl. Peruv. v. 3. 88. t. 323. f. *b.*—Flower-ſtalks axillary, longer than the leaves, pendulous. Leaves oppoſite or whorled, elliptic-lanceolate, ſlightly toothed, downy. Teeth of the calyx nearly as long as its tube.—Native of ſhady moiſt places at Munna in Peru, flowering from July to September.—A *ſhrub* about three feet high, apparently very nearly related to the laſt, from which it differs in the downineſs, and taper baſes of its *leaves*, its ſcarlet, more acute *petals*, and red *fruit*.

11. F. *lycioïdes.* Andr. Repoſ. t. 120.—Flower-ſtalks axillary, ſhorter than the leaves, drooping, Leaves ſcattered, elliptic-lanceolate, wavy. Teeth of the calyx as long as its tube, reflexed.—Native of the north-weſt coaſt of America, from whence it was introduced to our gardens, according to Mr. Andrews, in 1796. It is leſs ornamental than any of the above deſcribed, though not inelegant in its *flowers*, which, as well as the *leaves*, bear ſome reſemblance to a *Lycium*. The *calyx* is of a dull or pale red, and remarkable for being reflexed. *Petals* purple, about as long as the ſtamens, but ſhorter than the ſtyle. *Berry* blackiſh. It is increaſed by cuttings, but is more tender than the far more deſirable *F. coccinea.* We are at a loſs for the foundation of Mr. Andrews's "doubts whether this ſpecies may not be the *F. triphylla* of Father Plumier," as the figure of the latter ſtrikingly ſhews their wide difference.

12. F. *excorticata.* Linn. Suppl. 217. Willd. Sp. Pl. v. 2. 340. (Skinnera excorticata; Forſt. Prod. 27.)—Flower-ſtalks axillary, ſhorter than the leaves, drooping. Leaves elliptic-lanceolate, toothed, hoary beneath. Teeth of the calyx ſhorter than the tube, ſpreading.—Native of New Zealand. A *tree* ſmooth in all its parts. The *trunk* is two or three inches in diameter. *Leaves* ſcattered, ſtalked, two inches long, varying in breadth, deciduous. *Flowers* larger than in *F. lycioides*, but ſomewhat like them in the colour of the calyx, whoſe teeth however are of a ſhorter proportion, and not reflexed. The *petals* are ſmall, acute, deep violet.

We might ſwell our liſt of ſpecies with *F. multiflora*, taken up by Willdenow from the *Mantiſſa* of Linnæus, p. 331, on the authority of Mutis, who merely mentioned to him that there were two ſpecies of this genus in Mexico, one with many flowers on a ſtalk, the other with ſingle-flowered peduncles; but we preſume the former muſt be included among thoſe we have adopted from the *Flora Peruviana.* It is much to be wiſhed that the Spaniſh botaniſts might introduce any of them to the gardens of Europe.

Fuchsia, in *Gardening*, comprehends plants of the flowery exotic kind for the ſtove; of which the ſpecies chiefly cultivated are, the three-leaved fuchſia (F. triphylla) and the ſcarlet-flowered fuchſia (F. coccinea). The firſt is an herbaceous plant of ſmall growth, but the latter a ſhrub of conſiderable ſize with beautiful ſcarlet flowers.

Method of Culture.—Both theſe plants are capable of being increaſed by ſowing the ſeeds, by laying the young ſhoots down, by cuttings made from the ſhoots, and even ſometimes by ſuckers taken from the roots.

The ſeeds ſhould be ſown in pots filled with good light mould in the early ſpring plunging them in a bark hot-bed. When the plants come up, they muſt be kept clean, being occaſionally refreſhed with a little water. As ſoon as they have attained a few inches in height, they ſhould be carefully ſhaken out of the old pots, and after being nicely ſeparated, be planted out in ſeparate ſmall pots filled with the ſame ſort of mould, being replunged in the bark hot-bed, and kept well ſhaded until they have taken freſh root, when they ſhould have air admitted pretty freely.

The plants require to be kept warm during the winter ſeaſon.

The layers, cuttings and ſuckers may be laid down or be planted out towards the end of the ſummer or the beginning of autumn, in pots for the purpoſe, being occaſionally watered, and placed in the hot-bed.

The plants ſhould be kept in the ſtove during the winter ſeaſon, but they may be ſet out in the green-houſe in the ſummer months, when they will afford much ornament in their beautiful ſcarlet flowers, as they continue for a conſiderable length of time.

FUCHSWINKE, in *Geography*, a town of Sileſia, in the principality of Neiſſe; three miles S. of Patſchkau.

FUCINUS Lacus, in *Ancient Geography*, a lake of Italy in the Apennine mountains, belonging to the country of the Marſi. It is now called lake Celano. For a particular account of it, ſee Celano.

FUCUS is uſed for a paint, or compoſition, applied on the face, to beautify it, and heighten the complexion.

Old women make uſe of fucuſes and pomatums, to appear young. The fucus made with ceruſſe is corroſive and pernicious to the ſkin.

Pliny ſays, that the fucus of the Roman dames was a kind of white earth, or chalk, brought from Chio and Samos, diſſolved in water.

The fucus Solimanni is a compoſition of prepared ſublimate, in great repute among the Spaniards of Peru.

Fucus *Giganteus*, a name given by Mr. Banks and Dr. Solander to a kind of ſea-weed of an enormous ſize, which they diſcovered in their paſſage from Rio de Janeiro to the ſtrait of Le Maire. The leaves of it were four feet long, and ſome of the ſtalks, though not thicker than a man's thumb, above one hundred and twenty.

Fucus, in *Botany*, (from φυκος a ſea-weed, ſome kinds of which being uſed in colouring, occaſioned the Latin

word *fucare*, to ſtain or paint.) Linn. Gen. 567. Schreb. 768. Juſſ. 6. Reaumur Mem. de l'Acad. des Sciences for 1711, 282. t. 9, 10, 11. Claſs and order, *Cryptogamia Algæ*. Nat. Ord. *Algæ*.

Gen. Ch. Male unknown. Female, *Cal.* and *Cor.* none. *Piſt.* Germen imbedded in the gelatinous internal ſubſtance of a membranous or coriaceous frond, aggregate; ſtyle and ſtigma unknown. *Peric.* gelatinous. *Seeds* roundiſh, numerous, cluſtered, at length diſperſed.

Eſſ. Ch. Seeds produced in cluſtered tubercles, which burſt at their ſummits.

The fructification of this genus ſtill remains in the greateſt obſcurity. Linnæus imagined the male flowers to reſide in the ſpongy fibres found in the air-bladders of ſome ſpecies; but this appears to be merely cellular ſubſtance, thoſe bladders ſerving only to float the plant. Yet this theory, founded on a miſapprehenſion of Reaumur's opinion, is adopted by Juſſieu. Reaumur thought certain fibrous tufts, ſcattered over the ſurface, were male flowers. Gærtner has recurred to the old opinion that the family of ſea-weeds, and ſome others of the *Cryptogamia*, have no actual ſexual impregnation; but this does not bring us at all nearer the truth, though it may ſerve to ſhelter our ignorance. Mr. Correa de Serra, in the Philoſophical Tranſactions for 1796, has ſuggeſted that the mucus which envelopes the ſeeds of this family may be the true pollen or impregnating matter, which ſeems to us the moſt probable conjecture, though col. Velley, in the fifth volume of the Linnæan Society's Tranſactions, has oppoſed it. A great difficulty reſpecting, not only the generic character, but in many caſes the ſpecific diſcrimination of theſe plants, ariſes from the different aſpects the fruit aſſumes, being ſometimes in the form of round many-ſeeded tubercles, ſometimes in that of widely diſperſed ſeeds, like thoſe of an *Ulva*. This takes place unqueſtionably in the very ſame ſpecies. Theſe difficulties are ſo great, that though Roth and others have attempted generic diſtinctions among the plants ranged previouſly under *Fucus* and *Conferva*, Mr. Dawſon Turner, author of an excellent ſynopſis of the Britiſh *Fuci*, and of a ſplendid and very learned general work on this genus with coloured plates, in which 134 ſpecies have already appeared, leaves the ſubject of the generic character in complete uncertainty. The beſt books on the ſpecies of *Fucus* are Gmelin's *Hiſtoria Fucorum*, publiſhed at Peterſburgh, in 1768; Eſper's *Icones Fucorum*, Nuremberg 1800; Goodenough and Woodward's Obſervations on the Britiſh Fuci, Tr. of Linn. Soc. v. 3, beſides the works of Mr. Turner above-mentioned, and the ſplendid faſciculi of Stackhouſe's *Nereis Britannica*, and of Velley's *Plantæ Marinæ*. Numerous ſpecies are alſo figured and deſcribed in the Engliſh Botany. Thoſe which are natives of the Britiſh ſhores are now ſuppoſed to amount to near 100. They are diſtributed into the following ſections. 1. Leaves, or rather leaflets, diſtinct. 2. Leaves united with the ſtem. 3. Winged, or having a rib running along the centre of the leaf or frond. 4. Frond flat and deſtitute of a rib. 5. Frond compreſſed. 6. Frond round or cylindrical.

Theſe plants are eaſily preſerved, by being firſt waſhed clean from ſea water, and then diſplayed on paper while floating in a pan of freſh water, during which they are readily diſplayed by means of a briſtle, or hair-pencil. Some of them adhere to the paper when dry, others ſtart from it. Many ſpecies make a very elegant appearance, and are favourites with collectors of natural productions.

Fucus, in the teſtaceous claſs of *Vermes*, a ſpecies of *Murex*, which ſee.

Fucus, in the zoophyte claſs of *Vermes*, a name given by Imperatori to the Gorgonia *verrucoſa*, which ſee.—Alſo, to ſeveral ſpecies of *Alcyonium*, *Tubularia*, and *Corallines*, which ſee.

Fucus *palmatus*, *handed fucus*, the name given to a ſpecies of ſea fucus, diſtinguiſhed from the reſt by its having no ſtalks, its leaves being divided in the manner of a hand, and its extremities divided into many curled ſegments. It is common on almoſt all the ſea coaſts of Europe, and is one of the ſeveral ſpecies of ſea ſubſtances in which Mr. Reaumur has diſcovered regular flowers and ſeeds. They are in this ſpecies however ſo ſmall, as to require the aſſiſtance of a microſcope to diſcover them; though after they have been once ſeen in that manner, as is the caſe in many microſcopic objects, they may then be eaſily diſtinguiſhed by the naked eye. This ſubſtance is faſtened to ſome ſtone by a round root, from which there ariſe four or five leaves, which at about an inch diſtance from the root divide into a number of branchings, which conſtitute the whole of it. The natives of New Holland broil this ſpecies of ſea-wreck and eat it. It is alſo eaten both in Scotland and Ireland, ſometimes freſh, as a ſallad; but more frequently it is dried, rolled together, and chewed as tobacco. In the iſle of Sky it is uſed as a medicine.

Fucus *polyſchides*. See Polyschides.

Fucus *thermalis*, the name of a remarkable ſubſtance found only in the hot-water ſprings. It was firſt diſcovered by Monſ. de Monteſquieu, in the great baſon, at the boiling ſpring in Gaſcony; he was not able to diſcover that it produced either flowers or ſeeds. Its ſubſtance is entirely compoſed of ſmall bladders full of air, the ſurfaces of which are reticular, as worked in the manner of coarſe canvas. It is obſerved to grow only in the hotteſt waters.

FUDAL Baha, in *Geography*, a mountain of Aſiatic Turkey, in Natolia; ten miles from Cogni.

FUDDAH, a river of Algiers, which runs into the Shellif; five miles E. of Sinaab.

FUDDER, among the *Miners*, a load of lead, which is eight pigs, or ſixteen hundred weight. See Fodder.

FUDIA, in *Geography*, one of the Weſtern iſlands of Scotland, which is ſmall and mountainous. N. lat. 57° 2'. W. long. 7° 23'.

FUE'. See Faoue'.

FUEGO. See Terra *del Fuego*.

Fuego, Fogo, or *St. Philip*, one of the cape Verd iſlands. The firſt of theſe names is derived from a volcano, and the laſt from its being diſcovered on St. Philip's day. The volcano iſſues from a high mountain, and throws out flames, which are viſible at a great diſtance in the night; alſo clouds of aſhes, which ſuffocate cattle, pumice-ſtones, which float on the ſea, and torrents of ſulphur. The iſland has neither rivers nor freſh water; nevertheleſs it is fertile in maize, gourds, water-melons, wild figs, oranges, and apples. It abounds with goats, which run wild upon the mountains, the ſkins of which yield a revenue to the crown. They export alſo the ſkins of cattle, horſes, aſſes, and hogs. Fuego is about 15 miles in length. N. lat. 14° 57' 18". W. long. 24° 22' 12".

FUEGOO, one of the Philippine iſlands, about 36 miles in circumference; in the centre the land is pretty high, and declines towards both ends. N. lat. 9° 20'. E. long. 123° 26'.

FUEL, in *Philoſophy*, the pabulum of fire, or whatever receives and retains fire, and is conſumed, or rendered inſenſible thereby.

A great deal of nicety is required in chooſing the proper fuel to raiſe and continue the ſeveral degrees of fire in chemical operations. Dr. Black divides fuels into five

claſſes; the firſt comprehends the fluid inflammable bodies; the ſecond, peat or turf; the third, charcoal of wood; the fourth, pit-coal charred; and the fifth, wood, or pit-coal, in a crude ſtate, and capable of yielding a copious and bright flame.

The fluid inflammables are conſidered as diſtinct from the ſolid, on this account, that they are capable of burning upon a wick, and become in this way the moſt manageable ſources of heat; though, on account of their price, they are never employed for producing it in great quantities; and are only uſed when a gentle degree, or a ſmall quantity of heat is ſufficient. The ſpecies which belong to this claſs are alcohol and different oils.

The firſt of theſe, alcohol, when pure and free of water, is as convenient and manageable a fuel for producing moderate or gentle heats as can be deſired. Its flame is perfectly clean, and free from any kind of ſoot; it can eaſily be made to burn ſlower or faſter, and to produce leſs or more heat, by changing the ſize or number of the wicks upon which it burns; for as long as theſe are fed with ſpirit, in a proper manner, they continue to yield flame of preciſely the ſame ſtrength. The cotton, or other materials, of which the wick is compoſed, is not ſcorched or conſumed in the leaſt, becauſe the ſpirit with which it is conſtantly ſoaked is incapable of becoming hotter than 174°, Fahrenheit, which is conſiderably below the heat of boiling water. It is only the vapour that ariſes from it which is hotter, and this too only in its outer parts, that are moſt remote from the wick, and where only the combuſtion is going on, in conſequence of communication and contact with the air. At the ſame time, as the alcohol is totally volatile, it does not leave any fixed matter which, by being accumulated on the wick, might render it foul and fill up its pores. The wick, therefore, continues to imbibe the ſpirit as freely, after ſome time, as it did at the firſt. Theſe are the qualities of alcohol as a fuel. But theſe qualities belong only to a ſpirit that is very pure. If, on the contrary, it be weak, and contain water, the water, being leſs volatile, does not evaporate ſo faſt from the wick as the more ſpirituous part; and the wick becomes, after ſome time, ſo much ſoaked with water that it does not imbibe the ſpirit properly. The flame becomes much weaker, or is altogether extinguiſhed. When alcohol is uſed as a fuel, therefore, it ought to be made as ſtrong, or free from water, as poſſible.

Oil, although fluid like ſpirit of wine, and capable of burning in a ſimilar manner, is not ſo convenient in many reſpects. It is diſpoſed to emit ſoot; and this applying itſelf to the bottom of the veſſel expoſed to it, and, increaſing in thickneſs, forms, by degrees, a ſoft and ſpongy medium, through which heat is not ſo freely and quickly tranſmitted. This was obſerved by Muſchenbroeck in his experiments upon the expanſions of metalline rods heated by lamps. It is true we can prevent this entirely, by uſing very ſmall wicks, and increaſing the number, if neceſſary, to produce the heat required. Or, we may employ one of thoſe lamps, in which a ſtream of air is allowed to riſe through the middle of the flame, or to paſs over its ſurface with ſuch velocity as to produce a more complete inflammation than ordinary. But we ſhall be as much embarraſſed in another way, for the oils commonly uſed, being capable of aſſuming a heat greatly above that of boiling water, ſcorch and burn the wick, and change its texture, ſo that it does not imbibe the oil ſo faſt as before. Some have attempted a remedy, by making the wick of incombuſtible materials, as aſbeſtos, or wire; but ſtill, as the oil does not totally evaporate, but leaves a ſmall quantity of groſs fixed carbonaceous matter, this, conſtantly accumulating, clogs the wick to ſuch a degree, that the oil cannot aſcend, the flames become weaker, and, in ſome caſes, are entirely extinguiſhed. There is, however, a difference among the different oils in this reſpect; ſome being more totally volatile than others. But the beſt are troubleſome in this way, and the only remedy is to change the wicks often, though we can hardly do this and be ſure of keeping always an equal flame.

The ſecond kind of fuel mentioned, peat, is ſo ſpongy that, compared with the more ſolid fuels, it is unfit to be employed for producing very ſtrong heats. It is too bulky for this: we cannot put into a furnace, at a time, a quantity that correſponds with the quick conſumption that muſt neceſſarily go on when the heat is violent. There is, no doubt, a great difference in this reſpect among different kinds of this fuel; but this is the general character of it. However, when we deſire to produce and keep up, by means of cheap fuel, an extremely mild gentle heat, we can hardly uſe any thing better than peat. But it is beſt to have it previouſly charred, that is, ſcorched, or burnt to black coal. When prepared for uſe in that manner, it is capable of being made to burn more ſlowly and gently, or will bear, without being extinguiſhed altogether, a greater diminution of the quantity of air, with which it is ſupplied, than any other of the ſolid fuels. Dr. Boerhaave found it extremely convenient and manageable in his Furnus Studioſorum.

The next fuel, in order, is the charcoal of wood. This is prepared by piling up billets of wood into a pyramidal heap, with ſeveral ſpiracles, or flues, formed through the pile. Chips and bruſhwood are put into thoſe below, and the whole is ſo conſtructed that, when kindled, it kindles almoſt over the whole pile in a very ſhort time. It would burſt out into a blaze, and be quickly conſumed to aſhes, were it not covered all over with earth, or clay, beaten cloſe, leaving openings at all the ſpiracles. Theſe are carefully watched; and, whenever the white watery ſmoke is obſerved to be ſucceeded by thin blue, and tranſparent ſmoke, the whole is immediately ſtopped; this being the indication of all the watery vapour being gone, and the burning of the true coaly matter commencing. Thus is a pretty ſtrong red heat raiſed through the whole maſs, and all the volatile matters are diſſipated by it, and nothing now remains but the charcoal. The holes being all ſtopped in ſucceſſion, as this change of the ſmoke is obſerved, the fire goes out for want of air. The pile is now allowed to cool. This requires many days; for, charcoal being a very bad conductor of heat, the pile long remains red hot in the centre, and, if opened in this ſtate, would inſtantly burn with fury.

Small quantities may be procured at any time, by burning wood in cloſe veſſels. Little pieces may be very finely prepared, at any time, by plunging the wood in lead melted and red hot.

This is the chief fuel uſed by the chemiſts abroad, and has many good properties. It kindles quickly, emits few watery or other vapours while burning, and when conſumed leaves few aſhes, and thoſe very light. They are, therefore, eaſily blown away, ſo that the fire continues open, or pervious to the current of air which muſt paſs through it to keep it burning. This ſort of fuel, too, is capable of producing as intenſe a heat as can be obtained by any; but in thoſe violent heats it is quickly conſumed, and needs to be frequently ſupplied.

Foſſil coals charred, called cinders, or coaks, have, in many reſpects, the ſame properties as charcoal of wood; as kindling more readily in furnaces than when they are not charred, and not emitting watery, or other groſs ſmoke,

while

while they burn. This ſort of charcoal is even greatly ſuperior to the other in ſome properties.

It is a much ſtronger fuel, or contains the combuſtible matter in greater quantity, or in a more condenſed ſtate. It is, therefore, conſumed much more ſlowly on all occaſions, and particularly when employed for producing intenſe melting heats. The only inconveniences that attend it are, that, as it conſumes, it leaves much more aſhes than the other, and theſe much heavier too, which are, therefore, liable to collect in ſuch quantity as to obſtruct the free paſſage of air through the fire; and further, that when the heat is very intenſe theſe aſhes are diſpoſed to melt or vitrify into a tenacious droſſy ſubſtance, which clogs the grate, the ſides of the furnace and the veſſels. This laſt inconvenience is only troubleſome, however, when the heat required is very intenſe. In ordinary heat the aſhes do not melt, and though they are more copious and heavy than thoſe of charcoal of wood, they ſeldom choke up the fire conſiderably, unleſs the bars of the grate be too cloſe together.

This fuel, therefore, is preferable, in moſt caſes, to the charcoal of wood, on account of its burning much longer, or giving much more heat before it is conſumed. The heat produced, by equal quantities, by weight, of pit-coal, wood-charcoal and wood itſelf, are nearly in proportion of 5, 4, and 3. The reaſon why both theſe kinds of charcoal are preferred, on moſt occaſions, in experimental chemiſtry, to the crude wood, or foſſil coal, from which they are produced, is, that the crude fuels are deprived, by charring, of a conſiderable quantity of water, and ſome other volatile principles, which are evaporated during the proceſs of charring, in the form of ſooty ſmoke or flame. Theſe volatile parts, while they remain in the fuel, make it unfit (or leſs fit) for many purpoſes in chemiſtry. For beſides obſtructing the vents with ſooty matter, they require much heat to evaporate them; and, therefore, the heat of the furnace, in which they are burnt, is much diminiſhed and waſted by every addition of freſh fuel, until the freſh fuel is completely inflamed, and reſtores the heat to its former ſtrength.

But theſe great and ſudden variations of the heat of a furnace are quite inconvenient in moſt chemical proceſſes. In the greater number of chemical operations, therefore, it is much more convenient to uſe charred fuel, than the ſame fuel in its natural ſtate.

There are, at the ſame time, ſome kinds of foſſil coal, which are exceptions to what has now been delivered in general. We meet with ſome of them that leave a ſmaller proportion of aſhes than others, and the aſhes of ſome are not ſo liable to melt in violent heats. There is one ſpecies too, ſuch as the Kilkenny coal of Ireland, and which occurs likewiſe in ſome parts of this country, that does not contain any ſenſible quantity of water, or other ſuch volatile principles. But this may be called a ſort of native charcoal. It has the appearance of ordinary coal, but, when thrown into the fire, does not emit ſmoke or ſoot. It merely becomes red, gives a ſubtile blue flame, and conſumes like charcoal; only it laſts ſurprizingly long, or continues to give heat for a very long time before it is totally conſumed. But it cannot be made to burn ſo as to produce a gentle heat. If not in conſiderable quantity, and violently heated, it is ſoon extinguiſhed.

In uſing this kind of fuel, it is proper to be on our guard againſt the dangerous nature of the burnt air, which ariſes from charcoal of all kinds. Charcoal burns without viſible ſmoke. The air ariſing from it appears to the eye as pure and as clear as common air. Hence it is much uſed abroad by thoſe who are ſtudious of neatneſs, and cleanlineſs in their apartments. But this very circumſtance ſhould make us more watchful againſt its effects, which may prove dangerous, in the higheſt degree, before we are aware of it. The air ariſing from common crude fuel is no doubt as bad, but the ſmoke renders it diſagreeable before it becomes dangerous. The firſt ſenſation is a ſlight ſenſe of weakneſs; the limbs ſeem to require a little attention, to prevent falling. A ſlight giddineſs, accompanied by a diſtinct feeling of a flush, or glow in the face and neck. Soon after, the perſon becomes drowſy, would ſit down, but commonly falls on the floor inſenſible of all about him, and breathes ſtrong, ſnoring as in an apoplexy. If the perſon is alarmed in time, and eſcapes into the open air, he is commonly ſeized with a violent head-ach, which gradually abates.

But when the effect is completed, as above deſcribed, death very ſoon enſues, unleſs relief be obtained. There is uſually a foaming at the mouth, a great flush or ſuffuſion over the face and neck, and every indication of an oppreſſion of the brain, by this accumulation of blood. The moſt ſucceſsful treatment is to take off a quantity of blood immediately, and throw cold water on the head repeatedly. A ſtrong ſtimulus, ſuch as hartſhorn, applied to the ſoles of the feet, has alſo a very good effect.

The fifth and laſt kind of fuel is wood, or foſſil coals, in their crude ſtate, which it is proper to diſtinguiſh from the charcoals of the ſame ſubſtances. The difference conſiſts in their giving a copious and bright flame, when plenty of air is admitted to them, in conſequence of which they muſt be conſidered as fuels very different from charcoal, and adapted to different purpoſes. See FLAME.

Flaming fuel cannot be managed like the charcoals. If little air be admitted, it gives no flame, but ſooty vapour, and a diminution of heat. And if much air be admitted to make thoſe vapours break out into flame, the heat is too violent. Theſe flaming fuels, however, have their particular uſes, for which the others are far leſs proper. For it is a fact, that flame, when produced in great quantity, and made to burn violently, by mixing it with a proper quantity of freſh air, by driving it on the ſubject, and throwing it into whirls and eddies, which mix the air with every part of the hot vapour, gives a moſt intenſe heat. This proceeds from the vaporous nature of flame, and the perfect miſcibility of it with the air.

As the immediate contact and action of air are neceſſary to the burning of every combuſtible body; ſo the air, when properly applied, acts, with far greater advantage on flame, than on the ſolid and fixed inflammable bodies: for when air is applied to theſe laſt, it can only act on their ſurface, or the particles of them that are outermoſt; whereas flame being a vapour or elaſtic fluid, the air, by proper contrivances, can be intimately mixed with it, and made to act on every part of it, external and internal, at the ſame time. This great power of flame, which is the conſequence of this, does not appear when we try ſmall quantities of it, and allow it to burn quietly, becauſe the air is not intimately mixed with it, but acts only on the outſide, and the quantity of burning matter in the ſurface of a ſmall flame is too ſmall to produce much effect.

But when flame is produced in large quantity, and is properly mixed and agitated with air, its power to heat bodies is immenſely increaſed. It is therefore peculiarly proper for heating large quantities of matter to a violent degree, eſpecially if the contact of ſolid fuel with ſuch matter is inconvenient. Flaming fuel is uſed for this reaſon in many operations performed on large quantities of metal, or metallic minerals, in the making of glaſs, and in the baking or

burning of all kinds of earthen ware. The potter's kiln is a cylindrical cavity, filled from the bottom to the top with columns of wares, the only interſtices are thoſe that are left between the columns; and the flame, when produced in ſufficient quantity, proves a torrent of liquid fire, conſtantly flowing up through the whole of the interſtices, and heats the whole pile in an equal manner.

Flaming fuel is alſo proper in many works or manufactories, in which much fuel is conſumed, as in breweries, diſtilleries, and the like. In ſuch works, it is evidently worth while to contrive the furnaces ſo that heat may be obtained from the volatile parts of the fuel, as well as from the fixed; for when this is done, leſs fuel ſerves the purpoſe than would otherwiſe be neceſſary. But this is little attended to, or ill underſtood in many of thoſe manufactories. It is not uncommon to ſee vaſt clouds of black ſmoke and vapour coming out of their vents. This happens in conſequence of their throwing too large a quantity of crude fuel into the furnace at once. The heat is not ſufficient to inflame it quickly, and the conſequence is a great loſs of heat. See LABORATORY.

It is a known truth, that fuel cannot conſume by means of heat alone, without the admiſſion of freſh air, and this is no way more clearly proved, than by this eaſy experiment. Let a ſtrong cylinder of iron, hollow within, be fitted with a firm ſcrew at each end; in the cavity of this cylinder encloſe a long piece of charcoal, an then ſcrew up both the ends faſt, and place the whole in a ſtrong fire; let it continue there for ſeveral hours; and when it is taken out and cooled, open it, and the piece of charcoal will be found ſtill black, in its own form, and no way apparently altered or diminiſhed.

It is plain from this, that the conſumption of fuel depends upon the rarefaction, diſlodgment, briſk agitation, and diſcharge of its inflammable vapour, by means of freſh air; and hence we have the reaſon of the known rule of extinguiſhing fires by ſmothering them.

It is provided by ſtatute, that wood fuel ſhall not be felled under the aſſize. See BILLET and FAGGOTS.

FUEN, in *Geography*, a river of China, which runs into the Hoang, in the province of Chan-ſi. N. lat. 35° 29'. E. long. 110° 14'.

FUENARABIA, or FUENTERABIA. See FONTARABIA.

FUENCALIENTE, a town of Spain, in Old Caſtile, near the ſource of the Xalon; 15 miles N. of Siguença.

FUEN-HOA-FOU, a city of China, in the province of Pe-tcheli, celebrated for its extent and the number of its inhabitants, as well as for the beauty of its ſtreets and triumphal arches. It is ſituated near the great wall, amidſt mountains, and has under its juriſdiction, beſides two cities of the ſecond, and eight of the third claſs, a great number of fortreſſes which bar the entrance of China againſt the Tartars. Among the animals of the adjacent territory, the moſt remarkable are yellow rats; which are much larger than thoſe ſeen in Europe, and whoſe ſkins are much valued by the Chineſe. The contiguous mountains afford cryſtal, marble, and porphyry.

FUENSALIDA, a town of Spain, in New Caſtile; 18 miles N.N.W. of Toledo.

FUEN-SI, a town of China, of the third rank, in the province of Chan-ſi; 12 miles W.N.W. of Teho.

FUEN-TCHEOU-FOU, an ancient and commercial city of China, in the province of Chan-ſi, ſituated on the river Fuen-ho; its baths and ſprings, almoſt as hot as boiling water, attract a great number of ſtrangers, who contribute greatly to its opulence. To its diſtrict belong one city of the ſecond, and ſeven of the third claſs. N. lat. 37° 20'. E. long. 111° 26'.

FUENTE, LA, a town of Spain, in Aſturia; 20 miles S.W. of Santillana.

FUENTE *Duenna*, a town of Spain, in New Caſtile, ſituated on the Tagus; 24 miles S.E. of Madrid.

FUENTE-*Ginaldo*, a town of Spain, in Eſtremadura, uſed by the Spaniards in the ſucceſſion-war as a depôt for corn and cattle; 16 miles N.W. of Coria.

FUENTE *de Nanſa*, a town of Spain, in Aſturia; 28 miles S.W. of Santander.

FUENTE-*el-Olmo*, a town of Spain, in Old Caſtile, between Segovia and Aranda de Duero.

FUENTE *Ovejuna*, a town of Spain, in the province of Cordova; 32 miles N.W. of Cordova.

FUENTE *de la Piedra*, a village of Spain, in the province of Grenada, having a medicinal ſpring, of virtues known to the ancients, and celebrated for curing various diſorders, particularly the gravel; 6 miles from Antequera.

FUENTE *de la Reyna*, a town of Spain, in Valencia; 15 miles N. of Segorbe.

FUENTE *del Sabuco*, or *de Saburro*, a town of Spain, in the kingdom of Leon; 16 miles from Salamanca.

FUENTELSOL, a town of Spain, having a Carthuſian monaſtery, in Aragon, ſeated on the Ebro; 20 miles S.S.E. of Saragoſſa.

FUENTES, FORT, a fort of Switzerland, founded by the count de Fuentes, governor of Milan, in 1603, completed in 1606, and called by his name. It is ſeated upon an inſulated rock, about 1½ mile from the neareſt ridge of mountains, and two miles from lake Como, ſo that it completely commands the only great opening which leads into the Valteline, either from the Milaneſe or the Griſons; and of courſe it was a ſituation of great importance, when the poſſeſſion of the Valteline was an object of conſequence to the houſe of Auſtria. The fortifications are a quarter of a mile in circumference, conſtructed with ſtone, and contain a few ruinous barracks for ſoldiers, and the governor's houſe, which is in a wretched condition. The plain below the rock is marſhy, and renders the fort extremely inſalubrious. The Spaniards were accuſtomed to ſtyle this place, from its peculiar ſituation, the *yoke* of the Griſons, while the Griſons, in alluſion to its bad air, termed it, with greater propriety, the *grave* of the Spaniards. The view from the fort is remarkably picturеſque, on one ſide the rich Valteline, watered by the turbulent Adda; on the other, the lakes of Como and Chiavenna, beautifully encircled with numerous towns and villages. The hills which ſkirt the Valteline and the lake of Como preſent a variegated landſcape of foreſts, cornfields, and paſtures, finely contraſted, towards the Griſons, by the Rhætian Alps covered with eternal ſnow.

FUENTES, a town of Spain, in the province of Leon; 13 miles N.W. of Placentia.

FUENTES *de Onoro*, a town of Spain, in the province of Leon; 13 miles W. of Cividad Rodrigo.

FUERTE *de St. Joſef*, a town of South America, in the province of Tucuman; 95 miles N.E. of St. Miguel de Tucuman.

FUERTE *de Valbena*, a town of South America, in the province of Tucuman, on the Salado; 60 miles E.N.E. of St. Miguel de Tucuman.

FUESSEN, or FUSSEN, a town of Germany, in the biſhopric of Augſburg, ſituated on the Leech, and a frontier town to Bavaria and the Tyroleſe, with a Benedictine abbey

abbey and convent of Franciſcans; 47 miles S. of Augſburg. N. lat. 47° 34'. E. long. 10° 43'.

FUESSLI, JOHN-GASPARD, in *Biography*, an ingenious artiſt and writer, was born at Zurich in 1706; but having ſtudied the principles of painting under his father, he went to Vienna about the year 1724, without any means of ſupport, and without recommendations to thoſe whoſe patronage might be beneficial to him. Here, however, he attracted the notice of the principal nobility, and meeting with encouragement, in every reſpect adequate to his wants, he reſided at Vienna, till, at the earneſt ſolicitation of prince Schwarzenberg, he was induced to go to Radſtadt, where he became a favourite of the margravine, who was anxious to convert him to the Catholic religion. From Radſtadt he went to Nuremberg, where he formed an intimate friendſhip with the celebrated Rupezki, under whom he ſtudied, with a view to improve himſelf in his profeſſion. He next viſited Augſburg and Munich, and returned to Swiſſerland, where he arrived in his thirty-fourth year, and ſoon after married. His talents now claimed the reſpect of the moſt eminent artiſts. By Mengs he was preſented with a MS. treatiſe "On the Beautiful," which he publiſhed with a preface. With Winkelman he lived in the cloſeſt habits of friendſhip, and being as zealouſly attached to the beauties of poetry as he was famous as a painter, he maintained a correſpondence with Kleiſt, Klopſtock, Wieland, Bodmer, and other great men of the age. In the years 1740 and 1742, he loſt two of his beſt friends Rupezki and Rugendas, and being deſirous that men ſo eminent, and for whom he felt ſo ſtrong an affection, ſhould not be forgotten by poſterity, he wrote a biographical account of them. This, his firſt attempt in the department of literature, meeting with a very favourable reception, he ſet about reſcuing from oblivion ſome of his meritorious countrymen, by publiſhing as complete a hiſtory as poſſible of the artiſts of Swiſſerland. In this work, which he completed with great labour, perſeverance, and patience, he ſhewed himſelf a good writer and a ſound critic in the arts. He died at Zurich in May 1782, leaving behind him a moſt reſpectable character. He had very long been regarded as worthy the eſteem and friendſhip of perſons of the higheſt rank and eminence. But though accuſtomed to live with the great, he diſdained the arts of adulation, and was free and open in his manners and behaviour. His houſe was the reſort for thoſe who cultivated and were attached to the arts. His circumſtances were always very moderate, yet he was not deficient in his ſupport of men of letters, and was ready to ſerve thoſe who ſtood in need of his help. "Negligent," ſays his biographer, "in regard to himſelf, he was careful of others; and, though incapable of knocking at the doors of the great on his own account, he was not aſhamed to collect money from them when he had it in his power to contribute towards the ſupport of any child of misfortune." Moreri.

FUFA, in *Geography*, a town of Japan, in the iſland of Niphon; 140 miles W.N.W. of Jeddo.

FUGA, one of the iſlands called Barbuaynes, about 22 miles in circumference. N. lat. 19°. E. long. 121° 27'.

FUGA *Demonum*, in *Botany*, a name uſed by ſome authors for the hypericum, or St. John's wort.

FUGA, Ital. from *fugere*, Latin, to fly, a movement in *Muſic*, in which the leading part or firſt treble is purſued by the ſecond, the ſecond treble by the tenor, and the tenor by the baſe; ſo that a *fugue* is a *flight* and a *purſuit*. This ſubject has been ſo amply treated in the article COUNTERPOINT, to which the reader is referred, that little remains to be added to it here, except to recapitulate its laws, and the doctrines of learned harmoniſts in ſupport of them. Rouſſeau defines a fugue "a piece of muſic in which a trait of melody, called the *ſubject*, is treated, according to certain eſtabliſhed rules of harmony and modulation in making it paſs ſucceſſively and alternately from one part to another." The ſubject reſembles the *text* of a ſermon, out of which all that is ſaid ſhould naturally ariſe, and ſerve as a commentary and illuſtration. But though, for variety, or to indulge caprice, fugues and canons have been compoſed in all intervals, yet orthodox contrapuntiſts allow no fugues to be regular, but thoſe of which the anſwer is made in the fifth, fourth, eighth, or uniſon, as then the intervals will be the ſame. And of the anſwers, the preference is given to the fifth, then to the fourth, eighth and uniſon; as the effect is pleaſing in that order. It muſt be remembered that the ſubject itſelf, as of all other movements, ſhould begin on the key note, its fifth or its eighth. Of the various rules by which a true anſwer to a fugue may be tried, Dr. Pepuſch adviſes *ſolmiſation*; Padre Martini the modes of the Romiſh church, called *authentic* and *plagal*; both good in the three hexachords and their minor relatives; but in tranſpoſed keys, in which ſeveral flats or ſharps occur at the clef, there is no rule more certain and unexceptionable than giving the anſwer in exactly the ſame intervals as the ſubject, only remembering that if one part riſes a fifth, the other will only riſe a fourth, as C ♯ — G ♯ — G ♯ — C ♯ — *et e contra*: as G — C ♯ — C ♯ — G ♯. See AUTHENTIC, and PLAGAL. But this is only in leading off. The reſt of the anſwer muſt be in the ſame intervals, and characters for time, as the ſubject, except in prolation, augmentation and diminution, which give the anſwer in longer or ſhorter notes than the theme. See PROLATION, AUGMENTATION, and DIMINUTION. All fugues and canons are *imitations*; but the term *imitation* is only applied to irregular fugues, when the intervals are not the ſame. The anſwer to a regular fugue may commence in the middle of the ſubject, which will unite them together, and make them reciprocally accompaniments to each other. It were impoſſible to enumerate all the ingenious contrivances that have been uſed in the works of great fughiſts. The following are the moſt frequent.

FUGA *per Arſin et Theſin*, or fugue in contrary motion.

FUGA *per Contrari Movimenti*.

FUGA *in Conſequenza*, is ſometimes uſed for canon.

FUGA *Omofona*, a fugue in uniſon.

FUGA *Libera*, free fugue. A canon is ſo called.

FUGA *Legata*, and a ſtrict fugue, a canon.

FUGA *Perpetua*, perpetual fugue.

FUGA *Vacui*, in *Ancient School Philoſophy*, a ſuppoſed averſion in nature to a vacuum.

Moſt of the phenomena which the ancients aſcribed to the fuga vacui, the moderns have demonſtrated to ariſe from the gravity and preſſure of the air. This is the caſe in the aſcent of water in ſyringes, pumps, &c.

FUGALIA, in *Antiquity*, a feaſt celebrated among the Romans, ſuppoſed by ſome to be the ſame with the regifugium, held on the 24th of February, in memory of the expulſion of the kings, and the aboliſhing of the monarchical government. Struvius, Antiq. Rom. Syntag. cap. 9. diſtinguiſhes the fugalia from the regifuge; and even doubts whether the regifugium were thus called on account of the expulſion of the kings, or becauſe the rex ſacrorum, after the ſacrifice was ended, fled haſtily out of the forum and comitia.

Be this as it will, the only ancient author of note that makes expreſs mention of the fugalia is St. Auguſtine, De Civitate Dei, lib. ii. cap. 6. And his commentator Vives ſhews a great inclination to correct the reading of the word,

word, were it not that St. Auguſtine adds, that the feaſt was a true fugalia, all decency and modeſty being baniſhed from it.

That learned perſon conjectures, that the fugalia were the ſame thing with the poplifugia, or the feaſt of Fugia, the goddeſs of joy, occaſioned by the rout of an enemy, which was the reaſon why the people abandoned themſelves to riot and debauchery; and that the feaſt was firſt inſtituted on occaſion of the victory gained over the Ficulnates, Fidenates, and neighbouring nations, upon their attempt to take poſſeſſion of Rome, the day after the people had withdrawn from it, as related by Varro, lib. v. de Ling. Lat.

But, according to Varro, the poplifugia which fell in the month of June, were held in memory of the flight or retreat of the people, in a ſedition raiſed among them: it is true, he adds, that the day followed ſoon after the retreat of the Gauls, and the time when the neighbouring nations conſpired againſt them: but this does not appear to have any relation to the poplifugia, being only meant to mark the era or time when the ſedition and flight of the Roman people happened. After all, though the poplifugia might have been originally eſtabliſhed in commemoration of the flight of the people, and not that of the enemies, this does not hinder, but the fugalia of St. Auguſtine may probably be the poplifugia of Varro, according to the conjecture of Vives.

FUGAM Fecit, in *Law*, a term uſed where it is found, by inquiſition, that a perſon fled for felony, &c. And if flight and felony be found on an indictment for felony, or before the coroner, where a murder is committed, the offender ſhall forfeit all his goods, and the iſſues of his lands, till he is acquitted or pardoned; and it is held that when one indicted of any capital crime, before juſtices of oyer, &c. is acquitted at his trial, but found to have fled, he ſhall, notwithſtanding his acquittal, forfeit his goods, but not the iſſues of his lands, becauſe by the acquittal the land is diſcharged, and conſequently the iſſues. 3 Inſt. 218. H. P. C. 27. 2 Hawk. P. C. 450. The party may, in all caſes, except that of the coroner's inqueſt, traverſe the finding of a fugam fecit; and the particulars of the goods found to be forfeited, may be always traverſed; alſo whenever the indictment againſt a man is inſufficient, the finding of a fugam fecit will not hurt him. 2 Hawk. 451. Making default in appearance on indictment, &c. whereby outlawry is awarded, is a flight in law.

FUGAS, in *Geography*, a river of Africa, which runs into the Indian ſea, near Jubo, on the coaſt of Zanguebar.

FUGHE, Ital. the plural of *fuga*, fugues. See Double Counterpoint.

During the rage for fugues, air, accent, grace, and expreſſion were equally unknown to the compoſer, performer, and the hearer; and whatever notes of one voice or inſtrument were in tune with another, were welcome to the player, provided he found himſelf honoured from time to time with a ſhare of the ſubject, or principal melody; which happening more frequently in canons, and fugues, than in any other ſpecies of compoſition, contributed to keep them ſo long in favour with performers of limited powers, however tireſome they may have been to the hearers, when conſtructed on dull and barren themes. It has been ſaid by M. Marpurg (Traité de la Fugue), that fugues enjoy the privilege of greater longevity than any other ſpecies of muſic. A good fugue is an evergreen, and never grows old-faſhioned; but then it muſt be conſtructed on a pleaſing and fertile ſubject, and carried on with ſpirit; and a fugue on a dull and dry ſubject, however correct the compoſition, is a monotonous and tireſome compoſition.

The greateſt fughiſts, in practice on the organ, during the laſt century, were, doubtleſs, Sebaſtian Bach and Handel; but the moſt learned theoriſts and writers on the ſubject of fugue, whoſe treatiſes we have conſulted and doctrines adopted, are Dr. Pepuſch, Padre Martini, and the late Sig. Nicolo Sala. From the publications of theſe reſpectable authors, we have given in the muſic plates, ſubjects and fragments of fugues in 2, 3, and 4 parts, to ſhew enquirers into the art what are regarded as true anſwers to regular fugues. But we inform the young ſtudent, that even great fughiſts, beſtowing no thought on *melody*, beſides their inattention to *phraſeology*, are equally indifferent about *accent*; ſo intent is their ſearch after harmony and contrivance, that if the accents of the anſwers are ever the ſame as in the ſubject, it is more by accident than deſign. But if the accents of the anſwers differ from thoſe of the theme, the imitation is imperfect, and the whole compoſition becomes confuſed and unintelligible.

FUGI'LE. The ceruminous ſecretion of the ear; alſo an appearance in the urine like wax. The term has likewiſe two different ſurgical ſignifications; ſometimes it means a bubo; ſometimes, a ſwelling of the parotid gland.

FUGITIVA, La, in *Geography*, a ſmall iſland in the Pacific ocean, diſcovered by Quiros in the year 1606. S. lat. 14° 20′. W. long. 151° 50′.

FUGITIVE, *Refugee*, a perſon obliged to fly his country, or remove from a place where he had ſome abode or eſtabliſhment, on account of his crimes, debts, or on other occaſions.

In the Roman law, a fugitive ſlave was ſuch a one as was apt to run away from his maſter. And in ſelling a ſlave, the maſter was obliged to declare, whether or not he were fugitive.

The term is alſo applied to deſerters in an army, or thoſe who fly from the combat.

Fugitives' *Goods*, *bona fugitivorum*, the proper goods of him that flies upon felony, which, after the flight lawfully found on record, do belong to the king, or lord of the manor. 5 Rep. 109.

Fugitives *over Sea*, are perſons that go over ſea without the king's licence, who, unleſs they are merchants, or eminent perſons, or king's ſoldiers, forfeit their goods; and maſters of ſhips, &c. carrying ſuch perſons beyond ſea, ſhall forfeit their veſſels; and alſo, if the ſearcher of any port ſhall negligently ſuffer any perſons to paſs, he ſhall be impriſoned, &c. Stat. 9 Edw. III. cap. 10. and 5 Ric. II. cap. 2. Theſe ancient ſtatutes are obſolete, if not expired.

Fugitive *Pieces*, among the learned, denote thoſe little compoſitions which are printed on looſe ſheets, or half ſheets; thus called, becauſe eaſily loſt, and ſoon forgot.

FUGLOE. See Fogloe.

Fugue. See Fuga.

There are three kinds of fugues; the *ſingle fugue*, *double fugue*, and *counter-fugue*.

Fugue, *ſingle* or *ſimple*, is ſome point conſiſting of 4, 5, 6, or any other number of notes, begun by one ſingle part, and then ſeconded by a third, fourth, fifth, and ſixth part, if the compoſition conſiſts of ſo many, repeating the ſame, or ſuch like notes; ſo that the ſeveral parts follow, or come in, one after another, in the ſame manner, the leading parts ſtill flying before thoſe which follow.

Fugue, *double*, is when two or more different points move together in a fugue, and are alternately interchanged by ſeveral parts.

For

For the *Counter-fugue*, ſee COUNTER-*fugue*.

The Italians ſay, a *fugue*, or *flight of rooms*, or *chambers*, meaning a ſeries, or range of rooms, the doors whereof anſwer in a right line behind each other, ſo as they may be all ſeen at once, from one extreme to the other.

FUHME, in *Geography*, a river of Germany, which runs into the Mulda, 2 miles S. of Ragune, in the electorate of Saxony.

FUH-SANAH, a town of Africa, in the country of Tunis; 110 miles W.S.W. of Tunis.

FUHSE, a river of Germany, which runs into the Allier, near Zell.

FUIRENA, in *Botany*, ſo named by Rottböll in memory of George Fuiren, a Daniſh botaniſt. Rottb. Gram. 70. Linn. Suppl. 11. Nov. Gram. Gen. 25. Schreb. 40. Willd. Sp. Pl. v. 1. 255. Juſſ. 26. Lamarck, t. 39. Claſs and order, *Triandria Monogynia*. Nat. Ord. *Calamariæ*, Linn. *Cyperoideæ*, Juſſ.

Gen. Ch. *Cal.* Spike round, imbricated on all ſides, with wedge-ſhaped, channelled, three-keeled ſcales, each tipped with a ſhort ſtraight awn. *Cor.* Glumes three, rather membranous, inverſely heart-ſhaped, flat, entire, with an incurved terminal awn. *Stam.* Filaments three, linear, inſerted into the receptacle within the baſe of each glume of the corolla; anthers linear, erect. *Piſt.* Germen ſuperior, large, triangular; ſtyle thread-ſhaped; ſtigmas two, revolute. *Peric.* none, except the withered corolla. *Seed* one, naked, triangular, deſtitute of down.

Eſſ. Ch. Spike imbricated, with abrupt awned ſcales. Corolla of three obcordate awned valves. Seed ſolitary, triangular, beardleſs.

1. F. *umbellata*. Rottb. Gram. 70. t. 19. f. 3. (F. paniculata; Linn. Suppl. 105.) Native of Surinam. *Stem* two or three feet high, ſimple, angular, ſtriated. *Leaves* ſheathing, broadiſh, ribbed, acute, glaucous; their ſheaths hairy. *Flower-ſtalks* axillary and terminal, bearing ſeveral ſeſſile umbels of ſoft blueiſh ſpikes, half an inch long. This is the only ſpecies, and is not known, except in a dried ſtate, to European botaniſts. Its habit is that of a *Cyperus* or *Scirpus*, but the glaucous hue is remarkable.

FULBERT, in *Biography*, a learned French prelate, who flouriſhed at the latter end of the tenth and in the commencement of the eleventh centuries, was an Italian by birth. He was a diſciple of Gerbert, who aſcended the pontifical throne in 999, under the name of Sylveſter II. From Rome he came to France, and delivered public lectures. Here his ſcholars were very numerous, who, imbibing the inſtructions of their maſter, diffuſed his learning and various information over France and Germany, and the other northern ſtates of Europe, ſo that Fulbert is juſtly regarded as one of the principal reſtorers of learning and of the ſciences in that age. Some hiſtorians aſſert that he was chancellor of France, but others contend that his chancellorſhip extended only to the church of Chartres. In 1007 he was appointed to the vacant ſee of Chartres, and governed the church with great prudence upwards of twenty years. In conjunction with this biſhopric he held the treaſurerſhip of St. Hilary at Poictiers, but he expended the profits of the ſituation in rebuilding his cathedral church. Fulbert was highly eſteemed by Robert, king of France, by Canute, and Richard II. of England; by the dukes of Normandy and Aquitaine, and by other eminent princes and great men of his time. He was author of many theological pieces, but the moſt valuable extant is a collection of "Letters" by himſelf and friends, to the number of 134. He died in the year 1028. All his works were collected and publiſhed in a ſeparate form at Paris in 1608: they are alſo inſerted in the 17th vol. of the Bibliotheca Patrum. Fulbert was a friend to literature and ſcience, but not in the beſt ſenſe of the term; for he was an enemy to freedom of enquiry, and a furious zealot againſt thoſe who ventured to diſſent from any of the doctrines of the eſtabliſhed church. Moreri.

FULCIMENT, in *Natural Hiſtory*, is a term for the plant-like bodies, formed by zoophytic animals, as habitations or ſupports, and which, according to their conſiſtence, are denominated *coral*, *coralline*, or *ſponge*, &c. The application of this term to the ſcientific diſcrimination and arrangement of organic foſſils, or *reliquia* of this kind, will be found in Martin's "Outlines of the Knowledge of extraneous Foſſils," p. 88. 97. and 103. See RELIQUIA.

FULCRA, in *Botany* and *Vegetable Phyſiology*, the Props, or rather Appendages, of the herbage of many plants. We prefer this latter term in Engliſh, becauſe though the word *fulcrum* means a prop or ſupport, it is, in that ſenſe, not applicable to more than one kind of the organs in queſtion, the tendril. See CIRRUS.

Theſe appendages are of ſeven kinds.

1. *Stipula*. The Stipula or Stipulas. Theſe are an appendage to the proper leaves or to their footſtalks, commonly ſituated at the baſe of the latter, in pairs, as in the Roſe, the Pea family, and others. In the Coffee, *Gardenia*, and others of the Rubiaceous family, as well as in the common genus *Polygonum*, they are intrafoliaceous and ſimple, embracing the ſtem within (or above) the leaf-ſtalks. In theſe caſes the Stipulas are permanent; in the Tulip-tree, *Liriodendron*, they are in pairs, and fall off as the leaves unfold. In graſſes the ſimple ſtipula crowns the inſide of the ſheath of their leaf. This is idly termed *ligula* by ſome, for it is a real *ſtipula*.

2. *Bractea*. The Floral Leaf. This is a leafy appendage proper to the flower or its ſtalk, various in form and duration, ſometimes coloured, as in the Purple or Pink-topped Clary, *Salvia Horminum*.

3. *Spina*. A Thorn. Proceeds from the wood itſelf, being a modification of the materials of a bud, and is found in *Hippophae*, *Rhamnus*, and various ſpecies of *Cratægus* or *Meſpilus*. It is liable to diſappear by culture.

4. *Aculeus*. A Prickle. Ariſes from the bark only, and is ſtripped off with it, having no connection with the wood. Examples are found in the Roſe, Bramble, and Gooſeberry. The prickle does not diſappear in conſequence of culture like the *Spina*.

5. *Cirrus*. A tendril or claſper, by which moſt climbing plants are ſupported upon others. To this the word prop is therefore juſtly applied. See CIRRUS.

6. *Glandula*. A gland, or little tumour diſcharging a fluid, as in the viſcid clothing of the calyx and ſtalk of a Roſe, eſpecially the Moſs-roſe, and many ſimilar inſtances. The liquor diſcharged is either reſinous, and often aromatic, or ſweet and viſcid like honey.

7. *Pilus*. A Hair, including the various rough, hairy, or downy clothing of plants. This in the nettle conſiſts of an excretory duct, diſcharging a venomous fluid through each hair or briſtle, and the ſame holds good in divers plants whoſe hairy coats exude a clammy moiſture, to all which the Linnæan idea of a *pilus* is ſuitable, that it is "an excretory duct, of a briſtle-like form," differing therefore in ſhape only from the *glandula*. But in the greater number of caſes the hairs are merely a protection againſt cold, heat, or animals. They are often hooked, forked, branched, or entangled. Very generally they are curiouſly jointed and tubular; ſometimes they are flat, like minute ſhavings; ſometimes,

sometimes, as in Viper's Bugloſs, they are bulbous or tuberous at the baſe, and as hard as a ſhell in that part. The hairs of many of the Mallow family, and ſome ſpecies of *Croton* and *Solanum*, are beautifully and curiouſly ſtellated, and compoſe ſometimes a ſoft, ſometimes a very harſh coat to the whole of the leaves, ſtalks, and calyx.—The pubeſcence of plants varies greatly in degree according to circumſtances, but its direction is found to be very conſtant, affording good ſpecific characters in *Mentha*, *Myoſotis*, and *Fragaria*. In the latter the poſition or direction of the hairs ſeems to be aſcertained with more certainty after the plants are dried, which may account for its having been generally overlooked. See FRAGARIA.

FULCRUM, PROP, in *Mechanics*. See LEVER and HYPOMOCHLION.

FULDA, CHARLES-FREDERIC, in *Biography*, was born at Wimpfen, in Swabia, and educated at the gymnaſium of Stuttgard, near Tubingen. In the year 1748 he was appointed chaplain to a regiment in Holland. When this was diſbanded, which happened in a few months, he made a tour through various parts of Germany, and in 1749, completed his ſtudies at Gottingen. His firſt literary production was a prize diſſertation on the principal dialects of the German language, which was crowned by the Royal Society of Gottingen, and the facts and reaſonings of which he introduced, ſome years after, in his "Dictionary of the German Roots." After this he publiſhed another work, entitled an "Enquiry into Language." He did not confine his reſearches to language alone, but extended them to hiſtory and antiquities in general. Of this he gave various proofs in his many publications; but his principal work, and which is regarded as a treaſure of hiſtorical knowledge, ingenuity, and inventive genius, is his Chart of Hiſtory, publiſhed at Augſburg in 1783. In early life he was accuſtomed to render different objects of knowledge eaſier to be retained in the memory by graphic repreſentations; and when he was farther advanced he exhibited, in a ſort of genealogical tree, the connection of all the ſciences, profeſſions, arts, and handicrafts. He repreſented, in a ſimilar manner, in 1787, all the organs of ſpeech, with the origin of human language. Fulda died at Einzigen, in December 1788. Though he devoted his intellectual endowments to the cultivation of language, and the inveſtigation of its principles and philoſophy, yet he was converſant with all the ſciences; and was an excellent practical mechanic; made his own houſehold furniture; alſo implements for weaving; and worked them himſelf with great ſucceſs. Gen. Biog.

FULDA, in *Geography*, a biſhopric and principality of Germany, in the circle of the Upper Rhine, bounded on the N. by Heſſe-Caſſel, on the E. by the county of Henneberg, on the S. by the biſhopric of Wurzburg, and on the W. by the principality of Iſenburg and Heſſe; about 40 miles in length, and from 7 to 25 in breadth. The country is mountainous and woody, with ſome rich arable lands, and ſome ſalt and medicinal ſprings. From being a cloiſter of Benedictine monks, erected in 744, this biſhopric was formed in 1752 by pope Benedict XIV. In 1802 this biſhopric was given to the prince of Naſſau Dillenberg, late Stadtholder, as an indemnity for this office, and his dominions in Holland.

FULDA, a city of Germany, and capital of the above-mentioned biſhopric, ſituated on the river Fulda. It was made a town in the year 1162; and became the reſidence of the biſhop. Beſides the cathedral, it has a collegiate church, an univerſity founded in the year 1734, a college, an academy, and a convent of Benedictines. It is ſituated nearly in the centre of the dioceſe; the chapter of which is compoſed of thirteen canons. The library contains a number of ancient and rare manuſcripts. It is diſtant 63 miles E.N.E. from Mentz. N. lat. 50° 33′ 57″. E. long. 9° 43′ 45″.

FULDA, a river of Germany, in the circle of Upper Rhine, which paſſes by the town of Fulda, and joining the Werra at Minden, their confluence forms the Weſer.

FULFULÆ, in *Ancient Geography*, a town of Italy, in the country of the Samnites.

FULGENIA, or FULGENEVA, FOLIGNI, or FOLIGNO, in *Geography*, a town of Italy, in Ombria.

FULGENTIUS, in *Biography*, an African prelate in the ſixth century, was a deſcendant from an illuſtrious family of Carthage, but born at Lepte, in the province of Byzacena, about the year 468. He was early introduced to the ancient languages, and made ſo much progreſs, that while he was a boy he could repeat the whole of Homer, and even converſe in the Greek language with purity and fluency. At a proper age he was recommended to a poſt under government, which, however, not being agreeable to his mind, he relinquiſhed, in order that he might retire from the world and embrace a religious life. Fulgentius entered a monaſtery under the diſcipline of Fauſtus, and when this community was diſperſed by perſecution, he entered into another, where the high opinion entertained of his ſanctity and zeal occaſioned his being appointed colleague with Felix, the ſuperior of that inſtitution. The Moors, in a ſhort time, ſcattered in all directions the religious of this monaſtery, and Felix and Fulgentius were ſubjected to much cruel perſecution and perſonal ſufferings. Fulgentius afterwards embarked for Egypt, but having touched at Syracuſe he was perſuaded to abandon the idea of proceeding on his voyage. He went to Rome in the year 500, and having offered his devotions at the pretended ſepulchres of the apoſtles, returned to Africa, where he eſtabliſhed a new monaſtery; but his attachment to a ſolitary way of life led him to deſire a greater degree of privacy, and he reſolved to withdraw to a ſecluded ſpot among the Venetian Iſlands. His ſuperiors, however, inſiſted upon employing his talents in the catholic cauſe, and compelled him to return to his monaſtery, under the penalty of incurring excommunication. He was now ordained preſbyter, and in 504, or as others affirm in 508, he was conſecrated biſhop of Ruſpa. After this he was baniſhed in common with the other catholic biſhops of Africa to the iſland of Sardinia: here, though a junior among his brethren, he was called upon, from the known ſuperiority of his talents, to exerciſe his pen in the vindication of themſelves and their depreſſed cauſe. In the year 522 Fulgentius, and his fellow-ſufferers, were recalled and met with a joyful reception from the orthodox in Africa. Fulgentius appears to have ſpent the remainder of his life in tranquillity, diſcharging the duties of his epiſcopate with great diligence and prudence, and rendering himſelf highly uſeful by his piety and exemplary manners. He was frequently appointed to preſide at the ſynods which were held by his party. He died in the year 533, leaving behind him numerous treatiſes in theological controverſy. Fulgentius has been praiſed for the correctneſs and clearneſs of his creed, his intimate knowledge of the ſacred ſcriptures, his eloquence in addreſs, and his ſubtlety in argumentation. He has been called the Auguſtine of his age, becauſe he not only conformed to the tenets held and juſtified by that father, but imitated his ſtyle. He had many good qualities, but theſe were debaſed by the ſuperſtitious notions of religion and devotion that he had early imbibed: and by the credit of his character and influence, the ſpirit of monkery was widely diſſeminated among the chriſtians in Africa.

FULGO, in *Geography*, a river of Hindooſtan, which runs into the Mahany; 10 miles N.N.W. of Bahar.

FULGORA, in *Entomology*, a genus of hemiptera in the Linneæan ſyſtem, *Ryngota* of Fabricius, and *Orthoptera* of Lamarck, and later French writers.

This genus is characteriſed by having the head hollow, inflated, and extended forward; the antennæ ſhort, ſeated beneath the eyes, and conſiſting of two joints, the outer one larger and globular; beak elongated, inflected, and containing four joints; and the legs formed for leaping.

The fulgora ſeem to have entirely eſcaped the attention of European naturaliſts till within the ſpace of the laſt century, when an intereſting account, accompanied with figures, of the ſpecies lanternaria appeared in the coſtly volumes of Madame Merian's "Inſectorum Surinamenſium;" and about the ſame period the deſcription of another example of the ſpecies was given by Dr. Grew of London, in his work entitled "Muſeum Regalis Societatis." The hiſtory of this inſect, as related by Merian, is indeed ſurpriſing, and was much diſcredited in the firſt inſtance, notwithſtanding that the account given by that lady was in part corroborated by the teſtimony of Dr. Grew, and ſo far as reſpected the luminous property of that extraordinary creature, her veracity is completely confirmed by his authority. The paſſage to which we chiefly allude is to the following effect: "Once" ſays Madame Merian "when the Indians brought me a number of theſe lantern carriers, I put them into a wooden box, without being aware of their ſhining at night; but one night being awakened by an unuſual noiſe, and much frightened, I jumped out of bed and ordered a light, not knowing whence the noiſe proceeded. We ſoon perceived that it originated in the box, which we opened with ſome inquietude, but were ſtill more alarmed, after opening it and letting it fall on the ground, for a flame appeared to iſſue from it which ſeemed to receive additional luſtre, as often as another flew out of it. When we obſerved this ſome time, we recovered from our terror, and admired the ſplendour of theſe little animals." "Diſſert. de Generatione et Metamorphibus, &c." Theſe remarks are ſanctioned by Grew, when he obſerves that the circumſtance "which beſide the figure of the head is moſt wonderful in this inſect (Cucujus Peruvianus) is the ſhining property of the ſame part, whereby it looks at night like a lantern, ſo that two or three of theſe faſtened to a ſtick, or otherwiſe conveniently diſpoſed of, will give ſufficient light to thoſe who walk or travel in the night."

Relations ſimilar to the above are given by the miſſionaries who traverſed South America; nor does the fact appear to be conteſted except by Renard, who, in contradiction to thoſe writers, aſſures us that this extraordinary inſect does not emit light. That Madame Merian has committed a ſerious though perhaps hitherto undetected error in delineating this fulgora as the offſpring of the great cicada of Surinam, is very evident, and the commiſſion of this alone ſhould incline us to be cautious in repoſing implicit reliance on her obſervations; but as to the actual exiſtence of phoſphoric light in this individual ſpecies of fulgora, as recorded in her publication, we cannot reaſonably entertain the ſlighteſt doubt. It is even poſſible that obſerver of nature may be correct, and Renard alſo, ſince, like the lampyrides, the inſect may poſſeſs the power to diſplay or withdraw its luminous appearance at pleaſure, or this appearance may be aſſumed only at particular ſeaſons, and in that caſe probably at the period of their amours. Whether however the light emitted by this ſpecies of fulgora be permanent or not, it is ſufficiently evident on the teſtimony of thoſe who have witneſſed its ſhining properties, that the light produced is remarkably powerful and clear. Pere du Tertre declares in his "Hiſtoire des Antilles" that he could diſtinctly read his prayers by the light of one of them; and Leſſer, in his "Theologie des Inſectes," affirms that the Indians keep them in their houſes, and require no other light in the night time; an inſect of this ſort being ſufficient ſo far to illuminate an apartment of moderate ſize, as to enable its inhabitants to perform whatever houſhold work may be neceſſary.

The fulgora lanternaria was the only ſpecimen of this ſingular tribe of inſects known, till about the middle of the eighteenth century, when that curious and very abundant kind the Chineſe lantern-carrier (F. Candelaria) was brought to Europe. An account of this inſect was given by Roeſel, who at the ſame time obſerves, that he had never ſeen or heard of it in the works of any author. The tranſactions of the Stockholm academy include however the earlieſt figure and deſcription of this ſpecies, and it was from this ſource Linnæus introduced it into his Syſtema Naturæ. At firſt Linnæus referred it with the great lantern-carrier to the coleopterous order, under the appellation of lanternariæ; in a ſubſequent edition they are incorporated with his cicadæ, and laſtly they were allowed to conſtitute a diſtinct genus under the name which they retain at preſent.

The details afforded in the works of the above-mentioned writers, reſpecting the luminous properties of theſe inſects, awakened conſiderable attention among naturaliſts, as we learn from Degeer, Seba, Reaumur, and others; and ſome progreſs was alſo made in the aſcertainment of other ſpecies of the ſame tribe, eſpecially by the firſt of thoſe authors, notwithſtanding which, however, it is only within the laſt twenty or thirty years that we have become acquainted with the greater number of the ſpecies which compoſe the genus at this time. It does not appear that more than ten ſpecies were known to Linnæus, and thoſe including all that were deſcribed by Degeer, Seba, and others of his predeceſſors, but the total amount of thoſe inſerted in the works of Fabricius, Drury, Stoll, Donovan, and others, have increaſed that number to about thirty ſpecies.

The light diſſeminated by the luminous kinds of fulgora, (for it does not appear that all the ſpecies inherit this property) is generally imagined to iſſue from the trunk, or elongated projection of the forehead, but Roeſel offers a conjecture on that emitted by the fulgora lanternaria, which on further inveſtigation may enable naturaliſts to determine whether the light be entirely produced by an innate property of the trunk, or whether the inſect does not receive at leaſt an additional degree of ſplendour from ſome external cauſe. He notices a white farinaceous ſubſtance beſprinkled over various parts of the wings and body, as well as the trunk, which he obſerves looks like wood in that ſtate of decay when it aſſumes a ſhining aſpect in the dark. The ſame idea has occurred to us: we have frequently, if not invariably, found a ſimilar white powder on other inſects of this genus, which are known to be of the luminous kinds; and it is therefore poſſible, in our opinion, that its preſence may tend to increaſe, though it does not abſolutely excite, that vivid glow of light which theſe inſects unqueſtionably exhibit.

Reaumur endeavoured to diſcover the origin of this phoſphoric appearance in the fulgora lanternaria, and found, on diſſecting the trunk, that it was completely empty, which is indeed the truth in all the ſpecies of this tribe we have examined. But the obſervation advanced by Reaumur, as a late French author (Latreille) has well remarked, proves nothing, becauſe it is very likely that in the living inſect this cavity is filled with fluid matter, which dries or evapo-

rates with the other juices of its body after the inſect dies, and therefore, that until an opportunity be afforded to ſome intelligent naturaliſt to inſpect the trunk of the living inſect, we muſt remain in uncertainty whether that organ be excluſively the ſeat of that animated phoſphoric matter which renders the creature luminous, or whether, as before remarked, the farinaceous dots may not contribute, in a greater or leſs degree, to increaſe the ſplendour of its appearance. For a more ample diſcuſſion of this intereſting ſubject the reader may be referred to the remarks on the fulgora candelaria, in Donovan's "Inſects of China," and thoſe of fulgora pyrrorhynchus, feſtiva, and hyalinata, in the "Inſects of India," by the ſame author.

Species.

LANTERNARIA. Front extended, ſtraight; wing-caſes variegated; wings with a large ocellated ſpot on each. Linn.

A ſpecies far exceeding the reſt in magnitude, its length being from three to four inches, and the expanſion, when the wings and wing-caſes are extended, about ſeven inches. The trunk is remarkably large in proportion to the ſize of the inſect, and of a yellowiſh brown colour ſimilar to that of the wing-caſes; the wings in general rather paler. The whole ſurface is prettily variegated with dots of brown and black, and on the trunk in particular are a few conſpicuous ſpots of bright red on each ſide. When in fine condition, the wings, wing-caſes, and body, both above and beneath, are moſt elegantly dotted with ſpecks of fine white powder, but which is of a texture ſo extremely delicate as to rub off with almoſt the ſlighteſt touch of the finger. This is the powder before mentioned, and which is ſuppoſed to poſſeſs the property of emitting a phoſphoric light. It is a native of South America.

CANDELARIA. Front extended, aſcending; wing-caſes green, ſpotted with yellow; wings yellow, with black tips. Linn.

Der kleinere Aſiatiſche oder Chineſiſche lanternen-trager, Roeſ. *De gewapende cicade*, Stoll. *Chineſe lantern carrier*, Donov. Inſ. China.

This inſect is found in great abundance in ſome of the Chineſe provinces, and is occaſionally brought, with other inſects, common in that empire, to the European factories for ſale as an object of curioſity. It is a ſpecies of elegant appearance, and when in fine preſervation is obſerved to be beſprinkled with a kind of farinaceous ſubſtance on the wings and body, ſimilar to that on the fulgora lanternaria, though in a very inconſiderable degree.

SERRATA. Front roſtrated, aſcending, and armed with four ſeries of ſerrations. Seba, &c.

This extremely curious and uncommon ſpecies of fulgora is a native of Surinam; and is in ſize the ſame as that of the Chineſe lantern-fly; in form it alſo nearly correſponds, but the four diſtinct ſeries of ſharp teeth with which the extended ſnout is furniſhed, independently of its diſſimilarity in colour, at once remove this inſect, not only from the Chineſe ſpecies, but from every other of the fulgora tribe. The wing-caſes are brown, and the wings reddiſh, with an elegant ocellated ſpot near the tip. The only example of this intereſting inſect we are acquainted with is in the cabinet of A. Macleay, Eſq.

DIADEMA. Front extended, muricated, and trifid at the tip; wings black with red margin. Linn. *Fulgora armata*, Drury.

A rare ſpecies found in India.

PYRRORHYNCHUS. Trunk aſcending; apex red; wing-caſes brown with a pale band acroſs the middle; wings black, at the baſe green. Donov. Inſ. India.

Deſcribed from an unique ſpecimen brought many years ago from the interior of Hindooſtan by governor Holford. Its general outline is not unlike that of the Chineſe lantern-fly, fulgora candelaria, which latter however it materially exceeds in ſize. The colours are remarkably vivid in this inſect, yet nothing is more worthy of mention than the peculiar beauty of its trunk, the organ through which the "living light" is diffuſed; this is of a very rich and deep purple, from the baſe upwards to the apex, and the apex itſelf of a fine ſcarlet, and ſomewhat pellucid. The nocturnal appearance of this extraordinary creature, when on the wing, is conceived to be infinitely more ſingular than that of any known ſpecies of fulgora, the lampyrides, or other luminous inſects yet diſcovered, as the illuminated apex muſt naturally reſemble a globule of fire, or heated iron, and the numberleſs phoſphoric dots, relieved by the purple colour of the tube, appear like a train of glittering ſtars behind it.

The only figure of a fulgora in any reſpect reſembling this ſpecies is given in the work of Stohl, under the title of "De Groote Goene Coromandeliſche Lantaarndrager" (green lantern-carrier fly of Coromandel). The general aſpect of theſe latter inſects accords with the preſent ſpecies, except in the ſtructure of the trunk, which is altogether different, being recurved, tapering gradually from the baſe to an acute point at the apex, and of an olive black colour. The following account of this inſect is given by Stohl "In De Nederlandſche Kabinetten," &c. "This inſect was not known in the cabinets of the Low Countries till within the laſt three years (A.D. 1780.) during which time a few were brought from Tranquebar, on the Coromandel coaſt, to the cabinet of natural curioſities of his royal highneſs the Stadtholder of the United Provinces, of which I have been obligingly permitted to take the figure of a female, by Monſ. Voſmar, to whom I owe my public acknowledgments for it." The rarity of the above deſcribed inſects will afford a ſufficient apology for the introduction of theſe little anecdotes concerning them.

PHOSPHOREA. Front ſubulate, extended, and aſcending; body grey glaucous. Linn. *Cicada filiroſtris*, Degeer.

Native of Surinam.

NOCTIVIDA. Front roſtrated, pointed, and aſcending; body green; wings hyaline. Linn. *Cicada coniroſtris*, Degeer.

Inhabits ſame country as the preceding.

LUCERNA. Front roſtrated and prominent; body above greeniſh, beneath yellow. Linn. *Cicada breviroſtris*, Degeer.

A South American ſpecies.

FLAMMEA. Front roſtrated, aſcending, roundiſh, and truncated. Linn.

Native of South America.

TENEBROSA. Front roſtrated, ſtraight, and truncated; wing-caſes ſcabrous and grey. Fabr. *Cicada lanternaria fuſca*, &c. Degeer.

The head of this inſect is fuſcous, with the front rufous; thorax and wing-caſes rough with raiſed dots; and the wings duſky. Inhabits Guinea.

OBSCURATA. Front roſtrated, ſtraight, and truncated; wing-caſes cinereous with black ſpots. Fabr. Donov. Inſ. New Holland.

An inſect of ſmall ſize, deſcribed by Fabricius, from the Bankſian cabinet: the ſpecies inhabits New Holland; its ſnout is the length of the body, of a black colour with the baſe white, and marked with white dots, and two white bands;

bands; the thorax is brown; wings white, and legs black and white varied.

ADSCENDENS. Front extended, aſcending, and ſubulate; wing-caſes ferruginous brown, dotted with white. Fabr.

A native of Cayenne, deſcribed by Fabricius, from the cabinet of Rohr. The ſize of this inſect is ſmall; the ſnout above black, beneath yellow; head beneath yellow with two oblique black ſtreaks, and a black dorſal line above; wings hyaline; body yellow, and border of the abdomen black on the back.

FASCIATA. Frontr oſtrated and aſcending; wing-caſes ferruginous brown, with two green bands, and a dot of green behind. Fabr.

Inhabits ſame country as the laſt, and is about the ſame ſize; the head is conic and grooved, yellow with the back brown; thorax brown; body yellow; and abdomen rufous above.

TRUNCATA. Front ſomewhat obtuſe; wings green and truncated. Linn.

Native of India.

PLANA. Front extended, flat, and yellowiſh; thorax and wing-caſes ferruginous. Fabr.

A ſmall ſpecies found in Cayenne; the head is grooved beneath; anterior edge of the thorax yellow; wing-caſes hyaline at the tip; body yellow; abdomen above ferruginous.

HYALINATA. Front conic, and unequal; wing-caſes hyaline, with a black ſtreak. Fabr. Donov. Inſ. India.

This curious inſect, and which till very lately was conſidered extremely rare, is found according to Mr. Fichtel (who brought a number of them to Europe) in very conſiderable abundance in the vicinity of Bengal. Its ſize is moderate; the front conic, unequal above, and grooved beneath; the colour pale, inclining to browniſh, with ſtreaks and ſpecks of black. The eyes are large, white, and globular; thorax pale ſpeckled with black; the wings hyaline, with a black ſpot at the tip.

PALLIPES. Front extended and flat; wing-caſes green, with hyaline tips. Fabr.

Size of fulgora plana; the head black, with a whitiſh margin extending entirely round; the thorax greeniſh, with a black blotch on the fore part; wing-caſes rather yellowiſh at the baſe, with a ſtreak of black ſpots at the tip; beneath yellow; wings hyaline.

FOLIUM. Front extended, ſhort, and ſtraight: body yellow-green; wings very large, vertical and compreſſed. Degeer.

Native of America.

FESTIVA. Front conic; wing-caſes brown, the outer margin greeniſh, with black and fulvous dots; wings red at the baſe. Fabr. Donov. Inſ. India.

Inhabits Coromandel. The head is flat above and of a brown colour, beneath yellowiſh edged with black; thorax brown; wings ſanguineous red with the tips brown.

EUROPÆA. Front conic; body green; wings hyaline and reticulated. Linn.

Native of France and Germany, and has been once diſcovered in England. Vide Donov. Britiſh Inſects. The ſize is ſmall, ſcarcely exceeding that of the carrion or fleſh fly; the colour throughout a delicate pea-green; the wings and wing-caſes hyaline, with the nerves of the ſame green colour as the body.

FENESTRATA. Front conic, and furrowed; wing-caſes hyaline, with a marginal fuſcous ſpot. Fabr.

An African ſpecies deſcribed from the Bankſian cabinet; it is rather leſs than the laſt; the front yellowiſh; wings without ſpots.

MINUTA. Front conic; head and thorax yellowiſh; dorſal line and wing-caſes whitiſh. Fabr.

A ſmall ſpecies found in Saxony; the antennæ are ſhort and thick; body entirely yellowiſh, with a white dorſal line on the head and thorax, and the wing-caſes pale.

LIMBATA. Fuſcous with hyaline wing-caſes, marked with two brown ſpots on the diſk, and many on the borders; the nerves punctured. Fabr.

Size of the laſt, and alſo inhabits Saxony; the antennæ are ſhort, thick, and ſetaceous at the tip; wing-caſes longer than the body; wings hyaline and immaculate.

PELLUCIDA. Brown; wing-caſes white, hyaline, and immaculate. Fabr.

Native of Saxony. The body entirely brown, and the legs teſtaceous. Size of the former.

FLAVESCENS. Yellowiſh; wing-caſes hyaline and without ſpots. Fabr.

The antennæ of this ſpecies are ſhort, thick, and cetaceous at the end; the head and thorax yellowiſh without ſpots; body yellowiſh. This inhabits Saxony, and is of the ſame ſize as the preceding.

STRIATA. Yellowiſh; head black and ſtriated; wing-caſes yellowiſh, hyaline, and immaculate. Fabr.

Reſembles the foregoing in ſize, and alſo inhabits Saxony. The head is black ſtriated with yellow; thorax yellowiſh, and the abdomen beneath black at the baſe.

MARGINATA. Black; head ſtreaked with yellowiſh; anterior edge of the thorax with the legs yellowiſh; wing-caſes hyaline. Fabr.

This correſponds in ſize with the former; the antennæ are duſky and thick, and the head black with three yellowiſh ſtreaks; the body black, and the legs yellowiſh. A native of Saxony.

Fabricius, who deſcribes the five laſt mentioned inſects, from examples in the cabinet of Hybner, ſuggeſts at the ſame time, that though he admits them among the fulgora, it is poſſible they ought rather to conſtitute a new genus, ſince they not only differ in their general habit from the true fulgora, but alſo in the ſtructure of their antennæ, which latter objection is certainly materially worthy of conſideration in the eſtabliſhment of an eſſential character. We may perhaps beſides add, with ſome propriety, in ſpeaking of this genus generally, as adopted both by Linnæus and Fabricius, that ſome advantage would ariſe to the entomologiſt, were thoſe ſpecies of the fulgora which have the trunk conſiderably elongated, to be removed from thoſe which have the front very ſlightly advanced, or projected at leaſt in ſuch an inconſpicuous degree as rather to approach the cicada than fulgora tribe. The latter we conceive might conſtitute a diſtinct genus.

FULGOSIO, RAPHAEL, in *Biography*, generally ſuppoſed to be a native of Placentia, was profeſſor of the law in the college there, and likewiſe at Pavia. He afterwards occupied the profeſſor's chair at Padua, where he had a large ſalary. For his great knowledge in juriſprudence he was ſent to the council of Conſtance, and was of great uſe to that aſſembly by his dexterity and profound knowledge. He was often delegated on public buſineſs to Venice. He died in 1427, and a very ſplendid monument was erected to his memory in the church of St. Anthony at Padua. He was author of many learned works, as Commentaries upon the Code and Digeſt, Councils, &c. Moreri.

FULGURATING PHOSPHORUS, a term uſed by ſome Engliſh writers to expreſs a ſubſtance of the phoſphorous kind, the preparation of which does not ſeem to have been well known to any but the inventor of it. It

was prepared both in a liquid and a dry form, and not only ſhone in the dark in both ſtates, but communicated its light to the things it was rubbed on. If incloſed in a glaſs veſſel well ſtopped, it ſometimes would fulgurate, or throw out little flaſhes of light, and ſometimes fill the whole vial with waves of flame. It does not need recruiting its light at the fire, or in the ſunſhine, like the phoſphorus of the Bolonian ſtone, but of itſelf continues in a ſtate of ſhining for ſeveral years together, and is ſeen as ſoon as expoſed in the dark; the ſolid or dry matter always reſembling a burning coal of fire, though not conſuming itſelf. Phil. Tranſ. N° 134. See PHOSPHORUS.

FULHAM, in *Geography*, a village of England, in the county of Middleſex, ſeated on the Thames, over which is a bridge, which is ſubject to a toll for foot paſſengers, as well as cattle and carriages. In 1801 the number of inhabitants were 4428. The biſhop of London has a palace here; 4 miles W. of London.

FULICA, in *Ornithology*, a genus of the grallæ, with the bill convex, the upper mandible arched over the lower at the edge, and the lower gibbous near the tip; noſtrils oblong; front bald, and feet four-toed and pinnate. The genus is divided into two families, gallinule and coot; the firſt of which have the feet cleft, the other pinnate; this is the arrangement adopted by Linnæus. Some writers conſider theſe families as generically diſtinct, allowing only thoſe with pinnated feet to remain in the genus fulica, and conſtituting the others as a genus under the name of gallinule. The latter appears to be the moſt correct diſtribution of theſe birds according to their natural character, as they not only differ in the ſtructure of their feet, but in other eſſential particulars. The gallinules have the upper mandible membranaceous at the baſe, and the wings concave: the coots have the mandibles equal, and the noſtrils oval, narrow, and ſhort. Both tribes frequent watery places, and feed on worms, inſects, and ſmall fiſh.

Species.

FUSCA. Front and bracelets yellowiſh; body browniſh. Gmel. *Fulica albiventris*, Scop. *Gallinula minor*, Briſſ. *Rallus Italorum*, Geſner. *Poulette d'eau*, Buff. *Brown Gallinule.*

This bird inhabits France, the neighbourhood of Venice, and other ſouthern parts of Europe. Its haunts are the ſame as that of the common gallinule, but though it frequents the ſame places, it never aſſociates with that ſpecies, its diſpoſition being ſhy and ſolitary. The fleſh is in eſteem.

The length of this bird is about 12 inches. There is another analogous kind, and which is commonly conſidered as a variety, ſuperior to this in ſize, the length being 18 inches. The latter is the gallinula major of Briſſon; the body is cheſnut above, beneath cinereous, with the feathers edged with white; head and neck blackiſh, and the lower part of the belly white.

CHLOROPUS. Front tawny; bracelets red; body blackiſh. Scop. *Gallinula chloropus major*, Aldrovandus. *Poule d'eau*, Buff. *Common water-hen, or moor-hen*, Ray. *Common gallinule*, Lath. Donov. Britiſh Birds, &c.

The moor-hen is a native of America as well as Europe, and is about fourteen inches in length. Though from the ſhortneſs of the wings it flies with difficulty, it runs with great facility, and ſwims well. It frequents the borders of ponds, and rivers that are ſheltered with weeds, and builds near the water ſide upon low trees or ſhrubs; the neſt is compoſed of herbage, and contains about ſeven eggs, which are of a yellowiſh white colour, marked with irregular brown reddiſh ſpots. Theſe birds lay twice or thrice in the ſeaſon.

The bill of this bird is red with the tip greeniſh; the irides red; body above ſooty black mixed with olive, beneath cinereous; the outer edge of the wings and lower tail-coverts white, and legs greeniſh.

VIRIDIS. Above greeniſh, beneath white; front, bill, and legs greeniſh yellow. Gmel. *Porphyrio viridis*, Briſſ. *Poule ſultane verte*, Buff. *Green gallinule*, Lath.

A native of the Eaſt Indies. The length of this kind is eleven inches and a half; the bill of a greeniſh yellow; body above dull green, beneath white; the legs greyiſh yellow, with grey claws.

MELANOCEPHALA. Blue; head and neck black. Gmel. *Porphyrio melanocephalos*, Briſſ. *La Poule ſultane à tête noir*, ibid. *Black-headed gallinule*, Lath.

Entirely blue, except the head and neck, which are black, and a broad bare ſpace on the crown. In the female the crown and body above is tawny, the ſhoulders ſtreaked with white; wings greeniſh tinged with tawny, and the quill-feathers greeniſh blue. Native of America.

PURPUREA. Purple; bill pale; legs greeniſh yellow. Gmel. *Acintli*, Buff. *Quachilto*, Ray. *Crowing gallinule*, Lath.

Inhabits the marſhes of New Spain, and crows like a cock; the fleſh is good; called by the natives of Mexico yacacintli.

FLAVIROSTRIS. Above azure; throat blueiſh-white; belly and rump white; wings and tail brown; bill and legs yellow. Gmel. *La favorite de Cayenne*, Buff. *Favourite gallinule*, Lath.

Length 12 inches. Inhabits Cayenne.

PORPHYRIO. Front red; bracelets many; body green, beneath violet. Gmel. *Poule ſultane, et taleve de Madagaſcar*, Buff. *Purple water-hen*, Albin. *Purple gallinule*, Lath.

The bill and legs are red, irides tawny; head and neck above gloſſy violet; cheeks and throat violet-blue; back and rump gloſſy green; wings and rounded tail ſhining green; within brown. Size of a fowl, the bill and legs ſtout, the former compreſſed at the baſe. The female ſmaller than the male. This ſpecies inhabits in a greater or leſs abundance all the warmer parts of the globe; the female forms its neſt in reeds in marſhy places; lays three or four eggs, and ſits from three to four weeks. They are eaſily tamed, and domeſticated with the common poultry, and feed on fiſh, roots, fruits, ſeeds, and other ſimilar ſubſtances, and occaſionally, it is ſaid, like the parrot, will ſtand on one leg and lift the food to the mouth with the other. The fleſh is exquiſite.

VIOLACEA. Black violet; neck beneath blue; front and legs red. Lath. *Violet gallinule.*

Found with the laſt. The vent is white.

CARTHAGENA. Front blue; body rufous. Gmel. *Carthagena gallinule.*

Deſcribed by Jacquin as a native of Carthage in America. Size of the large black coot.

CAYANENSIS. Grey-brown; breaſt and upper part of the belly rufous, back and wings olive; chin whitiſh. Lath. *Grand poule d'eau de Cayenne*, Buff. *Cayenne gallinule.*

Very common in ſome parts of South America, where it frequents marſhy places, and feeds on fiſh and inſects. The bill is duſky at the tip; legs red, back tinged with olive. The length is eighteen inches.

RUFICOLLIS. Crown, neck above, with the back and quill-feathers brown; chin white; throat and breaſt rufous; belly,

belly, vent, and rump black. Gmel. *Black-bellied gallinule*, Lath.

The length of this bird is ſeventeen inches, the bill two inches and a half, red at the baſe, and at the tip yellow. The quill-feathers are rufous at the margin; flanks and lower wing-coverts faſciated with rufous and black. The legs long and red. Native place uncertain, but ſuppoſed to be Cayenne.

MADERASPATANA. Front and temples white; body above cinereous, beneath white. Gmel. *Porphyris maderaſpatanis*, Briſſ. *Angoli*. Buff. *Madras rail-hen*, Ray. *Madras gallinule*, Lath.

Inhabits the coaſt of Coromandel and Malabar, where it is known by the names of Boollu-cory, and Caunangoly. Its ſize is that of the common duck. The throat is marked with ſemi-circles; the quill-feathers cinereous, edged with black, and the bill and legs very long.

MARTINICENSIS. Front and bracelets blue; body violet. Jacquin. *Porphyrio minor*, Briſſ. *Petite poule-ſultane* Buff. *Martinico gallinule*.

Leſs than the common gallinule, being in length only twelve inches; the bill rather exceeds an inch, and is of a yellow colour, with the baſe red; the eyes are black; legs yellow; back and upper part of the wings greeniſh-brown; tail blackiſh above, beneath white. Inhabits the Weſt India iſlands.

NOVÆBORACENSIS. Legs brown; crown, and neck above olive ſpotted with white; back brown; breaſt dirty yellow. Gmel. *Yellow-breaſted gallinule*. Arct. Zool.

Size of a quail. The ſpecies inhabits New York.

NÆVIA. Bill and legs greeniſh; front ſaffron; feathers of the head and upper parts of the body black edged with rufous; margin of the dorſal feathers white; eye-brows white; wings and tail brown. Gmel. *Porphyrio nævius*. Briſſ. *Grinette*, Buff. *Small water-hen*. Albin. *Grinette gallinule*, Lath.

Length nine inches and three-quarters; the irides yellowiſh-green: chin, throat, and breaſt blueiſh-aſh ſpotted with black; tail-feathers on the outer edge, and two middle ones on both edges, white. Inhabits Italy.

MACULATA. Above reddiſh-brown; front and bill yellow; temples and throat white; wings ſpotted black and white; breaſt, belly and tail brown; two middle tail-feathers black tipt with white. Gmel. *Porphyrio punctulatus*, Briſſ. *Matkneltzel*, *Matkern*, Ray. *Speckled gallinule*.

Inhabits marſhes in Germany; its length is eleven inches; the bill of a dull yellow colour, and the legs grey.

FLAVIPES. Front and legs yellowiſh; head, body above, and tail rufous, ſpotted with black; beneath white; wings black. Gmel. *Porphyrio rufus*, Briſſ. *Gallinula ochropus major*, Ray. *Smirring*, Buff. *Yellow-legged gallinule*, Lath.

Native of Germany. The bill is yellow with black tip; margin of the eye-lids ſaffron; temples white; greater wing-coverts next the body white. Size of the common moor-hen.

FISTULANS. Front yellowiſh-green; body above brown. Beneath white, wings and tail brown. Gmel. *Porphyrio fuſcus*, Briſſ. *Glout*, Buff. *Piping gallinule*, Lath.

Inhabits borders of rivers in Germany, and feeds chiefly on ſmall fiſhes, worms, and inſects.

CINEREA. Cinereous, middle of the belly white. Gmel. *Creſted gallinule*. Lath.

Deſcribed from a ſpecimen in the Britiſh Muſeum, which is ſuppoſed to have been brought from China. The length is eighteen inches. Forehead and crown bare, of a reddiſh colour, and riſing into a knob at the back part, in a manner not unlike the caruncle on the head of the pintado; the chin is ſtriped with white; the back and wings greeniſh-aſh, the latter pale on the outer margin.

The above-mentioned ſpecies are of the gallinule, and the following of the coot tribe.

ATRA. Front fleſh-colour; bracelets greeniſh-yellow; body blackiſh. Scopoli. *Fulica*, Bellon. *Phalaris*, Geſner. *Foulque ou Morelle*, Buff. *Common coot*, Lath. Donov. Brit. Birds, &c.

A general inhabitant of Europe, Aſia, and America; frequents marſhy places, and forms a floating neſt among the ruſhes; the eggs are numerous, of a dirty-white colour, ſprinkled with minute ſpots of deep ferruginous. The young ſwim and dive with amazing facility almoſt as ſoon as hatched. Theſe birds feed on ſmall fiſhes, aquatic inſects and ſeeds, and in the winter ſeaſon are often found near the ſea. The bill is yellowiſh-white, and the front white, except in the pairing ſeaſon, when it becomes red; the legs are greeniſh-yellow, and the outer edge of the wings white.

ATERRIMA. Front white, bracelets red; body blackiſh. Gmel. *Fulica major*, Briſſ. *Grande foulque ou macroule*, Buff. *Blaeſſling*, Günther. *Greater coot*.

Differs from the laſt in being larger, and is perhaps not ſpecifically diſtinct from that kind. Found in Europe and Siberia.

AMERICANA. Cinereous; front, chin, and line in the middle of the belly white; legs blue-black. Gmel. *Cinereous coot*.

Larger than the common coot, and inhabits South America.

AETHIOPS. Entirely black. Sparrman Muſ. Carlſ.

Native place uncertain.

MEXICANA. Purple; front and bill red; back, wings and rump greeniſh. Gmel. *Yohoalcoachillin*, Ray. *Mexican coot*.

Inhabits New Spain, and is larger than the common coot. The bill is yellow at the tip; back, rump and wing-coverts varied with blue and tawny.

CRISTATA. Blue-black; naked front and crown red; caruncle red, bifid, and erect. Gmel. *Grande foulque à crête*, Buff. *Creſted coot*.

Length eighteen inches; bill whitiſh, with the baſe red, and legs duſky; bracelets of three colours, red, green, and yellow. The ſpecies inhabits Madagaſcar and China.

FULIGINOUS, an epithet applied to a thick ſmoke, or vapour, replete with ſoot or other craſs matter. See SMOKE.

The word is formed from the Latin *fuligo*, ſoot, and is rarely uſed but when joined with vapour

In the firſt fuſion of lead, there exhales a great deal of fuliginous vapour, which retained and collected, makes what we call *Litharge*; which ſee.

Lamp-black is what is gathered from the fuliginous vapours of pines, and other reſinous woods, when burnt. See *Lamp-*BLACK.

FULIGO METALLORUM, a term uſed by the chemiſts, ſometimes to expreſs arſenic, and ſometimes crude mercury.

FULIGULA, in *Ornithology*, a name given by Geſner to a ſpecies of duck, ſeeming to be the ſame with a kind common on the Yorkſhire ſhores; the *anas marila* of Linnæus. See DUCK. The ſame author alſo deſcribes another ſpecies under the name of *anas fuligula prima*, which ſeems the ſame with the *capo negro*, or *tufted duck*. See DUCK.

FULKE, WILLIAM, in *Biography*, was born in London about the middle of the ſixteenth century. In 1555 he was ſent to St. John's college Cambridge. From this univerſity he entered himſelf a ſtudent at Clifford's Inn London, and applied moſt diligently to the ſtudy of the law: but he had a ſecret deſire of quitting legal enquiries for theological inveſtigation, and returned to his college to purſue that courſe of ſtudy that ſhould ultimately fit him for the church.

His father, diſpleaſed at the change, refuſed to contribute to his ſupport. By the help of friends he contrived to maintain himſelf till he was choſen fellow of his college in the year 1564, and diſtinguiſhed himſelf by his proficiency in the different branches of learning, particularly in mathematics and theology. In the following year, when he was M. A. of three years ſtanding, he was incorporated in the ſame degree in the univerſity of Oxford. Having formed an intimate acquaintance wi.h the learned Thomas Cartwright, who was attached to the ſentiments of the puritans, Mr. Fulke embraced the ſame opinions, and is deſcribed by Anthony Wood, as jointly with Dr. Humphrey "ſtandard bearers, for a long time of the non-conformiſts, who did grow conformable in the end, as they grew riper in experience and ſager in judgment." By the public avowal of his ſentiments, he rendered himſelf ſo obnoxious, that he was expelled his college, and obliged to maintain himſelf by delivering lectures in his private apartments. After this he was patronized by the earl of Leiceſter who preſented him to the living of Warley in Eſſex, and afterwards to that of Didington in Suſſex; he then took his degree of doctor in divinity at Cambridge by mandamus, and went to France in the capacity of chaplain to the Engliſh embaſſy. Upon his return he was appointed maſter of Pembroke hall, and lady Margaret's profeſſor. He died in 1589: as a young man he ſuſtained the character of a good philoſopher, and in more advanced life, that of a pious and ſolid divine. He was author of numerous treatiſes, chiefly controverſial, but the moſt important of his works is a "Comment upon the Rheims Teſtament," firſt publiſhed in 1580, and reprinted in 1617, with the title of "the Text of the New Teſtament of Jeſus Chriſt, tranſlated out of the vulgar Latin by the papiſts, &c. with arguments of books, chapters, and annotations, pretending to diſcover the corruption of divers tranſlations: whereunto is added the tranſlation out of the original Greek, commonly uſed in the church of England, with a confutation of all ſuch arguments," &c. He was author likewiſe of "A Defence of the ſincere and true Tranſlation of the Holy Scriptures into the Engliſh Tongue againſt the cavils of Gregorio." Martin. Gen. Biog.

FULL is variouſly uſed, in oppoſition to empty, narrow, confined, &c.

The Carteſians hold, that the univerſe is full, *i. e.* that every part or point has matter in it.

An ambaſſador has full power given him to act, tranſact, &c. The army was in full march, *i. e.* the whole army was in march, with all the forces it conſiſted of.

A man is ſaid to bear the arms of a family full, *i. e.* without any difference or diminution.

FULL *Age.* See AGE, in *Law.*

FULL *Arms.* See ARMS.

FULL *Forfeiture.* See FORFEITURE.

FULL *Moon, plenilunium,* that phaſis of the moon, when her whole diſk or face is illuminated; which is in the time of her oppoſition to the ſun.

Eclipſes of the moon always happen at or near the time of full-moon. See ECLIPSE.

FULL *and by,* a *Sea-phraſe,* denoting a ſituation of a ſhip with regard to the wind, when ſhe is cloſe-hauled, and ſailing in ſuch a manner, as neither to ſteer too nigh the direction of the wind, nor to deviate to leeward, both of which movements are unfavourable to her courſe: as in the former her ſails will ſhiver, and render the effort of the wind precarious and ineffectual; and in the latter ſhe will advance in a direction widely diſtant from her real courſe. Hence, "keep her full" is the order from the pilot or other officer, to the helmſman, not to incline too much to windward, and thereby ſhake the ſails ſo as to retard the courſe. Falconer.

FULLER, a workman employed in the manufactories, to full, mill, or ſcour cloths, rateens, ſerges, and other woollen ſtuffs, by means of a mill, to render them thicker, and more compact and durable.

The word is formed of the Latin *fullo,* which ſignifies the ſame thing.

The fullers amongthe Romans waſhed, ſcoured, and fitted up cloaths; and their office was judged of that importance, that there were formal laws preſcribed them for the manner of performing it. Such was the Lex Metalla de Fullonibus. See alſo Pliny, lib. vii. cap. 56. Ulpian, leg. 12. ff. de Furtis, lib. xiii. § 6. Locati, lib. xii. § 6 ff. &c. See FULLING.

FULLER, NICHOLAS, in *Biography,* a learned Engliſh divine, was born at Southampton in the year 1557, where he received his education. After this he was taken into the family of Dr. Horne biſhop of Wincheſter, and had an ample opportunity of purſuing his ſtudies, till at length he was made ſecretary to that prelate. Upon the death of biſhop Horne, he was choſen to the ſame office under Dr. Watſon his ſucceſſor, but in the courſe of a few months he determined to retire, in order that he might devote himſelf to literary purſuits, more congenial to his temper than a life of active buſineſs. Before his plans were well arranged, he was invited to become the tutor to the ſons of a gentleman in Hampſhire, two of whom he accompanied to the univerſity of Oxford in the year 1584, and matriculated, at the ſame time with them, as a member of St. John's college. Having ſpent ſome time in this learned ſeminary, and having taken both his degrees in arts, he was admitted to orders, and preſented with a ſmall living in Wiltſhire; and though its income was very inadequate to his comfortable maintenance, yet he felt contented, as it afforded him leiſure to apply himſelf to his literary and critical ſtudies. His ſkill in the learned languages, and his publications tending to illuſtrate the ſcriptures, gave him conſiderable celebrity, but it was not till late in life that he obtained any ſubſtantial reward for his various merits. He was at an advanced age made prebendary of Saliſbury, and preferred to the rectory of Biſhop's Waltham in Hampſhire, which he did not long enjoy. He died in 1622-3, at the age of ſixty-five years. His works are the "Miſcellanea Theologica," and a defence of the ſame againſt Druſius, who had charged him with plagiariſm. The "Miſcellanea," are inſerted in the ninth volume of the "Critici Sacri," and they may be found diſperſed in Pool's "Synopſis Criticorum." He was author of "An Expoſition of Rabbi Mordecai Nathan's Hebrew Roots with Notes;" and a "Lexicon," which remain in M. S. in the Bodleian library.

FULLER, *Nicholas,* contemporary of the preceding, was a barriſter, who boldly reſiſted the oppreſſion of archbiſhop Bancroft, and his brethren of the high-commiſſion court, againſt a miniſter and a merchant of the town of Yarmouth, who were impriſoned for being preſent at a conventicle, as it was denominated. He obtained a writ to bring them to the bar, when he moved for their liberation upon the principle that the high commiſſioners were not impowered by law to impriſon any of his majeſty's ſubjects. His pleas were ineffectual for his clients, and at the advice of Bancroft, who affected to regard Fuller as the champion of the non-conformiſts, this vindicator of the rights of the ſubject, was himſelf ſhut up in cloſe confinement, and there kept till the day of his death.

FULLER, *Thomas,* ſon of an eminent clergyman, was born at Aldwinkle in Northamptonſhire, in 1608. He made, under the inſtructions of the father, ſo rapid a progreſs, that at twelve years of age he was deemed fitted for the

ſtudies of an univerſity. He was accordingly ſent to Queen's college, where he applied himſelf with ſo much ardour and ſucceſs that he took his degrees with great applauſe in the years 1624 and 1628. He removed from Queen's to Sidney college, and was choſen miniſter of St. Bennet's pariſh, in the town of Cambridge. In 1631, he obtained a fellowſhip in Sidney college, and was almoſt at the ſame time collated to a prebend in the cathedral church of Saliſbury. Soon after this he was ordained prieſt, and preſented to the rectory of Broad Windſor in Dorſetſhire. In the year 1641, the nation being threatened by a civil war, Mr. Fuller, for the ſake of greater ſecurity, and in the expectation of better opportunities for his ſtudies, and a more ready acceſs to books, removed to London, where he acquired high reputation as a popular preacher, and was choſen lecturer of the Savoy in the Strand. Mr. Fuller was a member of the convocation, but diſapproved and reſiſted ſome of its meaſures which he thought to be of very dangerous conſequence. He was, nevertheleſs, zealouſly attached to the king, and by his open avowal in defence of the royal party, he was brought into danger with the parliament, who, in the end, deprived him of all means of ſubſiſtence, and of a church to preach in. He now engaged as chaplain to ſir Ralph Hopton, the duties of which office he conſtantly exerciſed as the army moved from place to place, omitting, however, no opportunity, as occaſions might occur, of purſuing his favourite ſtudies, and of making hiſtorical collections for his work, well known by the title of the "Worthies of England." Mr. Fuller, in ſeveral inſtances, was uſeful in animating the troops in defence of the cauſe for which they were contending. In the year 1643, he was appointed chaplain to the infant princeſs Henrietta Maria, who reſided at Exeter, and here he remained till that city ſurrendered in 1646, to the parliament forces, when he was permitted, without any reſtrictions, to remove to London. He was now choſen lecturer at Clement's Lane, in Lombard Street, whence he ſoon removed to St. Bride's church, Fleet Street. Some offence being taken, he was for a ſhort time ſuſpended from the functions of a preacher, but in 1648, he was allowed to proceed in his duty, and was preſented to the living of Waltham Abbey, Eſſex. Mr. Fuller ſpent that, and the following year, between the metropolis and Waltham, employing engravers to embelliſh with maps and other copper plate engravings his view of the Holy Land, entitled, "A Piſgah ſight of Paleſtine, and the Confines thereof, with the Hiſtory of the Old and New Teſtament acted thereon." This was publiſhed in folio in the year 1650, and in the following year he laid before the public a collection of lives, ſome written by himſelf, and ſome by others, of religious reformers, martyrs, &c. under the title of "Abel Redivivus." In 1656, he publiſhed his "Church Hiſtory of Britain from the Birth of Chriſt to the year 1648:" "The Hiſtory of the Univerſity of Cambridge ſince the Conqueſt;" and "The Hiſtory of Waltham Abbey." About the year 1659 or 1660, Mr. Fuller was invited to another living in Eſſex, where he exerciſed his miniſterial labours till he was appointed chaplain to lord Berkeley, who preſented him with the living of Cranford, in Middleſex. He afterwards went with his lordſhip to the Hague, to congratulate Charles II. on his reſtoration. He was now appointed chaplain to his majeſty, created doctor of divinity at Cambridge, and was in a fair road to a biſhopric, but taking a journey to Saliſbury, on the buſineſs of his prebend, he was attacked with a fever which put an end to his life in the year 1661. The laſt literary work on which his attention was employed was his "Hiſtory of the Worthies of England," part of which was printed during his life, and the reſt from his papers after his death. It was publiſhed in 1662, in folio. Beſides the works already mentioned, he was author of many others of which we may notice "David's hainous ſin, heærtie Repentance, and heævie Puniſhment," in 8vo., and a "Hiſtory of the Holy War," which laſt went through ſeveral editions. He printed likewiſe a ſermon which was preached at Weſtminſter abbey on occaſion of the king's commencing hoſtilities againſt his parliament, from the words "Yea let them take all, ſo that my Lord the King return in Peace." The funeral of this worthy man was performed by the direction and at the expence of lord Berkeley, and it was attended by two hundred of the clergy. Mr. Fuller had a very remarkable memory; he could repeat five hundred ſtrange and unconnected words after twice hearing them; and a ſermon, verbatim, after he had heard it once; he undertook, after paſſing from Temple Bar to the fartheſt part of Cheapſide and back again, to mention all the ſigns then over the ſhops, as they ſtood in order, on both ſides of the ſtreets repeating them backwards and forwards, and performed the taſk with great exactneſs. He had a great vein of wit, which is thought to have injured his writings; they nevertheleſs are repoſitories of much valuable and uſeful information. Biog. Brit.

FULLERS' *Earth*, in *Mineralogy*, *Argilla Smectis*, Waller; *Talcum fullonum*, Wern.; *Talcum Smectis*, Linn.; *Fullonia communis*, Forſt.; *Argille Smectite*, Haüy; *Terre à foulon*, Fr.; *Walker-Erde*, Germ.; *Walk-lera*, Swed.; a ſpecies of earth, which from the predominance of ſilex as a conſtituent part, (at leaſt in the varieties analyzed by Bergmann and Klaproth,) ſhould be referred to the ſiliceous genus, though Werner, guided by what he terms the characteriſtic component part, places it in the firſt diviſion of his talc genus, together with bole, native talc earth, and écume de mèr. Emmerling places it in his flint genus, in the ſame manner as all the varieties of common clay are transferred by him to that genus. It is fruitleſs to enter on any diſcuſſion with regard to the place a foſſil is to occupy in a ſyſtem, before all its relations, orycto-gnoſtical, chemical, and geological, are thoroughly underſtood; and this is more than at preſent can be ſaid of fullers' earth, which, in common with other mineral ſubſtances, denominated from the particular uſes to which they may be applied, is, both by collectors and writers, continually confounded with other ſubſtances, eſpecially with varieties of common clay. Hence it is that we find ſo very contradictory deſcriptions of the characters of this earth. The following external characters are principally derived from the varieties found in England, in Saxony, (particularly at Roſſwein, at the foot of the Saxon Ertzgebirge) in Auſtria, Moravia, the Palatinate, Alſace, and Sileſia. Many of thoſe from other parts of Europe that we have had an opportunity of ſeeing in collections, appeared to partake too much of the nature of common clay, others of that of ſteatite, while others again exhibited characters belonging to varieties of marle.

Fullers' earth is generally of a greeniſh colour, more or leſs mixed with brown and grey, together with a portion of yellow, by which various ſhades of dirty olive green are produced; ſometimes the yellow predominates, and a yellowiſh grey appears, paſſing over (in the genuine *Lemnian earth*, which, as we ſhall ſhew hereafter, cannot be ſeparated from fullers' earth,) into whitiſh grey. It is alſo found of various ſhades of red: that of Sileſia is tile red, ſometimes ſprinkled with white and green ſpots. Often ſeveral of the juſt mentioned colours are intimately; but mechanically, mixed; which, in ſome, can be obſerved only with the aſſiſtance of a magnifying glaſs. The brown colour, both uniform and in ſpots, is generally owing to an accidental admixture of iron ochre.

It

It has been found maſſive only, ſometimes conſtituting whole fletz-ſtrata. Large maſſes, on being ſeparated, generally diſunite into ſmaller pieces, when expoſed to the influence of the atmoſphere.

Internally it is more or leſs dull; its fracture being earthy, generally of a fine grain: often it appears perfectly conchoidal, and even ſlaty; but commonly the fragments are indeterminately angular and blunt-edged, and in the latter caſe perfectly opaque: in the pureſt varieties the edges are ſometimes tranſlucent. When ſcratched with the nail of the finger, or cut with a knife, it becomes ſmooth and ſhining.

It is very ſoft, almoſt friable, and mild; feels more or leſs greaſy, and ſcarcely adheres to the tongue. It does not ſoil. Specific gravity about 2.

Genuine fullers' earth does not effervеſce with nitrous acid; nor are all varieties of it inſtantly reduced into powder by that acid. But ſmall pieces put into water almoſt inſtantly crumble into conical heaps of minute, very ſoft particles, without producing a crackling noiſe, as is the caſe with bole; neither does a foaming take place, as has been copied by moſt authors from Cronſtedt, who attributes this quality to a fullers' earth found at Oſmund in Dalarne.

Though fuſible *per ſe*, it requires a high degree of heat: that of Hampſhire, according to Klaproth, melted in the charcoal crucible into a denſe, dark-grey, opaque ſlag, which had loſt 0.25 of its original weight, and contained many grains of iron. In the clay crucible the ſame was reduced to a cloſe, blackiſh, green ſlag, with ſoft, reddiſh, punctated ſurface. Mr. Brongniart ſays, that of Woburn melted into a ſlaggy maſs at 120° of Wedgewood's pyrometer. The variegated kind of fullers' earth (according to the late Mr. Wiedenmann's experiments,) acquired before the blow-pipe a grey, or greyiſh black colour; and a whitiſh variety, thus acted upon, became ſtill whiter: but neither of them manifeſted any ſigns of fuſion, except at the ſharp edges of the fragments. The ſame appears to hold good with all genuine varieties of this mineral ſubſtance; whence the obſervation of the late Mr. Fichtel, that the true fullers' earth "melts with great eaſe before the blow-pipe, often with ebullition and increaſe of its bulk," is undoubtedly founded in error.

Bergmann was the firſt who analyzed what he ſtyles fullers' earth, from Hampſhire; and all ſubſequent mineralogical writers have followed him in mentioning that part of England as producing the ſubſtance in queſtion: it is, however, probable that the accurate Swediſh chemiſt was miſinformed as to the county; though, from the ſatisfactory deſcription he gives of its external characters, it is ſufficiently evident that he operated on an Engliſh fullers' earth. The reſults of his analyſis were

Silica - - -	51.80
Alumine - - -	25.00
Lime - - -	3.30
Magneſia - -	0.70
Oxyd of iron - -	3.70
Water - - -	15.50.

The variety lately analyzed by Klaproth, which is well aſcertained to be from Ryegate, was found to be compoſed of

Silica - - -	53
Alumine - - -	10
Oxyd of iron - -	9.75
Magneſia - -	1.25
Lime - - -	0.50
Muriate of ſoda -	0.10
Water, &c. - -	24
Kali (a trace only)	
	98.60. Klap. Beitr. vol. iv.

We are indebted to the ſame celebrated chemiſt for an analyſis of a Sileſian fullers' earth, the external characters of which agree pretty well with thoſe of the other varieties, except that its colour is tile-red, like ſome varieties of bole, either pure, or ſpotted and veined with white and green; which colours, before the blow-pipe, give way to a marbled brown. Hundred parts of it contain

Silica - - -	48.50
Alumine - - -	15.50
Magneſia - -	1.50
Oxyd of iron - -	6.50
Oxyd of Manganeſe -	0.50
Water, &c. - -	25.50
Muriate of ſoda, (a trace only)	
	98. Klap. Beitr. vol. iv.

We mentioned above the *Lemnian earth* as a variety of the common fullers' earth; but it ſhould be underſtood that three diſtinct ſubſtances were comprized by the ancients under the name of Terra Lemnia. "Tres ejus," ſays Galen, "ſignantur differentiæ; *una* quam poſuimus terræ ſacræ, quam alii nemini, præter unam ſacerdotem, contingere fas eſt; *altera* vero ejus quæ revera Miltos eſt ſive Rubrica: utuntur autem ea potiſſimum fabri: demum *tertia* ejus extergit; qua utuntur qui lintea et veſtes lavant, quibus utique collibitum eſt." The nature of the three kinds of earth alluded to in this paſſage has been placed in a clearer light by Klaproth. The *ſecond* of them, called Miltos, was a red earth applied for the purpoſe of painting. The *third* appears to be the ſame which is mentioned by Pliny under the name of *Cimolia*, as an excellent ſubſtance for fulling: but it contains no magneſia. (See CIMOLIA.) But the *firſt* of the varieties enumerated by Galen, is the true *terra ſigillata*, recommended as early as the time of Homer for the cure of infectious diſeaſes, and ſtill celebrated in the eaſt for its imputed medicinal virtues. At the time of Dioſcorides it was mixed by the prieſts with goats' blood, and marked with a ſtamp repreſenting that animal (Σφράγις αἰγὸς): and ſtill at the preſent day this ſubſtance is dug up in the iſland of Lemnos (now Stalimene,) once a year, namely, the 15th of Auguſt, the day on which the Greeks celebrate the feſtival of the aſcenſion of the Virgin; the clergy and magiſtrates, after ſeveral previous religious ceremonies, ſuperintend the excavation of this ſubſtance, which is immediately formed into ſpindle-ſhaped balls of one ounce in weight, and marked with a ſeal bearing the name of the earth in the Turkiſh language. This ſubſtance (which ſhould not be confounded with a kind of bole of the ſame name, which is generally found nidulating in baſalt and baſaltic wackes) is of a whitiſh-grey colour, with ferruginous ſpots on its ſmooth ſurfaces. Put into water, it emits air, and ſoon crumbles into a looſe heap, exactly like the common fullers' earth, to which, notwithſtanding the ſlight difference in the reſults of the analyſis, it may, according to Klaproth's opinion, be conſidered as ſubordinate. The genuine Lemnian earth contains in hundred parts

Silica - - -	66.
Alumine - - -	14.50
Oxyd of iron - -	6.
Lime - - -	0.25
Magneſia - - -	0.25
Natron - - -	3.50
Water - - -	8.50
	99. Klap. Beitr. vol. iv.

The

FULLERS' EARTH.

The beſt fullers' earth is found in England, eſpecially Buckinghamſhire, Bedfordſhire, Surry, Kent and Nottinghamſhire. The following localities are likewiſe mentioned in the different ſyſtems of mineralogy; but we cannot vouch for the correctneſs of all of them, ſince many ſubſtances have been called by the name of fullers' earth, that, ſyſtematically ſpeaking, appear to have no claims to it. Auſtria (Karlſtein, Görtz); Croatia (Bellowar); France (Rittenau, Winterhauſen, in Alſace, &c.); Hungary (Fünfkirchen, &c.); Moravia; Neumark (Zillenzi, Droſſen); Palatinate (Kleinſtärz); Pomerania (Stargard); Saxony (Roſſwein, Johan-Georgenſtadt, Schönberg); Sileſia (Riegerſdorf, Nimptſch); Sweden (Oſmundberg); Stiria (Cilly and Thalberg); Switzerland (territory of Zurich and Berne); Tranſylvania (Thorotſko); Wirtemberg (Seeburg), &c.

The geognoſtic relations of fullers' earth are not yet ſufficiently aſcertained to enable the geologiſt to derive any general reſults from them. The relative age of the different formations appears to be as little underſtood, as the mode in which they have originated

In Saxony, where it is found in extenſive beds, it appears to owe its origin to the diſintegration of rocks of the primitive trap formation of Werner; that of Roſſwein is ſubordinate to green ſtone ſlate. In the Upper Palatinate it alternates with layers of clay and porcelain earth. In England it occurs principally in beds, and in ſtrata alternating with or reſting on ſand-ſtone, the geognoſtic relation of which is not yet determined. At Wavedon in Buckinghamſhire, on the borders of Bedfordſhire, where the pureſt ſort is found, it appears to occur in the newer fletz-formation, ſubordinate to ſand-ſtone. From the ſurface of the earth, to the depth of ſix feet, ſeveral layers of ſand are ſeen of various ſhades of reddiſh, under which there is a thin ſtratum of ſand-ſtone which reſts on the fullers' earth. The upper part of this latter, which is in contact, and mixed with the ſuperincumbent indurated ſand, is called *cledge* by the workmen, and thrown away as uſeleſs. To this ſucceeds a ſtratum of the good fullers' earth, being about eight feet thick, and ſubdivided by horizontal rifts into other layers of nearly one foot and a half in thickneſs. There is generally a ferruginous ſubſtance depoſited on the rifts, which penetrates part of the layers; and the earth, ſo tinged, is called *crop*, by the workmen, while the part unimpregnated by it receives the name of *wall-earth*. Under the fullers' earth is a ſtratum of coarſe white ſand-ſtone of about two feet thickneſs. The Engliſh fullers' earth is of much newer formation than that of Saxony; as is that of Moravia, which appears to belong to the alluvial formation.

The principal uſe to which fullers' earth is applied is indicated by its name, (ſee art. FULLING.) The quality it poſſeſſes, of depriving cloths and other ſtuffs of the greaſe and oil uſed in their preparation, appears to be derived more from the argillaceous than the other ingredients; and Mr. Kirwan thinks that the union of the lime and magneſia (which in Bergmann's opinion is chemically combined with the alumine, and not mechanically mixed, as in marls) is uſeful only as contributing to the prompt diffuſibility of this earth, which particularly qualifies it for the purpoſe to which it is applied Every clay that has ſome unctuoſity, (which manifeſts itſelf by the poliſh it receives by being rubbed with the nail,) and the ſiliceous ingredients of which are very fine, may be uſed for fulling; but it does not follow that all ſuch clayey earths as agree in theſe two characters, and in the economical advantage derived from them, ſhould of courſe occupy the ſame place in the ſyſtem. Fullers' earth was formerly an article of the greateſt importance in England, whence its exportation was prohibited under ſevere penalties; but of late it has been ſuperſeded by other ſubſtances, particularly ſoap.—K.

We ſubjoin ſome obſervations on the ſubject of fullers' earth, communicated by Mr. Farey.

"This mineral is found in three places at leaſt in the Britiſh ſeries of ſtrata, the uppermoſt of which is, in the ſand ſtrata that underlay the chalk, and are expoſed to view by the great Kent, Suſſex, and Surry *denudation*, (ſee that article,) at the foot or ſouthern ſkirt of the North Downs, at various places near Ryegate, Godſtone, &c. and from whence London is principally ſupplied with the article, though the quality of the earth and thickneſs of the ſeam (which varies much in different places) is greatly inferior to the next fullers' earth ſtratum, found near the lower part of the great ferruginous ſand ſtrata, (which Mr. Smith has denominated the Woburn ſand,) in which fullers' earth is now dug in the greateſt perfection, at Hogſtye-end in the pariſh of Waverdon, Bucks, near Woburn. Formerly it was dug alſo in Aſpley Guiſe pariſh, in Bedfordſhire adjoining, but the works there are diſcontinued. Below this ſtratum of fullers' earth, which ſometimes proves of ſeven feet in thickneſs for ſome diſtances together, is a ſingular greeniſh chertz ſtone, with a rhomboidal fracture, which ſeems very characteriſtic of this ſtratum. In diſtant counties, like Lincolnſhire, wherein we have examined it, about Bolingbroke, and to the N. and N. W. of that place, we find this and the accompanying ſtrata very ſimilar to thoſe of Bedfordſhire, although the fullers' earth is here ſo thin and imperfect in its quality, as not to be known by that name, but rather as a clay ſeam which holds up their ſprings of water in the ſand diſtrict. It may alſo be worthy of remark reſpecting this fullers' earth ſtratum, that petrified or ſiliceous wood occurs in the ferruginous ſand and ſand-ſtone below it in great plenty and perfection, and furniſhes moſt of the perfect ſpecimens of this kind from Aſpley, Crawley, and other places near Woburn, which are to be met with in the cabinets of the curious. How the ſtories of the petrifying ſprings at Aſpley which occaſioned them, as it is ſaid, came firſt into circulation, we are unable to trace; but certain it is, that the inhabitants of this village diſclaim any knowledge of ſuch ſprings or petrifying waters, except what books and credulous travellers have brought to them. It has often occurred to the writer of this, that there might, at ſome period of the earth's formation and conſolidation, have been a connection between the *ſilex* which abounds in ſuch quantity and ſo very minute a ſtate of diviſion in the fullers' earth, and that which has ſo perfectly taken the place of the pieces of wood, lodged in the ſand below it, and perhaps filled the interſtices of the chertz ſand-ſtone above mentioned; but that ſuch took effect, in too gradual a manner to be ever noticed as a petrifying ſpring on the ſurface, as the ſtories above mentioned have maintained. The examination of ſome hundreds of ſpecimens of this petrified wood in Aſpley and Crawley, ſome many feet in length, and a foot or more in diameter, has not ſeemed to furniſh data for referring any of them to the known woods of the preſent race, or to contradict the theory advanced in our article COLLIERY, of ſuch being part of the arboriferous trunks of ſub-aqueous vegetables of the primitive creation, whoſe *reliquia* they are, and by which alone their exiſtence can ever be known to us, and not fragments of any of the trees which, now, or at any period, did occupy or grow upon the *dry land* of our globe.

"In Somerſetſhire and other counties, a ſtratum occurs between the rocks of the Bath free-ſtone ſtrata, which is there called fullers' earth, and poſſeſſes its ſcouring properties;

as indeed other ſtrata do which are not called fullers' earth, particularly one in the aſſemblage of ſtrata below the chalk, called the chalk-marl; from which a ſaponaceous whitiſh clay is got, and uſed by the country people for extracting greaſe, ſcouring greaſy kettles, &c. There are doubtleſs other ſtrata in the Britiſh ſeries which poſſeſs theſe properties, in a greater or leſſer degree, but the modern improvements in chemiſtry and the arts have rendered fullers' earth, of even the beſt quality, of comparatively ſmall importance, to that which it had when particular ſtatutes were judged neceſſary for prohibiting its exportation, under the ſevereſt penalties.

"Fullers' earth has been deemed abſolutely neceſſary to the well dreſſing of cloth; and hence foreigners, though they can procure wool to be clandeſtinely exported out of the kingdom, can never reach to the perfection of the Engliſh cloths, &c. without fullers' earth, which is very plentiful in England, and excels that of other countries in quality, as much as in quantity and cheapneſs. For this reaſon it is made a contraband commodity; and the export made equally criminal with that of exporting wool."

This earth is reckoned by ſir H. Plat, and others, a great improver of land; and conſequently proper for being uſed as a manure where it is found in ſufficient quantity for that application. It is probably the moſt adapted to the more light ſorts of land.

FULLER's *Thiſtle*, in *Agriculture*, the common name of a plant cultivated in the field in ſome diſtricts, for its uſe by the manufacturers of ſome ſorts of cloth, as affording a fine vegetable hook, &c. See TEASLE.

FULLERTOL, in *Geography*, a town of Hindooſtan, in Rohilcund; 20 miles E.S.E. of Pillibeat.

FULLERTON, CAPE, a cape in Hudſon's bay. N. lat. 64° 10'. W. long. 88° 20'.

FULLERTON *Point*, a cape on the W. coaſt of the iſland of Antigua. N. lat. 17° 13'. W. long. 61° 35'.

FULLERY, a work-houſe, or place where cloths, &c. are fulled or ſcoured. The term is principally underſtood of the fulling-mill.

FULLING, the art or act of cleanſing, ſcouring, and preſſing cloths, ſtuffs, and ſtockings, to render them ſtronger, cloſer, and firmer; called alſo *milling*. See BLEACHING.

Pliny, lib. vii. cap. 56. aſſures us, that one Nicias, the ſon of Hermias, was the firſt inventor of the art of fulling: and it appears by an inſcription quoted by ſir G. Wheeler, in his travels through Greece, that this ſame Nicias was a governor in Greece in the time of the Romans.

The fulling of cloths, and other ſtuffs, is performed by a kind of water-mill; thence called a *fulling or ſcouring-mill*.

Theſe mills, excepting in what relates to the mill ſtones and hopper, are much the ſame with corn-mills. And there are even ſome which ſerve indifferently for both purpoſes; corn being ground, and cloths fulled, by the motion of the ſame wheel.

Hence in ſome places, particularly France, the fullers are called *millers*; as grinding corn, and milling ſtuffs, at the ſame time.

FULLING *Mill*, in the *Manufactures*, is a machine employed for waſhing, ſcouring, or fulling of cloth, either with a view of cleanſing it, in which caſe it is termed ſcouring, or for the purpoſe of thickening woollen cloth, worſteds, &c. when it is termed milling; in either caſe the fulling-mill employed is the ſame: its operation is to conſtantly agitate and expoſe a new ſurface to the action of water or other menſtrua, with which the goods to be operated upon are conſtantly ſupplied; this is performed by two beaters or mallets, which are ſucceſſively raiſed by the action of a water-mill, or ſteam-engine, and let fall upon the cloth, which they ſtrike and turn over in the trough where it is placed; a conſtant ſtream of water paſſing through it, carries away the dirt and impurities which are looſened from the cloths by the agitation of the mallets, or ſtocks, as they are termed.

An inſpection of *Plate* XXIX. *Mechanics*, will give a clearer idea of the conſtruction of this machine. Here *fig.* 4. is a perſpective view of a pair of ſtocks, or fulling-mill, in the action of ſcouring a piece of goods; the other figures are explanations of the parts of the machine by a ſection, *fig.* 5, and elevation, *fig.* 6. A fulling-mill generally contains four, ſix, eight, or ten pair of ſtocks, according to the quantity of work it is required to perform; theſe are all moved by the ſame water-wheel, or ſteam-engine: in the former caſe, the axis of the water-wheel is employed to move two or three pair, whilſt the others receive their motion from one of two ſimilar and parallel ſhafts, turned by cog-wheels from the ſhaft of the water-wheel. A portion of this ſhaft is repreſented at A in the plate, beneath the floor of the mill; and the cog, which gives it motion, is denoted by N, *fig.* 4: it revolves upon gudgeons at its ends, which are ſupported on braſſes reſting on the frame work or maſonry, as ſhewn in *fig.* 6. Four levers or lifters, B, B, D, D, are fitted upon the ſhaft which alternately, as they paſs the beaters E and F, lift them up, and they deſcend by their own gravity: theſe beaters are formed from a large block of wood E and F, affixed to a long ſtem G, moving on a centre at *g*, which is ſupported at the top of the frame H I K of the whole machine; the principal part of this is a large block of wood H I, hollowed out into a large cavity *a a*, for the reception of the cloth; this is termed the trough. K are pieces of wood fixed to the piece H I, and curved to a ſegment of a circle ſtruck from the centre *g*, on which the beaters move; in the ſpaces between theſe beams the ſtems G of the beaters project ſo as to be intercepted by the lifters B, D, as they revolve; the beaters are alſo curved at the loweſt ſide to the ſame circle as the beams K, ſo that they apply as cloſe as poſſible to each other without touching; this is neceſſary to prevent the cloth getting between them, and being pinched or cut thereby. The ends of the beaters, which act upon the cloth, are armed with three ſmall boards at *h*, *i*, and *k*, *fig.* 5. which project like teeth, and act more effectually to bend and diſturb every portion of the cloth placed in the trough *a a*. The beaters act very cloſe to each other ſideways, that the cloth may not introduce itſelf between them; and in the ſame manner they fit the ſides of the trough, formed by boards nailed to the block H I, and the beams K, which alſo give a great ſtrength to the machine. At one ſide theſe boards are not ſo high, for the convenience of taking the cloth out of the trough; but when the machine is in action a moveable board M, *fig.* 4. is placed on the top of the loweſt ſide, to raiſe it to the ſame height with the other, and prevent any danger of the cloth getting over. R is a pipe bringing water to the trough, and furniſhed with a ſtop cock to regulate the ſupply; the pipe paſſes through the back of the block H I, and the water ſtriking againſt a board *x*, placed before the aperture, it falls down in a ſheet upon the cloth, and keeps it conſtantly ſaturated. When the cloth is to be put into the machine, a workman with a lever ſupported on an iron hook *k* receives the beater when at the higheſt point of its motion, and prevents its deſcent; he then thruſts a long iron bolt *r*, *fig.* 6. through a hole in the beams K, and by that means retains it; the other beater is then taken up in the ſame manner, and retained

tained by the ſame bolt, being puſhed farther forwards; the looſe board M is now removed, and the cloth thrown into the trough *a a*; the beaters are then ſet in motion by removing the bolt *r*, which held them up. As the ſhaft A revolves, the lifters alternately engage one or other of the beaters which falls againſt the cloth, and, ſtriking it at the under ſide, thruſts it up into the curved part of the trough *a a*, and by that means it falls down upon the head of the beater; when the lifter raiſes the beater another time, the cloth falls into the ſpace left by its being raiſed; in this manner it continues turning the cloth over in the trough, and ſtriking it by its teeth *h, i, k*, ſo as to waſh it thoroughly. As the two beaters fall alternately, that is, one is up when the other is down, the cloth is alſo turned round diagonally in the trough: by this means, after milling a piece of cloth for ſome hours, there is little chance but that every part ſhall be ſubjected to the action of the beaters, though a whole piece is in action at once, and conſequently folded in innumerable creaſes. The water which enters at the upper end of the trough beneath the looſe board *x*, (which is intended to ſpread the water out into a thin ſheet, that it may fall equally upon the whole of the cloth,) eſcapes ſlowly through the grooves between the beam K, in which the ſtems G move, carrying with it all the filth contained in the cloth; it falls into a pit repreſented by the dark ſpace in *figs.* 5. and 6, in which the ſhaft revolves. This pit uſually has a communication with the water of the mill, to waſh away the ſediment which accumulates in the pit, from the foul water continually falling into it. The machine is fixed over this pit by a tennant at the lower part of the block H I, which is bolted between two beams L, L, ſupported on maſonry; M are two braces to ſuſtain the ends of the beams K, and keep the whole machine firmly in the ſame poſition: the beams L, L, are extended to a conſiderable length, and have three or four machines placed parallel to each other between them.

The true method of fulling with ſoap is delivered by Monſ. Colmet in an authentic memoir on that ſubject, ſupported by experiments made by order of the marquis de Louvois, then ſuperintendant of the arts and manufactories of France. The ſubſtance of which we ſhall here ſubjoin.

FULLING, *Cloth and woollen Stuffs, with Soap, Method of.* A coloured piece of cloth, about forty-five ells, is to be laid in the uſual manner, in the trough of a fulling-mill, without firſt ſoaking it in water, as is commonly practiſed in many places.

To full this trough of cloth, fifteen pounds of ſoap are required; one half of which is to be diſſolved in two pails of river or ſpring-water, made as hot as the hand can well bear it. This ſolution is to be poured by little and little upon the cloth, in proportion as it is laid in the trough: and thus it is to be fulled for at leaſt two hours; after which it is to be taken out, and ſtretched.

This done, the cloth is immediately returned into the ſame trough, without any freſh ſoap; and there *fulled* two hours more. Then taking it out, they wring it well, to expreſs all the greaſe and filth.

After the ſecond fulling, the remainder of the ſoap is melted, as the former, and caſt, at four different times, on the cloth; remembering to take out the cloth every two hours, to ſtretch it, and undo the plaits and wrinkles which it has acquired in the trough. When they perceive it ſufficiently fulled, and brought to the quality and thickneſs required, they ſcour it out for the laſt time in hot water, keeping it in the trough till it be quite clean.

As to white cloths; becauſe theſe full more eaſily, and in leſs time, than coloured ones, a third part of the ſoap may be ſpared.

FULLING *of Stockings, Caps, &c.* may be performed ſomewhat differently; viz. either with the feet or the hands; on a kind of rack, or wooden machine, either armed with teeth of the ſame matter, or elſe with horſes or bullocks' teeth.

The ingredients made uſe of herein are urine, green ſoap, white ſoap, and fullers'-earth. But water ſoftened with chalk is far preferable.

Note, woven ſtockings, &c. ſhould be fulled with ſoap alone; for thoſe that are knit, fullers'-earth may be uſed with the ſoap.

Indeed, it is frequent to full theſe kinds of works with the mill, after the uſual manner of cloths, &c. But that is too coarſe and violent a manner, and is apt to damage the work, unleſs it be very ſtrong.

FULLING, in the *Manufacture of Hats*, is the completion of *felting* (which ſee), and has for its objects the intimate connection of the fibres, and a more perfect and durable coheſion of the whole maſs. For this purpoſe the mere mechanical act of preſſure is inſufficient. In this way the reſult would be a formleſs maſs, without conſiſtence. Experience (ſays Chauſſier, cited in Nicholſon's Journal, vol. i.) has long ſhewn, that for the fulling it is neceſſary to make uſe of a bath of water heated nearly to ebullition, into which are put 10 or 15 pounds of lees of wine, for each hundred pounds of water. The heat is kept up during the whole time of working, and every three or four hours a new quantity of lees is added. Into this bath the workmen plunge their felt, and begin their ſecond proceſs. The felt is dipped in, and immediately again taken out and ſqueezed, bended and rolled, by preſſure in different directions, ſometimes with the hand defended by leather, and ſometimes by means of a roller or other ſimilar inſtrument. The immerſion and working of the felt are repeated, and the operation continued, till the ſtuff is well condenſed, and has acquired the requiſite ſolidity.

Since the operation of fulling is employed to form a denſe and compact ſtuff with the fibres or hairs, and to determine the intimate coheſion of its component parts; and ſince the mere mechanical operation is not ſufficient for this purpoſe, even with the aſſiſtance of a water-bath at the boiling heat, without the addition of lees as a neceſſary condition;—this laſt muſt be conſidered as a chemical ſolvent, which acts directly on the ſubſtance of the hairs themſelves, and produces, either by ſoftening or ſwelling them, an alteration neceſſary to inſure the coheſion of the different fibres of the ſtuff. But the lees being compoſed of the mucilaginous and colouring parts, which are ſeparated, together with a great quantity of tartar, or the acidulous tartrite of pot-aſh, it became neceſſary to aſcertain, in a poſitive manner, what might be the principle of its action. The editor of the Encyclopedié affirms without heſitation, that it is the alkali or pot-aſh of the lees which determines the fulling. But in order to ſhew (ſays Mr. C.) how erroneous this aſſertion is, nothing more is neceſſary than to dip a piece of blue paper into the bath, by which the former becomes inſtantly red; and if, after ſeveral hours' work, the ſtate of the bath be again examined, it is found that the acidulous tartrite of pot-aſh is partly exhauſted, and the workmen ſoon perceive, from the difficulty of continuing their work, that a new quantity is required to be added. And again, if we conſider the ſparing ſolubility of the acidulous tartrite of pot-aſh in cold water, it is eaſily ſeen why in this proceſs the water muſt be kept nearly boiling. Whence

it is evident that it muſt act by the portion of acidate which it contains. Hence our author was induced to think, that the ſulphuric acid might be advantageouſly ſubſtituted in the place of the lees; and as 12 pounds of lees are uſually added to 100 of water, he eſtimated by approximation that one gros of ſulphuric acid would be equivalent to at leaſt one pound of the lees, and conſequently that 12 gros of ſulphuric acid would be ſufficient for 100 pounds of water. His conjectures were ſoon confirmed by experiment; and after a fair trial it was aſcertained that the uſe of the ſulphuric acid is much preferable to that of wine-lees; that it is not only much more economical, but ſtill more convenient in the uſe; and, what is yet more important, the health of the workmen is not injured by the exceſs and duration of the heat, the thick vapours, and the diſguſting odour, which exhales from the bath, particularly when the lees have been altered by mouldineſs and putrefaction, which is very common in theſe manufactories. When the ſulphuric acid is employed, it is uſeleſs to keep the bath nearly boiling, as was formerly done. A degree of heat of 25 or 30 degrees (90° or 100° of Fahrenheit) is ſufficient for good fulling. The ſaving of fuel is an object of importance in manufactories; and as very little fire is neceſſary when ſulphuric acid is uſed, cauldrons of lead may be ſubſtituted inſtead of copper-boilers, the firſt coſt and annual repair of which are very conſiderable.

The felts prepared by this new proceſs are alſo of a very ſuperior quality to thoſe which have been worked in the bath with wine-lees. In fact, the mucilaginous and colouring matters of the lees, which are ſuſpended in the bath, penetrate the texture of the ſtuff, and adhere with more or leſs force; and when, after having paſſed the hats through the dye, they are beaten, a fine black duſt flies off in great abundance, which not only weakens the texture of the felt, but by diffuſing itſelf through the manufactory greatly incommodes the workmen, and frequently occaſions coughs and diſorders of the throat.

Hats felted in this manner, ſays a manufacturer who had adopted this proceſs, are not only clear of the powder which abounds in the others, but they take the dye better, and are cleaner.

FULLONIANI, in *Church Hiſtory*, heretics who anathematized all who did not acknowledge, that Chriſt ſuffered in his divine nature; or who diſtinguiſhed his human and paſſible nature from his divine and impaſſible.

FULLONICA *Terra Alba*, white fullers' earth, in natural hiſtory, a name given by ſome authors to the common white tobacco-pipe clay. See CIMOLIA, and PIPE-CLAY.

FULLONUM CARDUUS. See TEAZEL.

FULMAR, in *Ornithology*, a ſpecies of procellaria, or petrel, (the PROCELLARIA GLACIALIS, which ſee,) that inhabits the iſle of St. Kilda; appearing there in November and continuing through the whole year, except the months of September and October. It lays a large white and brittle egg, which is hatched in June. This bird is ſuperior in ſize to the common gull; the bill is ſtrong, hooked at the end, and of a yellow colour. The noſtrils are compoſed of two large tubes, lodged in one ſheath; the head, neck, inferior part of the body, and tail are white; the back and coverts of the wings aſh-coloured; the quill-feathers duſky, and the legs yellowiſh. Inſtead of a back toe, it has only a ſort of ſpur, or ſharp ſtraight nail. The ood of theſe birds is the blubber or fat of whales, of which they are very voracious; inſomuch that the whales are diſcovered at ſea by the flights of theſe birds; this is ſoon converted into oil and ſpouted from their bills in large quantities for their defence, and for the ſupply of their young. This oil, it is ſaid, has been ſucceſsfully uſed in rheumatic caſes. The fulmar is of ſingular uſe to the iſlanders, as it ſupplies them with oil for their lamps, down for their beds, a delicacy for their tables, a balm for their wounds, and a medicine for their diſeaſes. The fulmar is alſo a certain prognoſticator of the change of the wind; becauſe, if it comes to land, no weſt wind is expected for ſome time; and the contrary, when it returns and keeps at ſea. Pennant.

FULMINANT, FULMINANS, or *Fulminating*, an epithet applied to ſomething that thunders, or makes a noiſe like that of thunder.

We ſay, "Jupiter fulminans, aurum fulminans, pulvis fulminans, &c." The Jupiter fulminans and the Jupiter fulgurator ſeem to have been very much of the ſame kind: but if they are diſtinguiſhed, we may conſider the former as the diſpenſer of the lightnings which are darted from the clouds, and the latter as the diſpenſer of thoſe leſſer lightnings that only ſhoot about and ſtruggle amidſt the clouds.

FULMINANS, *Aurum*. See AURUM.

FULMINANS, *Pulvis*, is a compoſition of three parts of nitre, two parts of purified pearl-aſh, (kali præparatum, Lond. Pharm.), and one part of flowers of ſulphur. The parts are to be well mixed in an earthen mortar, and placed on a tile or plate before the fire, till it is perfectly dry; and if it be transferred, while hot, into a bottle with a ground ſtopper, it may be kept for any time without injury. Its effects are exhibited by pouring from 10 to 40 grains into an iron ladle, placed over a ſlow fire, in which caſe it will ſoon acquire a brown colour, and the conſiſtence of paſte; a blue lambent flame will appear on its ſurface; and immediately afterwards, the whole compoſition will explode with a ſlight momentary flaſh, and a loud noiſe. The maſs being removed from the fire as ſoon as it is fuſed, may be kept in a dry, well cloſed phial, and it will at any time be exploded by a ſpark, and burn like gun-powder, but more rapidly and with a greater detonation; but this effect cannot be produced on the unmelted powder, however accurately its ingredients may have been mixed. Whilſt the powder is in fuſion, but not ſufficiently heated to produce the blue flame, a particle of ignited charcoal thrown upon it, will immediately occaſion a very loud exploſion. The fulminating property of this powder is acquired by fuſion, or when the pot-aſh and ſulphur form ſulphuret of pot-aſh. It may therefore be prepared by mixing ſulphuret of pot-aſh with nitre, inſtead of adding the ſulphur and alkali ſeparate.

FULMINATING DAMP. See DAMP.

FULMINATING *Legion*. See THUNDERING *Legion*.

FULMINATION, in the *Romiſh Canon Law*, a ſentence of a biſhop, official, or other eccleſiaſtic appointed by the pope; whereby it is decreed, that ſome bull, diſpenſation, or reſcript, ſent from the pope, ſhall be executed.

Fulmination is the ſame thing with the verification, or recognition, of a letter, or inſtrument, of a prince in a lay court.

FULMINATION is alſo uſed for the denunciation or execution of a ſentence of anathema, made in public, with due ſolemnity. See ANATHEMA.

In fulminating anathemas, the biſhop who pronounces ſentence is to be clothed in his epiſcopalia, and accompanied with two prieſts, in ſurplices; after ſentence is pronounced,

nounced, they caſt down to the ground the lighted wax-tapers which they held in their hands.

FULMINATION, or *Fulguration*, in *Chemiſtry*, a vehement noiſe, or ſhock reſembling thunder, occaſioned by the ſudden exploſion and inflammation of divers preparations; as *aurum fulminans*, &c. when ſet on fire.

FULNECK, in *Geography*, a village ſituated at a ſmall diſtance from the high road, leading from Leeds to Bradford, 4½ miles from the former place, in the wapentake of Morley, and in the weſt-riding of the county of York, is remarkable for a ſettlement of numerous perſons, belonging to a ſingular ſect of Chriſtians, called, on account of their tenets, the Unitas Fratrum; and Moravians, becauſe firſt founded by count Zinzendorf, in the province of Moravia. The place, originally named Lamb's-hill, had its preſent denomination given to it by the new inhabitants. The ſettlement is pleaſantly ſituated on the ſlope of a riſing ground, at the foot of which runs a meandering ſtream. It conſiſts chiefly of two long ſtreets, the houſes of which are neatly built, and an elegant ſtructure near the centre contains a chapel and ſeminary. There are two inſtitutions nearly reſembling a monaſtery and nunnery, which go under the ſingular appellations of "The Young Men's Economy, and the Young Women's Economy." No ſtrangers of the oppoſite ſex are admitted in either houſe, but the inhabitants may occaſionally come out to converſe with their friends. They are allowed to follow any buſineſs moſt eligible to themſelves, and, fixed by no vows, they are at liberty, whenever they pleaſe, to change their way of life. The number of women is about ſixty, who are principally occupied in ſpinning, tambour, and embroidery, and they ſleep together in one large room. The men, who amount to about fifty, ſleep alſo in a common dormitory, and are chiefly employed in the different branches of the clothing trade.

Originally the number of ſettlers of this perſuaſion was upwards of four hundred, but the population of Fulneck has been latterly on the decline. Many who at firſt joined for the ſake of novelty have ſeceded; and the ſeparation of the ſexes, according to the principles of their founder, and the rules adopted by themſelves, together with their peculiar management in conducting trade, is little calculated, either to increaſe population or extend manufactures.

FULNECK, a town of Moravia, in the circle of Prerau, is a place of conſiderable importance in the Moravian church; 21 miles N.E. of Prerau. N. lat. 49° 37'. E. long. 17° 51.

FULTA, a town of Hindooſtan, in Bengal, on the E. ſide of the Hoogly; 24 miles S.S.W. of Calcutta.

FULTAWARY, a town of Hindooſtan, in Bengal; 26 miles N. of Purneah.

FULUSCULUM, in *Botany*, a name given by the ancient Romans to a peculiar ſpecies of mullein or verbaſcum, of which they uſed to make the wicks of the torches with which they kindled their funeral piles. The Greeks for the ſame reaſon called this ſpecies necuia. Dioſcorides indeed calls it *lychnitis*, λυχνιτις; and Nicander, *thryallis*, θρυαλλις. The way they uſed it was thus; they beat out the ſtalk of the plant, as we do hemp, and when it was ſeparated into looſe fibres, they plunged it into melted reſin; this gave it a conſiſtence again, and when cold, it was a kind of flambeau.

FULWAR, in *Geography*, a town of Hindooſtan, in the ſoubah of Lahore, on the Setledge; 100 miles S. E. of Lahore.

FUMADOES, in *Commerce*, a name given to pilchards, garbaged and ſalted, then hung in the ſmoke and preſſed; ſo called in Spain and Italy, whither they are exported in great abundance. Vid. Stat. 14 Car. II. cap. 31.

FUMAGE, a term uſed in ſome parts of the kingdom, for dung, or manuring with dung.

FUMAGE. See FUAGE.

FUMANI, ADAM, in *Biography*, was born at Verona in the ſixteenth century, and by his ſkill and acquirements in the ancient languages, he obtained the friendſhip of the moſt eminent ſcholars of his time. He accompanied cardinal Pole in his legation to Flanders, and Navagero to the council of Trent, to which aſſembly he was appointed ſecretary. He held likewiſe ſome church preferment. He tranſlated from the Greek into Latin the works of St. Baſil. He compoſed many poetical pieces, of which the moſt remarkable was "A Syſtem of Logic," in Latin heroics, in five books, which he treated with an elegance and eaſe which are altogether ſurpriſing, and prove the author's facility in the management of verſe and language. It was not printed till the year 1739, in an edition of the works of Fraſcatorius. Moreri.

FUMARIA, in *Botany*, from *fumus*, ſmoke, it having been called by old writers *fumus terræ*, ſmoke of the ground, we know not for what reaſon. Hence the Engliſh name, Fumitory. Linn. Gen. 849. Schreb. 1154. Willd. Sp. Pl. v. 3. Mart. Mill. Dict. v. 2. Juſſ. 237. Claſs and order, *Diadelphia Hexandira*. Nat. Ord. *Corydales*, Linn. *Papaveraceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of two equal, ſmall leaves, moſtly deciduous, often coloured. *Cor.* tubular, ringent, of two petals, each lobed and ſpreading at the extremity, gibbous, and holding honey at the baſe, variouſly formed in different ſpecies. *Stam.* Filaments ſix, capillary, united into two ſets by their broad, elongated, membranous baſes, ſheathing the germen; anthers ſmall, roundiſh, vertical. *Piſt.* Germen roundiſh or oblong; ſtyle curved or oblique; ſtigma obtuſe. *Peric.* Pod of two valves, and one cell. *Seeds* one or more, roundiſh.

Eſſ. Ch. Calyx of two leaves, inferior. Corolla ringent, gibbous and honey-bearing at the baſe. Each filament bearing three anthers.

Obſ. This genus, as underſtood by Linnæus and his followers, is extremely natural, but the ſeed-veſſel is ſo very different in many of the different ſpecies, that Gærtner, whoſe ſtudies were peculiarly directed to that part of the fructification of plants, has, on this principle alone, ſeparated *Fumaria* into ſeveral new genera. We are more diſpoſed to agree with Linnæus, eſpecially as the ſeed-veſſels in queſtion ſeem to us, in many caſes, to differ rather in appearance than in reality.

Some ſpecies of *Fumaria* have a ſingle protuberance at the baſe of the corolla, others a double one, which in a few becomes a ſpur. Six of the former diviſion are natives of Britain, but none of the latter. *F. ſolida*, Engl. Bot. t. 1471, is common in gardens, though rarely wild with us. It flowers in the ſpring, and mixes prettily with harebells, anemonies and daffodils. *F. lutea*, t. 588, found on rocks and old walls in the north, is a doubtful native, but very frequent in gardens, where it ſoon becomes a weed. Theſe two have a many-ſeeded pod. The vulgar *F. officinalis*, t. 589, and the rare *F. parviflora*, t. 590, and *capreolata*, t. 943, all agree in their elegant little pink bloſſoms, variegated with ſpots of dark red and of green, as well as in having round ſingle-ſeeded pods. *F. claviculata*, t. 103. has green and white flowers, and a very delicate climbing herbage. Its pods have ſeveral ſeeds, but its cloſe generic affinity to the three preceding cannot be diſputed.

The exotic *Fumariæ* are ſeveral. Among thoſe with two protuberances at the baſe of the flower is *F. ſpectabilis*, a native of Siberia or Tartary, as far as we can diſcover. It is cultivated by the Chineſe, and ſometimes ſeen among their drawings

drawings of ornamental plants, being extremely handſome. A figure is given of this ſpecies in the ſeventh volume of the *Amœnitates Academicæ* from a ſpecimen in the Linnæan herbarium, the only one we have ever met with in any collection. A very elegant Siberian ſpecies has been ignorantly called *ſpectabilis* in the Engliſh gardens, and is figured by Mr. Andrews in his Repoſitory. This has much ſmaller flowers and leaves than the true one, but deſerves cultivation, as it thrives well in peat earth in the open ground, and bloſſoms abundantly. The American *F. ſempervirens*, conſpicuous for its glaucous leaves, and red and yellow corolla, is alſo a very pretty garden plant.

FUMARIA, in *Gardening*, comprehends plants of the tuberous-rooted low-flowery perennial kind; of which the ſpecies moſtly cultivated are, the naked ſtalked fumitory (F. cucullaria); the glaucous fumitory (F. ſempervirens); the yellow fumitory (F. lutea); and the white-flowered fumitory (F. capnoides.)

Theſe plants are deſerving of ſituations in the flower-garden, and different compartments of ornamented grounds, as the fore-parts of clumps, borders, &c.

Method of Culture.—Theſe plants muſt be raiſed in different ways according to the kinds. The firſt ſort is readily increaſed by planting the off-ſets taken from the old roots in a light ſoil where the ſituation is rather ſhady, in the early part of the autumn, as ſoon as the old ſtems begin to decay. They ſhould afterwards be kept perfectly free from weeds.

All the other ſorts are capable of being raiſed by ſowing the well-ripened ſeeds in ſituations where the plants are to grow. They afterwards only require to be kept perfectly clean from weeds.

FUMARIA, in the *Materia Medica*, was by the ancients named "Capnos," becauſe it was thought to be peculiarly uſeful in dimneſs of ſight, and other diſeaſes of the eyes. The leaves, which are the part of the plant directed for medicinal uſe by the Edinburgh college, are extremely ſucculent, and have no remarkable ſmell, but a bitter, ſomewhat ſaline taſte. Fumitory has been ſuppoſed by ſeveral phyſicians of great authority, both ancient and modern, to be very efficacious in opening obſtructions, and infarctions of the viſcera, particularly thoſe of the hepatic ſyſtem; it is alſo highly commended for its power of correcting a ſcorbutic and acrimonious ſtate of the fluids, and has therefore been employed in various cutaneous diſeaſes: when taken in pretty large doſes it proves diuretic and laxative, eſpecially the juice, which may be mixed with whey, and uſed as a common drink. Dr. Cullen claſſes this plant among the tonics. Its remarkable virtues, he ſays, are thoſe of clearing the ſkin of many diſeaſes, and he experienced its good effects in many inſtances of cutaneous affections, which he would call lepra. He commonly uſed it by expreſſing the juice, and giving that to the quantity of two ounces twice a day. He adds that the virtues remain in the dried plant, ſo that they may be extracted by infuſion or decoction, in water; and the foreign diſpenſatories have prepared an extract of it, to which they aſcribe all the virtues of the freſh plant. An infuſion of the leaves is uſed as a coſmetic, to remove freckles and clear the ſkin. Woodville Med. Bot.

FUMAY, in *Geography*, a town of France, in the department of the Ardennes, and chief place of a canton in the diſtrict of Rocroy. The place contains 1740, and the canton 6795 inhabitants, on a territory of 240 kiliometres in nine communes. The principal article of its trade is ſlates, of which there are quarries near the town. N. lat. 50°. E. long. 4° 44'.

FUMBO, one of the Querimba iſlands in the Indian ſea. S. lat. 13° 6'.

FUMEL, a town of France, in the department of the Lot and Garonne, and chief place of a canton in the diſtrict of Villeneuve-d'-Agen, 9 miles E.S.E. of Montflanquin. The place contains 2079, and the canton 8465 inhabitants, on a territory of 167½ kiliometres in 8 communes.

FUMEN, a town of Perſia, in the province of Ghilan; 10 miles N.W. of Reſhd.

FUMET, a term uſed among ſportſmen for the ordure or dung of harts: otherwiſe called fewmets.

FUMIGATION, in *Medicine*, the diffuſion of various ſubſtances in the form of vapour or gas, with a view to correct the air, when vitiated by the putrefaction of animal and vegetable matter, or by contagious effluvia.

As the air has been liable to vitiation by fœtid and offenſive effluvia, from the time that men were in the habit of aſſociating in numbers; ſo, from the earlieſt ages, the diffuſion of other effluvia, whether of a fragrant or a pungent quality, through the air, as an antidote to its diſagreeable or unwholeſome qualities, has been often reſorted to. We have already obſerved, that Hippocrates and Acron of Agrigentum, when the plague raged at Athens, ordered large piles of wood to be burnt in the ſtreets, with a view of correcting the ſuppoſed vitiated condition of the atmoſphere. (See CONTAGION.) The ſame expedient has been reſorted to in modern times, during the prevalence of the plague in London, Marſeilles, Toulon, &c. ſo that theſe cities were enveloped in a cloud of ſmoke for two or three days; but in London a great increaſe in the number of deaths took place on the night following; and at Marſeilles, the hiſtorian obſerves, this ſmoke augmented the natural heat of the climate and ſeaſon, and ſeemed to increaſe the activity of the contagion. (Papon, de la Peſte, &c. tom. i. p. 234.) The burning of wood, indeed, produces an acid, which has been hence denominated the *pyro-ligneous acid*, and which is ſufficiently obvious from the ſmarting ſenſation which the ſmoke of wood occaſions in the eyes; but experience proves its operation in deſtroying contagion to be comparatively feeble. The effect of a dry confined heat in purifying clothes, or other fomites, from the contagious matter which they may contain, as mentioned by Dr. Lind, depends altogether upon another operation of heat, diſtinct from fumigation by the vapours of the ſubſtances burnt. But M. Guyton Morveau has remarked, that the burning of three truſſes of ſtraw in the cell of a priſon, in a moſt intolerably offenſive condition, did not remove the putrid ſmell. (Traité des Moyens de deſinfecter l'Air, p. 12.)

Next to the burning of wood, the vapours of burning ſulphur have been generally employed with a view to deſtroy the matter of contagion. This vapour is the ſulphureous acid gas, or volatile vitriolic acid of the old chemiſts; and its efficacy in the deſtruction of contagion has been long eſtabliſhed; but as, even in ſmall quantity, it affects the reſpiration of animals, and in larger quantity will occaſion ſuffocation and death, it can only be employed for fumigating clothes, furniture, or empty apartments, to the individual parts of which the fumes can be directly applied.

The deflagration of gunpowder was eſteemed "next to the ſmoke of wood for purifying a tainted air," by Dr. Lind, (On Fevers and Infections, p. 51.) But the products, which it yields, are inadequate to the deſtruction of the contagious miaſms. Perhaps its principal operation conſiſts in giving movement to a large maſs of air, and thus diſplacing ſome of the contagious effluvia, without deſtroying them, or in diffuſing them through a larger volume of air, and therefore weakening their force. The deflagration of nitre was tried by Dr. Carmichael Smyth in the hoſpital wards at Wincheſter, upon the notion that nitrous acid

was

was diſengaged by the combuſtion; but a farther acquaintance with chemiſtry convinced him of his miſtake. (See his Deſcript. of the Jail Diſtemper, &c. p. 174.)

With reſpect to all perfumes, and other aromatic, reſinous, and balſamic ſubſtances, they are utterly proſcribed upon the authority of general experience. "It is obvious," ſay the intelligent authors of a pamphlet of inſtructions for the people, publiſhed during an epidemic in France, "that theſe ſtrong ſmelling ſubſtances are far from poſſeſſing the wonderful properties attributed to them; in fact, they afford a treacherous ſecurity. This vapour furniſhes no new air; exerting no action on that with which it mingles, it ſerves only to conceal the bad ſmells, without deſtroying them." (Morveau, loc. cit. p. 158.) This is to put a maſk on the enemy, and then to miſtake him for a friend. By ſeveral direct experiments, M. Morveau aſcertained the feeble powers of the vapours of various odoriferous and volatile ſubſtances, in deſtroying or concealing the offenſive exhalations ariſing from putrid animal matter. He found that by burning benzoin, &c. by ſpirituous ſolutions of this reſin, and of the balſam of Peru, of ſtyrax, and of myrrh, the odour of theſe ſubſtances was only mixed with that of the putrid matter; and however predominant it was, it did not prevent him from diſcerning the preſence of the putrid air by an exceſſively diſagreeable faint ſmell. (Loc. cit. Exper. XII—XV.) The ſame obſervation is applicable to the vapour of tar, which Dr. Lind imagined was poſſeſſed of ſome efficacy.

The acetous acid, or common vinegar, when evaporated by heat, has been often employed as a fumigation in infected apartments; and the experiments of the intelligent French chemiſt, juſt mentioned, evince that it is poſſeſſed of ſome little power in diminiſhing the fetid odour of putrid air. The acetic acid, or radical vinegar, as it has been called, is more efficacious in removing the offenſive properties of this air. He obſerves, however, that its powers are limited to a very ſmall ſpace; and therefore that, although it may be uſeful about the perſons of thoſe who are compelled to be much about the ſick, it is altogether inadequate to the purification of large rooms; not to mention the great expenſe of its preparation. When the fumes of vinegar are attempted to be obtained by throwing it on burning coals, the greater part of the acid is actually decompoſed, and therefore its efficacy is in a great meaſure loſt. The anti-peſtilential vinegar, or "vinegar of the four thieves," which has been greatly extolled, was found very ineffectual in correcting the putrid air with which it was agitated: indeed as the aromatic ſubſtances, from which its pretended virtues were ſaid to be derived, are themſelves inefficacious, the combination could not be expected to be poſſeſſed of much power.

In thoſe mineral acids, however, which are capable of being converted into vapours, modern reſearch has diſcovered very efficacious agents, it would appear, for deſtroying the matter of contagion; ſuch are the nitrous or rather nitric acid gas, the muriatic, and the oxygenated muriatic acid gas. The e gaſes not only have the advantage of decompoſing the miaſms of contagion, but alſo of being reſpirable in a ſtate of moderate dilution or diffuſion, ſo as to admit of being uſed in the wards of hoſpitals, or other inhabited apartments. There has been ſome controverſy with regard to the priority of the diſcovery of the anti-contagious property of the vapours of theſe mineral acids, in conſequence of a parliamentary reward of 5000 pounds having been given to Dr. Carmichael Smyth for the diſcovery. Of the three individuals, who may poſſibly have each been led to the experiment without any aſſiſtance from the other, it ſeems to be certain that Dr. Smyth was the laſt to reſort to it; although he was perhaps the firſt to employ one of theſe acid vapours, *viz.* the nitrous. It has been ſhewn, we think ſatisfactorily, by Dr. John Johnſtone, of Birmingham, that his father, Dr. James Johnſtone, ſenior, had employed the vapour of muriatic acid in an epidemic fever at Kidderminſter in the year 1756, and recommended it in "An hiſtorical Diſſertation" concerning that epidemic, publiſhed in 1758. (See a pamphlet entitled, "Account of the diſcovery of the mineral acids in a ſtate of gas to deſtroy contagion," 1803: alſo, a "Reply to Dr. J. C. Smyth, &c." 1805.) In the year 1773, M. Guyton de Morveau, of Dijon, publiſhed an account of the efficacy of the vapour of muriatic acid, in purifying the putrid air of a church in that city, which had been rendered uſeleſs, and was ſhut up, in conſequence of the opening of ſome vaults within it. (See Rozier, Journal de Phyſique, tom. i. p. 436. Juin, 1773.) This ingenious chemiſt appears to have been led to the experiment upon a piece of hypotheſis, that the muriatic acid gas would neutralize the ammoniacal ſalts, which are generated during putrefaction. The experiment ſucceeded perfectly, and the tainted air, before intolerable to reſpiration, was completely deprived of its offenſive qualities. It was not until the year 1795, that Dr. Smyth recommended the nitrous acid gas as the means of deſtroying contagion, and directed an experiment which was made in the Union, a hoſpital-ſhip, and again in part of the Ruſſian ſquadron, at Sheerneſs. The ſucceſs of this experiment was nearly as complete as that of M. de Morveau, at Dijon. The immediate effect of the fumigation was to deſtroy the offenſive ſmell ariſing from ſo many ſick crowded together; none of the attendants were afterwards attacked with the fever; and the general ſtate of the ſhip was ſpeedily improved. (See Report of the experiments, &c. by Mr. A. Menzies.)

Such is the hiſtory of this diſcovery; and the efficacy of the nitrous and muriatic fumigation has been confirmed by the ſubſequent experience of other naval medical officers, and of the phyſicians to the houſes of recovery for contagious fever, eſtabliſhed in various parts of the kingdom. It remains for us, therefore, to deſcribe the mode in which the fumigation is performed.

"To obtain the nitrous or marine acid, in a ſtate of vapour," Dr. C. Smith obſerves, "the method is extremely ſimple. It conſiſts in decompoſing nitre or common ſalt, by means of heated vitriolic acid, which may be done as follows. Put half an ounce of vitriolic acid" (the undiluted ſulphuric acid, or oil of vitriol of commerce) "into a crucible, or into a glaſs or china cup, or deep ſaucer; warm this over a lamp, or in heated ſand, adding to it from time to time ſome nitre or common ſalt: theſe veſſels ſhould be placed at twenty or thirty feet diſtance from each other, according to the height of the cieling or virulence of the contagion." (Smyth on the Jail Diſtemper, p. 198.) With reſpect to the nitric acid vapour, however, it was obſerved by Dr. Odier of Geneva that, when heat was employed, it was extremely difficult to avoid the extrication of the red fumes of nitrous acid, which are very injurious to reſpiration; and that by mixing the ingredients cold, an equal quantity of the vapours of nitric acid was obtained. In the Houſe of Recovery, in London, this method is purſued, and the following formula is adopted in the fumigation of ſmall apartments, "Take an equal quantity of powdered nitre and ſtrong vitriolic acid or oil of vitriol (about ſix drachms of each are ſufficient); mix them in a tea-cup, ſtirring them occaſionally with a tobacco-pipe or piece of glaſs; the cup muſt be removed occaſionally to different parts of the room, and the

fumes

fumes will continue to ariſe for ſeveral hours. The oil of vitriol ſhould be taken by meaſure, not by weight." (See Reports of the Fever Inſtitution.) On board the Union, hoſpital-ſhip, the mixed ingredients in the cup were carried about the ſhip in earthen pipkins containing hot ſand. M. Morveau informs us that the muriatic fumigation, when common ſalt, or muriate of ſoda, is employed, may alſo be effected without the aid of heat. M. Morveau conſiders the oxy-muriatic acid vapour, however, as the moſt effectual deſtroyer of contagion; but Dr. Smyth was led to reject this acid, from a notion that it was not reſpirable, and therefore could not be employed in inhabited apartments: both the experiments of Morveau, however, and of Mr. Cruikſhank, of Woolwich, have ſhewn the ſafety and practicability of uſing this acid gas in fumigation. The following are the quantities and proportions of the neceſſary ingredients, which M. Morveau employed in a ward, containing ten beds.

	oz.	gros.	gr.			
Common ſalt - -	3	2	10	or	10	decagrams.
Black oxide of manganeſe	0	5	17	—	2	
Water - - -	1	2	35	—	4	
Sulphuric acid - -	1	7	50	—	6	

The oxide is firſt reduced to powder, and then mixed with the ſalt by trituration; this mixture is then put into a glaſs or china veſſel, and the water added; laſtly, the acid is poured upon thoſe ingredients, at once, if the fumigation is made in uninhabited apartments; but in ſucceſſive portions if the rooms are inhabited. The following proportions were employed by Mr. Cruikſhank.

Muriate of ſoda - -	2 parts
Oxide of manganeſe -	1
Water - - -	1½

Sulphuric acid of 36 degrees 2. (See Rollo on Diabetes.)

M. Morveau, who is ſatisfied that oxygenated muriatic acid gas is the moſt efficacious preſervative againſt infection, "l'anti-contagieux par excellence," ſuggeſts a mode of obtaining this gas extemporaneouſly; *viz.* by pouring upon a drachm of the oxide of manganeſe, in a four ounce bottle, about 2½ ounces of the nitro-muriatic acid. The vapour of the oxy-muriatic acid is immediately diſengaged in conſiderable intenſity.

Although theſe mineral acid vapours are obviouſly poſſeſſed of the power of deſtroying putrid effluvia, and the contagious miaſms ariſing from typhoid fevers, dyſentery, foul ulcers, &c.; the extent of their power upon the contagious matter of ſmall-pox, ſcarlet-fever, meaſles, &c. is not yet ſufficiently aſcertained. The only evidence with which we are acquainted relative to this part of the ſubject, is the following obſervation of Dr. Smyth. After ſtating that in ordinary caſes, and in private practice, he found that one, two, or three fumigating lamps, by which a conſtant fumigation is kept up, night and day, ſo as to paſs over the beds of the ſick, are perfectly ſufficient, he adds: "In this manner I have not only ſtopped the common contagion in the hoſpital and in private, but I have equally ſucceeded, which is of great conſequence to be known, in preventing the ſcarlatina anginoſa, or putrid ſore throat, from being communicated to the reſt of the family, living under the ſame roof. Whether this will apply to the ſmall pox, I cannot ſay from my own experience; but I have been told by Dr. Rollo, ſurgeon to the artillery, and Mr. Cruikſhank, profeſſor royal of chemiſtry to the academy at Woolwich, that it deſtroys the miaſma of ſmall pox; and that of two quantities of matter, taken for the purpoſe of inoculation, one was expoſed to the nitrous vapour, the other not: the perſons inoculated with the firſt were not ſeized with the diſeaſe, whilſt the inoculation took the uſual effect, when performed with the ſecond." (See Dr. Smyth's treatiſe "On the Effect of the Nitrous Vapour," &c. p. 221.)

FUMIGATION, *Powder of*, was invented at Moſcow, in 1771, for preventing the infection of the plague. It is prepared of different degrees of ſtrength in the following manner: 1. Take leaves of juniper, juniper-berries pounded, ears of wheat, guaiacum wood pounded, or, if this cannot be had, the cones of pines or firs, of each ſix pounds; common ſalt-petre pounded, eight pounds; ſulphur pounded, ſix pounds; Smyrna tar or myrrh, or, inſtead of this, the common tar of pines and firs, two pounds; mix all theſe ingredients together, and they will produce a pood of the powder of the firſt ſtrength. 2. Take ſouthernwood or mugwort, cut into ſmall pieces, five pounds; leaves of juniper, cut in the ſame manner, four pounds; juniper-berries pounded, three pounds; common ſalt-petre pounded, four pounds; ſulphur pounded, two pounds and a half; Smyrna tar or myrrh, one pound and a half; mix theſe together, and they will yield half a pood of the powder of the ſecond ſtrength. The efficacy of the powder of fumigation was tried on ten malefactors under ſentence of death, who were confined three weeks in a lazarette, and expoſed in every poſſible way to the infection of the plague, and none of them were at all injured by it.

FUMIGATION is alſo uſed for the act of making a ſuſpended body receive the fumes of or ſteams of one or more other bodies, in order to calcine, to correct it, or impart to it ſome new quality.

Ceruſs is made by the fumigation, or vapour, of vinegar, gnawing and corroding plates of lead.

FUMIGATION, is a practice, in *Surgery*, of applying remedies, in the form of ſmoke, to the ſurface of the body, or to that of ulcers, tumours, &c. It is one of the moſt ancient plans of affecting the conſtitution with mercury, and Lalonette and Albernethy have ſtated circumſtances in its favour, which certainly render it ſometimes a very eligible mode. The latter is of opinion, that if the peculiar advantages of mercurial fumigations were generally known to practitioners, they would be much more frequently employed. The advantages of the method conſiſt in its affecting the conſtitution, when other means have failed, and in producing its effects in a much ſhorter time than any other mode requires. How deſirable this celerity of operation muſt often be, when venereal ulceration is making great ravages in the palate, throat, &c. it is needleſs to inſiſt upon. In patients, who have not ſtrength to rub in ointment, and whoſe bowels will not bear the internal exhibition of mercury, the mode of fumigation may prove of great ſervice.

"In the year 1776, the Chevalier Lalonette, a phyſician at Paris, laid before the public an account of a new mode of mercurial fumigation, free from the inconveniences of former ones, and which, in the ſpace of thirty-five years, he had ſucceſsfully employed in more than four hundred caſes, that had reſiſted all the ordinary methods of cure. His method conſiſted in incloſing the patient, previouſly undreſſed, in a kind of box reſembling a ſedan-chair, with an opening at the top to let out the head, and another at the bottom, to which was fitted a ſmall grate or furnace, having in it a heated iron for converting the mercurial remedy into fume. The preparation he made uſe of was a kind of calomel, which, by repeated ſublimation from iron filings, was ſo far deprived of its muriatic acid, as to be in part reduced into running quickſilver; and while it poſſeſſed conſiderable volatility, was perfectly unirritating. Some of this powder, being ſtrewed upon the hot iron placed below, was immediately converted into ſmoke, which ſurrounded the patient's

body, and after ſome time ſettled on his ſkin in the form of a white and very fine calx of quickſilver: a complete dreſs, having its inner ſurface fumigated with the ſame powder, was then put on. The remedy, being thus generally applied to the mouths of the cutaneous abſorbents, ſoon got admiſſion into the circulating fluids, and the conſtitution became thereby more ſpeedily affected, than by any other proceſs known before." (Abernethy's Surgical and Phyſiological Eſſays, part 3.)

As the fumigating powder uſed by M. Lalonette was very operoſe, and conſequently a very expenſive preparation, and appeared to have no advantages over one made by abſtracting the muriatic acid from calomel by means of volatile alkali, Mr. A. has always employed the latter, which is prepared at the hoſpital in the following manner: Two drachms of aqua ammoniæ are added to ſix ounces of diſtilled water, and four ounces of calomel are thrown into this liquor, and ſhaken up with it; the powder is afterwards ſeparated by a filter, and dried.

The powder thus obtained is of a grey colour, and contains a good deal of quickſilver in its metallic ſtate, which of courſe is extremely volatile, but becomes oxydated when raiſed into fume, and afterwards condenſed into a white ſubtile powder.

Mr. A. never knew this method fail in curing the lues venerea.

In local diſeaſe of the joints, ſuch, for inſtance, as frequently takes place in the knee, and in ſarcomatous enlargements of the breaſt in women, Mr. Sharp, and ſir C. Blicke, have long been accuſtomed to direct fumigated ſtockings, or under-waiſtcoats, to be worn; by which the complaints have been relieved, and the conſtitutions of the patients affected, without the trouble and unpleaſantneſs ariſing from the uſe of the common mercurial ointment. (See Abernethy's Surgical and Phyſiological Eſſays, part 3.)

Mr. Pearſon procured Lalonette's machine, and made a conſiderable number of experiments to determine the comparative advantages of this method and mercurial frictions. He found, that the gums became turgid and tender very quickly, and that the local appearances were ſooner removed, than by the other modes of introducing mercury into the ſyſtem; but that it ſoon brought on debility, a rapid and premature ſalivation, and, of courſe, the medicine could not be ſteadily continued. This gentleman concludes, that where checking the progreſs of the diſeaſe ſuddenly is an object of great moment, where the body is covered with venereal ulcers, or where the eruptions are large and numerous, ſo that there ſcarcely remains a ſurface large enough to abſorb the ointment, the vapour of mercury will be advantageous. But he thinks it extremely difficult thus to introduce a ſufficient quantity of mercury into the ſyſtem to ſecure the patient from a relapſe, and therefore by no means eligible as a general practice. The vapour of mercury, he ſays, is ſingularly efficacious when applied to venereal ulcers, fungi, and excreſcences; but this plan requires an equal quantity of mercury to be given in other ways, as if the local application itſelf were not a mercurial one. (Pearſon on Lues Venerea, p. 145, &c.)

For the purpoſe of fumigating ſores, the hydrargyrus ſulphuratus ruber is commonly uſed. Ulcers and excreſcences about the pudendum and anus in women are ſaid to be particularly benefited in this way; and in theſe caſes the fumes are moſt conveniently applied by placing a red-hot heater at the bottom of a night-ſtool pan, and after ſprinkling on it a few grains of the red ſulphurated quickſilver, placing the patient on the ſtool. On other occaſions, a ſmall apparatus, ſold at the ſhops, is uſed, which enables the ſurgeon to direct the fumes through a funnel againſt the ulcer in any ſituation.

Though mention has juſt been made of venereal excreſcences, it is very queſtionable, whether any are ever really of this nature. Many excreſcences and verrucæ about the anus, and parts of generation, diminiſh and are cured by a courſe of mercury. This is the only argument in favour of their being venereal; for, when tied, cut off, or made to fall off by ſtimulating them with pulv. fabinæ and ærugo æris, they are as effectually cured, as if mercury had been given. Cooper's Dictionary of Practical Surgery, art. *Mercury*.

FUMIGATOR, formed of *fumus*, ſmoke, an inſtrument uſed for injecting clyſters of the ſmoke of tobacco. Clyſters of this kind have been applied in the iliac paſſion, in the hernia incarcerata, and in other caſes of an obſtinate conſtipation, or obſtruction of the bowels; and as they are admirably adapted to excite the ſuſpended or extremely languid periſtaltic motion of the inteſtines, which are reckoned among the moſt irritable parts of the body, and are allowed to retain the vital influence longer than any other, they have been peculiarly ſerviceable in caſes of recovery from apparent death by drowning, &c. The inſtrument commonly uſed for the injection of theſe clyſters is formed with an iron or braſs capſula for containing a certain quantity of tobacco, to which capſula are faſtened two pipes; one of them made of bone, to be inſerted into the anus; and the other of ivory, in the ſhape of that end of the trumpet which is applied to the mouth; by means of which the ſmoke of the burning tobacco in the capſula is forced through the firſt pipe into the anus. The Dutch have made the bowl of this inſtrument large enough to contain three-fourths of an ounce of tobacco; it is conſtructed of wood, lined with braſs or tin, and covered by a top of wood lined in the ſame manner; the top is ſcrewed upon the other; the inſtrument is uſed by means of a wooden tube or blow-pipe, ſcrewed to the top, and adapted either to the mouth, or to a pair of bellows. The inſtrument uſed by the French is compoſed of a box reſembling the bowl of a pipe, covered by a lid, at the upper part of which is a hole or chimney, for giving air to the tobacco at pleaſure. From the ſide of this cover proceeds a tube, about four inches in length, incorporated with it, and adapted at the other extremity to the end of a flexible tube. At the lower part of this box is inſerted a kind of tubular handle, which admits the nozzle of a pair of bellows, faſtened to it by means of an iron pin paſſing tranſverſely through both. By this contrivance, when the tobacco is lighted, it is not neceſſary to touch the heated box; and the bellows ſerves as a handle by which to direct all the neceſſary movements: the whole inſtrument is made of copper.

Mr. Wriggleſworth, in conſequence of hints and obſervations communicated to him by Dr. Cogan, has conſtructed a fumigator, free from the inconveniences attending thoſe already mentioned. The bowl or body of this new inſtrument is made of caſt braſs, and is large enough to contain about an ounce and a half of tobacco. The pipe projecting from the lower part of it is bored out of a ſolid piece of braſs, and alſo thoſe to which each extremity of the leathern tube is affixed. The cover is likewiſe made of caſt braſs; from the upper extremity of which projects a neck about an inch and a half in length, the opening or bore of it being about half an inch in diameter. The cover is fixed to the box by means of two notches made on each ſide of a circular ridge or edge, admitting two ears, that project from the upper part of the box, which by a circular motion lock upon the brim.

The nozzle of the bellows is accurately adapted to the neck of the cover, and is about an inch and half or two inches long; the lower end of the nozzle is rounded and ſmooth, like the lower extremity of a glyſter-pipe, and perforated like a cullender, in order to prevent the aſhes of the tobacco from riſing into the bellows. The bellows are faſtened upon the cover or lid in a manner ſimilar to the preceding; an ear projects from the upper part of the neck, and is admitted into a notch, in a circular rim, upon the nozzle. The pipe projecting from the lower extremity of the bowl, locks into the croſs-pipe to which the leathern tube is affixed, in the manner of a bayonet. By this kind of faſtening the whole apparatus may be made ready in the ſpace of a minute, and forms one compact body, free from the hazard of falling in pieces, and thus interrupting the operation; and yet either part may be taken off, when the occaſion requires, with the utmoſt eaſe and expedition. The bowl is incloſed in a thick caſe of wood, removeable at pleaſure; which ſecures the hand from injury during the whole proceſs. The ſame ingenious artiſt has alſo conſtructed a machine ſo formed, as to contain the above deſcribed fumigator, with every requiſite for beginning an operation in the recovery of perſons apparently drowned, &c. ſuch as brandy, ſalt, ſpirit of ſal ammoniac, tinder-box, flint and ſteel, and cloths to rub the body. This machine is light and portable, being not much larger than a caſe of ſurgical inſtruments. Reports of the Humane Society, 1775, p. 82, &c. See DROWNING.

FUMING, in *Metallurgy*, the firſt calcination of the ores of metals, intended to diveſt them of their ſulphurs. See ROASTING.

FUMITORY, in *Botany*. See FUMARIA.

FUMOS, CAPE, in *Geography*, a cape on the coaſt of Africa, in the Indian ſea. N. lat 27° 30'. E. long. 29° 17'.

FUNAI, or FUGEO, a town of Japan, ſituated in a bay on the E. coaſt of the iſland of Ximo. N. lat. 33° 20'. E. long. 133° 20'.

FUNAMBULUS, among the Romans, was what we call a *rope-dancer*, and the Greeks, *ſchœnobates*.

The term is alſo uſed for ſuch as, letting themſelves down by a rope or cord, make their eſcape out of a city, or place beſieged, as is obſerved by Du-Cange.

Julius Capitolinus, and Horace, make mention of funambuli. Acron on Horace aſſures us, that it was the orator Meſſala who firſt introduced the word funambulus, in lieu of ſchœnobates, uſed by the Greeks. For the Greeks ſeem to have had ſome of theſe rope-dancers from the firſt inſtitution of their ſcenic games, which are ſaid to have been invented about the time of Icarius, father of Erigone; or of Dionyſias, ſurnamed Liber Pater, whom Theſeus firſt introduced into Athens.

At Rome, the funambuli firſt appeared under the conſulate of Sulpicius Pæticus and Licinius Stolo, who were the firſt introducers of the ſcenic repreſentations. It is added, that they were firſt exhibited in the iſland of the Tiber; and that the cenſors Meſſala and Caſſius afterwards promoted them to the theatre.

In the Floralia, or ludi Florales, held under Galba, there were funambulatory elephants, as we are informed by Suetonius. Nero alſo ſhewed the like, in honour of his mother Agrippina. Vopiſcus relates the ſame of the time of Carinus and Numerianus.

There was a funambulus, it ſeems, who performed at the time when the Hecyra of Terence was acted; and the poet complains, that the ſpectacle prevented the people from attending to his comedy: "Ita populus ſtudio ſtupidus in funambulo animum occupârat."

FUNARIA, in *Botany*, from *funis*, a cord, on account of the twiſted ſtructure, and very active hygrometrical properties, of the fruit-ſtalk, is a genus of Moſſes, founded by Hedwig on the *Mnium hygrometricum* of Linnæus, Hudſon, and others. It has an angular veil, a double fringe with oblique or twiſted teeth, and a very ſlightly prominent lid. This genus is admitted into the *Flora Britannica*, and two or three new ſpecies have recently been added to the original one, among which is *F. Muhlenbergii*, a native of Ireland as well as of America.

FUNCH, JOHN, in *Biography*, was born at Werden, near Nuremberg, in the year 1518: little is known of his early life, but that he diſcovered a great love of literature, and was admitted to the profeſſion of the miniſtry. He was choſen court preacher to Albert duke of Pruſſia, and having a turn for politics, he engaged in cabals unfavourable to the intereſts of the Poliſh nation. For this he was proſecuted in the name of the province, and condemned to be put to death as a diſturber of the public peace. He was beheaded at Konigſberg in 1566, in the forty-ninth year of his age. He was author of a ſyſtem of "Chronology," which went through ſeveral editions; of "Commentaries upon the Apocalypſe;" of "The life of Andrew Oſiander," his father-in-law; of "The life of Vitus Theodorus," &c. He is ſaid to have compoſed the following verſes on the morning of his execution:

"Diſce, meo exemplo, mandato munere fungi.
Et fuge, ceu peſtem, *την πολυπραγμοσυνην*."

That is, learn, from my unhappy fate, to attend to your own buſineſs, and avoid, as a plague, the deſire of meddling with too many things. Moreri. Bayle.

FUNCHAL, or FUNCHIALE, in *Geography*, a ſea-port town and capital of the iſland of Madeira, ſituated in a valley on the S. coaſt of the iſland: deriving its appellation from *funcho*, the Portugueſe name for fennel, which grows in great plenty upon the neighbouring rocks, and by the obſervation of Dr. Heberden lying in N. lat. 32° 33' 33" and W. long. 16° 49'. It is ſituated in the bottom of a bay, and though larger than the extent of the iſland ſeems to deſerve, is very ill built; the houſes of the principal inhabitants are large, thoſe of the common people are ſmall, the ſtreets are narrow, and very badly paved. The harbour is defended by ſeveral batteries and a caſtle. It contains ſix pariſhes, ſeveral chapels, and ſix convents, with ſeveral hoſpitals. The churches are loaded with ornaments, among which are many pictures, and images of favourite ſaints, but the pictures are in general wretchedly painted, and the ſaints are dreſſed in lace clothes. Some of the convents are in a better taſte, eſpecially that of the Franciſcans, which is plain, ſimple, and neat in the higheſt degree. The infirmary is a model, which might be adopted in other countries with great advantage. In this is a ſmall chapel, the whole lining of which, both ſides and cieling, is compoſed of human ſculls and thigh bones.

The Portugueſe, though numerous, do not conſtitute the bulk of the inhabitants; the Engliſh and French Roman Catholics, who live in the Portugueſe manner, are juſtly ſuppoſed to exceed the others in number and wealth; under theſe there is a large multitude of Mulatto and Negro freemen. The principal trade of the inhabitants conſiſts in wine and ſweatmeats. The tides at this place flow at the full and change of the moon north and ſouth; the ſpring tides riſe ſeven feet perpendicular, and the neap-tides four. The refreſhments which ſhips may obtain here are water, wine, fruit of ſeveral ſorts, onions in plenty, and ſome

ſweetmeats: freſh meat and poultry are not to be had without leave of the governor, and at a high price.

FUNCHEON, a river of the county of Cork, Ireland, which riſes in the Galtie mountains, and paſſing near the town of Kilworth, waters the beautiful ſeat of lord Mountcaſhel, and then joins the Black-water a few miles below Fermoy.

FUNCTION, the act of doing ſomething for which the agent was appointed, or to which he was obliged.

FUNCTION is alſo uſed figuratively in ſpeaking of the offices, duties, or occupations in which a perſon is engaged.

The actions of an ambaſſador muſt be diſtinguiſhed from his functions; the one regard his character, the other his perſon.

FUNCTION, in *Analyſis*. The function of any quantity, as x, is any algebraic expreſſion of calculation into which x enters, mixed with other quantities that have invariable values; thus $\frac{1}{1+x}$, $(1+x^n)$, $(1+x)^{\frac{1}{2}}$, $(1+bx)^m \log. x$, &c. are all expreſſions which may be called functions of x: x is here ſuppoſed to be a variable quantity, and the object of the theory of analytic functions is to inveſtigate rules and proceſſes for determining in what manner certain variations of the quantity x will affect the values of the expreſſions, which, like the above, are functions of x.

Though the theory of analytic functions is ſo comprehenſive as to embrace the whole doctrine of variable quantities, or magnitudes, of what nature ſoever, yet it is nothing more than a continuation or branch of common algebra. It requires no new hypotheſis, but derives all its rules from the nature of the ſymbolical language adopted in that ſcience, and from the ſignification which by convention has been given to various analytical expreſſions. In its application to the inveſtigation of problems, it is analogous to the differential or fluxional calculus, but free from the objection ſo often urged againſt thoſe methods. Principles derived from the doctrine of bodies in motion, when applied to the inveſtigation of ſimple analytical expreſſions, ſeem evidently very remote from the ſubject in queſtion, and from that circumſtance alone we might very reaſonably be induced to ſuſpect the exiſtence of ſome other more appropriate method.

Surely it cannot be neceſſary to have recourſe to mechanical principles to ſhew what is the product of $a+x$ multiplied by $a+x$ a certain number of times, yet this is continually done by writers on fluxions, when they attempt to demonſtrate the binomial theorem by proceſſes derived from the principles of motion. It may ſometimes however happen that we are guided in our path to the diſcovery of general principles, from reflecting on the circumſtances which take place in partial inſtances. This has been the caſe in the doctrine of fluxions. The relation between the time employed and the ſpace deſcribed by a body in motion has given riſe to our idea of velocity; and from conſiderations drawn from theſe particular variable quantities, ſome principles have been deviſed, which it appears are applicable to variable quantities in general; yet the more logical method would certainly have been, firſt to have eſtabliſhed the law of variable magnitudes generally, and then to have ſhewn their application to the particular caſe of a body in motion.

It was a celebrated mathematician of our own country, Landen, who firſt propoſed to treat the fluxionary calculus as a branch of common algebra, but the method which he propoſes to ſubſtitute for it, is not only ſomewhat objectionable in its principle, but very incommodious in its practical application.

In the year 1772, M. Lagrange, in the Memoirs of the Academy of Berlin, firſt undertook to explain in what manner the fluxionary or differential calculus was included in the theory of the expanſion, in a ſeries of analytic functions. This celebrated work, entitled "Théorie des Fonctions Analytiques," appeared in 1796; it has ſince been illuſtrated and extended in another publication, "Leçons ſur le Calcul des Fonctions," 1806.

In theſe works the reader will find the whole theory of variable quantities completely developed, and applied to a great variety of important inveſtigations. Though we have no book in our own language which treats this ſubject on ſo extenſive a ſcale, yet the theory and principles on which the whole of this calculus depends, have been moſt ably explained by R. Woodhouſe, eſq. F.R.S. of Cambridge, in his "Principles of Analytical Calculation," a work which, for clearneſs, elegance, and perſpicuity, will probably for a long time remain unrivalled, and can never be excelled.

It is from theſe publications, and particularly the laſt, that the preſent abſtract is profeſſedly compoſed. But to enable the reader to comprehend the object propoſed, we ſhall endeavour to illuſtrate it by ſome very eaſy and ſimple examples.

Suppoſe $y = ax$, x being a variable quantity, y is then ſaid to be a function of x, ſince it depends on x for its value. If x aſſumes a new value, and becomes $x+\Delta x$ (Δx expreſſing the increment of x) y will require a new value, expreſſed in like manner by $y+\Delta y$. In this caſe we ſee immediately how the propoſed alteration in the value of x will affect the value of y; for ſubſtitute $x+\Delta x$ for x in the expreſſion ax, and it becomes $ax + a.\Delta x$. Therefore

$$y + \Delta y = ax + a.\Delta x;$$
$$\text{and} \quad \Delta y = a.\Delta x.$$

It appears, therefore, that in the above equation, $y = ax$, if any variation is made in the value of x, the correſponding alteration in the value of y is a times as great.

Again, ſuppoſe $y = x^3$;
let x become $x+\Delta x$; then

$$y + \Delta y = x^3 + 3x^2.\Delta x + 3x.(\Delta x)^2 + (\Delta x)^3$$
$$\text{and } \Delta y = 3x^2.\Delta x + 3x.(\Delta x)^2 + (\Delta x)^3.$$

In the firſt of the above examples, Δy, or the new value of y, conſiſts of a ſingle term, namely, Δx with a co-efficient. In the ſecond example, Δy conſiſts of a ſeries of ſeveral terms, the firſt of which is Δx, with a certain co-efficient; the others contain regular aſcending powers of Δx, Δx^2, Δx^3, with their reſpective co-efficients.

It will be ſeen that it is under this form that Δy, or the new value of φx or y, may be moſt commonly obtained.

The object of reſearch is to find one or more terms, and ſometimes the whole of this ſeries, from the given relation between φx and x, and ſometimes the reverſe; or to find from one or more of theſe terms the original relation that ſubſiſted between φx and x. Theſe two methods, namely, the direct and reverſe, are analogous to the finding fluxions and fluents in the uſual fluxionary calculus.

If y be any function of $x = \varphi x$, and its new value $y + \Delta y$ be obtained in the form of a ſeries aſcending according to the powers of Δx, then the firſt term of that ſeries, conſiſting of Δx and its co-efficient, is called the firſt derived function, or the differential of the variable quantity: it is the ſame as the fluxion of that quantity, but we do not obtain it in conſequence of any particular hypotheſis. The differential is only known to be the firſt term in conſequence of a previous definition, entirely arbitrary. The fluxion of a quantity is, on the contrary, obtained in conſequence of a particular theory; therefore, in whatever proceſs it is applied,

that whole proceſs becomes burthened with all the imperfections to which that original theory is liable. All this will be more diſtinctly ſeen hereafter; what is ſaid at preſent is only to introduce the ſubject, by appriſing the reader of the object of the ſcience.

The notation we ſhall adopt is the ſame as that uſed by Mr. Woodhouſe, after M. D'Arbogaſt. It differs materially from that of Lagrange.

Δ, denotes the entire difference,
d, the differential,
D, the differential co-efficient,
∂, the variation.

Thus, if $\overline{a+x}^m$ be expanded, the co-efficient of the term involving x is always found by multiplying the index (m) of the firſt term a^m, into that term, its index being diminiſhed by unity: D, therefore, denotes this operation; hence D a^m ſignifies $m a^{m-1}$, D a^{-m} ſignifies $-m a^{-m-1}$, &c.

D D D a^m, or $D^3 a^m$, denotes that three ſimilar operations are to be made, the firſt on a^m, the ſecond on the power of a that reſults after the firſt operation, the third on the power of a, which remains after the ſecond; hence $D^3 a^m$ ſignifies $m D^2 a^{m-1}$, or $m \cdot \overline{m-1} \cdot D\, a^{m-2}$, or $m \cdot \overline{m-1} \cdot \overline{m-2} \cdot a^{m-3}$.

Similarly, D D.....Da^m (n D's and $n \angle m$) ſignifies $m (m-1) (m-2) \ldots\ldots (m-n+1) a^{m-n}$.

Or, if D D D.....D (n) be abridgedly repreſented by D^n, $D^n a^m$ ſignifies $m (m-1) (m-2) \ldots\ldots\ldots\ldots (m-n+1) a^{m-n}$,

$D^2 a^2$, $3 \cdot 2 \cdot 1\, a^0$; $D^3 a^4$, $4 \cdot 3 \cdot 2\, a$;

$D^3 1^m$, $m \cdot (m-1) (m-2)\, 1^{m-3}$;

$D^2 1^{-\frac{1}{2}}$, $-\frac{1}{2} \cdot \frac{-3}{2} 1^{-\frac{5}{2}}$, or $\frac{3}{4} 1^{-\frac{5}{2}}$, or $\frac{3}{4}$;

$D^3 1^{\frac{1}{3}}$, $\frac{1}{3} \cdot \frac{-2}{3} \cdot \frac{-5}{3} 1^{-\frac{8}{3}}$, or $\frac{10}{27} 1^{-\frac{8}{3}}$ or $\frac{10}{27}$;

$D^2 a^{-m}$, $-m \cdot -m-1 \cdot a^{-m-2}$, or $m \cdot (m+1) \cdot a^{-(m+2)}$.

The propoſition aſſumed by Lagrange, and which forms the baſis of his whole work, is this, that if φx be any function whatever of a variable quantity x, and x changes its value, and becomes $x+i$, then the $\varphi (x+i)$ may be repreſented or reſolved into a ſeries of this form, $\varphi x + P i + Q i^2 + R i^3$, &c. in which the co-efficients of the powers of i are new functions of x, derived from the primitive function x independent of i, and moreover, that every co-efficient is derived from the preceding one, in the ſame manner as the firſt is derived from the original function.

Could ſuch a general propoſition as this be ſatisfactorily demonſtrated, it would, no doubt, lead us at once a great way in the ſcience. The binomial theorem, and other ſeries of frequent occurrence, would need no ſeparate inveſtigation, but would follow as particular caſes of a general rule.

But Mr. Woodhouſe, in the work alluded to, has clearly ſhewn that this aſſumption of Lagrange is much too general, and that no ſuch theory of ſeries can be eſtabliſhed which ſhall preclude the neceſſity of any farther examination of particular forms. Now the function of x or φx comprehends, under its general ſignification, a variety of combinations, ſuch as x^m, a^x, log. x, ſin. x, coſ. x, &c. It ſeems, therefore, eſſentially neceſſary in an elementary treatiſe to conſider theſe forms, and to ſhew in what manner, and with what reſtrictions, they may be included under any general expreſſion. The well-known binomial theorem we ſhall take for granted, but not as a propoſition derived from any abſtract principle, but as the reſult of inveſtigation depending in great meaſure on inſpection and trial. (See Manning's Algebra.)

Thoſe authors who endeavour to give it a higher origin, as capable of being deduced from principles of motion, as in many treatiſes on fluxions, ſeem to have been led into the error of ſuppoſing known what actually they were in ſearch of. Inſtances are to be found where the elementary rules of the ſcience of fluxions are founded on the law of the binomial theorem, and that theorem afterwards demonſtrated by the application of thoſe very rules which could not themſelves have been deviſed without the previous knowledge of the theorem to be inveſtigated.

But, however this may be, let us at preſent take the truth of this theorem for granted, and proceed to a farther inveſtigation of the ſubject.

Note.—For the purpoſe of a more commodious notation, D^n_c repreſents $\frac{D^n}{1 \cdot 2 \cdot 3 \ldots n}$; $\frac{D^2}{c} = \frac{D^2}{1 \cdot 2}$; $\frac{D^3}{c} = \frac{D^3}{1 \cdot 2 \cdot 3}$ &c.

$\overline{a+x}^m$ being then aſſumed equal $a^m + \frac{D}{c} a^m x + \frac{D^2}{c} a^{m-2} x^2 + \frac{D^3}{c} x^3$, &c. the next expreſſion to be conſidered is $\varphi x = a^x$.

Now, in the expreſſion a^x there is nothing indicative of any operation that can be performed in a manner analogous to that of $\overline{a+x}^n$, ſome artifice muſt be deviſed to change its form for that purpoſe; one of the moſt ſimple is, to make $1+b=a$, or a^x may be put under this form, $a^x = (1+(a-1))^x$: then by the preceding theorem, where $a=1$, $x=a-1$, $m=x$, $a^x = (1+(a-1))^x = 1 + x (a-1) + \frac{x \cdot (x-1)}{1 \cdot 2} (a-1)^2 + x \cdot \frac{(x-1) \cdot (x-2)}{1 \cdot 2 \cdot 3} (a-1)^3$, &c. &c.

$= 1 + x ((a-1) - \frac{1}{2} (a-1)^2 + \frac{1}{3} (a-1)^3 - \frac{1}{4} (a-1)^4 \ldots\ldots\ldots\ldots$ or $A x + \frac{x^2}{1 \cdot 2} ((a-1)^2 - (a-1)^3 + (a-1)^4 \ldots\ldots A_{,} x$

$= 1 + A x + A_{,} x^2 + A_{,,} x^3$;

in which ſeries the quantities A, A, $A_{,}$, $A_{,,}$, are conſtant co-efficients, but unknown. To determine the law of their connexion or dependance on each other, increaſe x by the indeterminate quantity z;

then $a^{x+z} = 1 + A (x+z) + A (x+z)^2 \ldots A_{n-1} (x+z)^n$;

or expanding the powers of $x+z$, ſtopping at the two firſt terms

$a^{x+z} = 1 + A (x+z) + A_{,} (x^2 + 2xz + \&c.) + A_{,,} (x^3 + 3x^2 z + \&c.)$

$A n-1 (x^n + n x^{n-1} z + \&c.) + A (x^{n+1} + (n+1) x^n z + \&c.)$

Again, $a^{x+z} = a^x = (1 + A x + A_{,} x^2 \ldots A_{n-1} x^n + \&c.)$

$\times (1 + A z + A_{,} z^2 \ldots A^{n-1} z^n + \&c.)$

$= 1 + A (x+z) + A_{,} x^2 + A_{,,} z \ldots\ldots + A^{n-1} x^2$

$+ A^2 xz + A_{,} A \cdot x^2 z \ldots + A^{n-1} \cdot A x^{n-1} z$.

Compare the correſponding terms in the two expanſions, and

$2 A_{,} = A^2$, and $A_{,} = \frac{A^2}{2}$, $3 A_{,,} = A A_{,} = \frac{A^3}{2}$, and $A_{,,,} = \frac{A^3}{1 \cdot 2 \cdot 3}$ $n A_{n-1} = A_{n-2} A$ or $A_{n-1} = \frac{A n-2 A}{n} = \frac{A^n}{1 \cdot 2 \cdot 3 \cdot 4}$

Hence, $a^x = 1 + A x + \frac{A^2 \cdot x^2}{1 \cdot 2} + \frac{A^3 x^3}{1 \cdot 2 \cdot 3} + \frac{A^4 x^4}{1 \cdot 2 \cdot 3 \cdot 4}$

If $x = 1$

$a =$

$$a = 1 + A + \frac{A^2}{1.2} + \frac{A^3}{1.2.3} + \&c.$$

If $x = \frac{1}{A}$

$a^{\frac{1}{A}} = 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3} + \&c. = 2.718281824$,

and when $A = 1 . a = 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3} =$ 2.71828 1824 $= e$, suppoſe therefore $a^{\frac{1}{A}} = e$, and $a = e^{A}$,

then $e^x = 1 + x + \frac{x^2}{1.2} + \frac{x^3}{1.2.3} + \frac{x^4}{1.2.3.4}$;

x is here ſuppoſed variable; let the difference between it and its ſucceſſive value be expreſſed by the ſymbol Δx.....

then $e^{\Delta x} = 1 + \Delta x + \frac{(\Delta x)^2}{1.2} + \frac{(\Delta x)^3}{1.2.3} + \&c.$

$e^{x+\Delta x} = e^x + e^x \Delta x + \frac{e^x (\Delta x)^2}{1.2} + \frac{e^x (\Delta x)^3}{1.2.3} + \&c.$

Since $e^{-x} = 1 - x + \frac{x^2}{1.2} - \frac{x^3}{1.2.3}$ &c.

$e^x + e^{-x} = 2 + \frac{2x^2}{1.2} + \frac{2x^4}{1.2.3.4}$;

or $\frac{e^x + e^{-x}}{2} = 1 + \frac{x^2}{1.2} + \frac{x^4}{1.2.3.4} + \frac{x^6}{1.2.3.4.5.6} + \&c.$

and $\frac{e^x - e^{-x}}{2} = x + \frac{x^3}{1.2.3} + \frac{x^5}{1.2.3.4.5} + \frac{x^7}{1.2.3.4.5.6.7}$ + &c.

Again $e^{x+\Delta x} + e^{-(x+\Delta x)} = (e^x - e^{-x}) + (e^x - e^{-x}) \Delta x + (e^x + e^{-x}) . \frac{(\Delta x)^2}{1.2} + \&c.$

And $e^{x+\Delta x} - e^{-(x+\Delta x)} = (e^x - e^{-x}) + (e^x + e^{-x}) \Delta x + (e^x - e^{-x}) . \frac{(\Delta x)^2}{1.2}$.

In the form for e^x for x ſubſtitute $\pm x\sqrt{-1}$, then the ſymbol $e^{x\sqrt{-1}}$ repreſents $1 + x\sqrt{-1} - \frac{x^2}{1.2} - \frac{x^3\sqrt{-1}}{1.2.3}$ &c

and $e^{-x\sqrt{-1}}$ repreſents $1 - x\sqrt{-1} - \frac{x^2}{1.2} + \frac{x^3\sqrt{-1}}{1.2.3}$ − &c.

and conſequently $\frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{2}$ is the ſymbol for $1 - \frac{x^2}{1.2} + \frac{x^4}{1.2.3.4}$ − &c.

and $\frac{e^{x\sqrt{-1}} - e^{-x\sqrt{-1}}}{2\sqrt{-1}}$ is the ſymbol for $x - \frac{x^3}{1.2.3} + \frac{x^5}{1.2.3.4.5}$ − &c.

again $e^{x\sqrt{-1}} \times e^{\Delta x\sqrt{-1}} = e^{x\sqrt{-1}} . \Delta x\sqrt{-1} - \frac{e^{x\sqrt{-1}}(\Delta x)^2}{1.2}$ − &c.

$e^{-x\sqrt{-1}} \times e^{-\Delta x\sqrt{-1}} = e^{-x\sqrt{-1}} - e^{-x\sqrt{-1}} . \Delta x\sqrt{-1} - \frac{e^{-x\sqrt{-1}}(\Delta x)^2}{1.2} + \&c.$

$\therefore \frac{e^{(x+\Delta x)\sqrt{-1}} + e^{-(x+\Delta x)\sqrt{-1}}}{2} = \frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{2} + \frac{e^{x\sqrt{-1}} - e^{-x\sqrt{-1}}}{2} . \Delta x\sqrt{-1} - \frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{1.2} (\Delta x) + \&c.$

The form for a^x being determined, ſuppoſe it were required to determine X in terms of x; in this equation $x = a^X$. Since $x = a^X$, $x^z = a^{Xz}$ (z being an independent arbitrary quantity,) conſequently from the laſt article, if $(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \&c.$ be put $= V$;

then $1 + Vz + \frac{(Vz)^2}{1.2} + \frac{(Vz)^3}{1.2.3} + \&c.$

$= 1 + AXz + \frac{(AXz)^2}{1.2} + \frac{(AXz)^3}{1.2.3}$, &c. Hence comparing the co-efficients affected with the ſame powers of z

$V = AX$ or $X = \frac{V}{A} = \frac{(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \&c.}{A}$

&c.

$= \frac{(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \&c.}{(a-1) - \frac{1}{2}(a-1)^2 + \frac{1}{3}(a-1)^3 - \&c.}$

Hence, if equations, as $x = a^X$, $1 + x = a^X$, &c. be thus denoted,

$x = a^{\varphi x}$, $1 + x = a^{\varphi(1+x)}$, we have

$$\varphi(1+x) = \frac{x - \frac{x^2}{2} + \frac{x^3}{3} - \&c.}{A}$$

In like manner $\varphi\left(1 + \frac{\Delta x}{x}\right)$

$= \frac{\frac{\Delta x}{x} - \frac{1}{2}\left(\frac{\Delta x}{x}\right)^3 + \frac{1}{3}\left(\frac{\Delta x}{x}\right)^3 - \&c.}{A}$

And ſince $x + \Delta x = x + \left(1 + \frac{\Delta x}{x}\right)$, $a^{\varphi(x+\Delta x)} = a^{\varphi x} \times a^{\varphi(1+\Delta x)}$.

Therefore $\varphi(x + \Delta x) = \varphi x + \varphi\left(1 + \frac{\Delta x}{x}\right)$,

or $\varphi(x + \Delta x) = \varphi x + \frac{\frac{\Delta x}{x} - \frac{1}{2}\left(\frac{\Delta x}{x}\right)^2 + \frac{1}{3}\left(\frac{\Delta x}{x}\right)^3 - }{A}$

&c.

If $x = a^{\varphi x}$, $x^{\frac{1}{2}} = a^{\frac{\varphi x}{2}}$, $x^{\frac{1}{3}} = a^{\frac{\varphi x}{3}}$, &c.

and generally $x^{\frac{1}{m}} = a^{\frac{\varphi x}{m}}$; then

$\varphi x = \frac{2}{A}\left(\left(x^{\frac{1}{2}} - 1\right) - \frac{1}{2}\left(x^{\frac{1}{2}} - 1\right)^2 + \frac{1}{3}\left(x^{\frac{1}{2}} - 1\right)^3 - \&c.\right)$

or $= \frac{3}{A}\left(\left(x^{\frac{1}{3}} - 1\right) - \frac{1}{2}\left(x^{\frac{1}{3}} - 1\right)^2 + \frac{1}{3}\left(x^{\frac{1}{3}} - 1\right)^3 - \&c.\right)$

or generally $= \frac{m}{A}\left(\left(x^{\frac{1}{m}} - 1\right) - \frac{1}{2}\left(x^{\frac{1}{m}} - 1\right)^2 + \frac{1}{3}\left(x^{\frac{1}{m}} - 1\right)^3 - \&c.\right)$

In the equation $x = a^X$, or $= a^{\varphi x}$, X or φx is called the logarithm of x, and a the baſe; if the value of a be ſuch that A or $(a-1) - \frac{1}{2}(a-1)^2 + \frac{1}{3}(a-1)^3 - \&c. = 1$, repreſenting this value of a by e $\left(= 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3}\right.$

and

and = 2.7182818284, &c.); then in the equation $x = e^x$ or $e^{\phi x}$, X or ϕx is commonly called the hyperbolic logarithm, becauſe it can be repreſented by the area of an equilateral hyperbola between its aſymptotes: the name, however, is improperly given, ſince the connection between the theories of curve lines and logarithms is merely arbitrary and accidental.

It has appeared that

$$(x + \Delta x)^m = x^m + m x^{m-1} . \Delta x + \frac{m . (m-1)}{2} , x^{m-2} (\Delta x)^2 + \&c.$$
$$= x^m + D x^m . \Delta x + \overset{D^2}{c} x^m (\Delta x)^2 + \&c.$$

Likewiſe that $a^{x+\Delta x} = a^x . A . \Delta x + \frac{a^x . A^2 (\Delta x)^2}{1 . 2}$, &c.

$$e^{x+\Delta x} = e^x + e^x \Delta x + \frac{e^x (\Delta x)^2}{1 . 2} + \&c.$$

and that in the equations $x + \Delta x = a^{L.(x+\Delta x)}$, $x + \Delta x = e^{l(x+\Delta x)}$;

$$L . (x + \Delta x) = L . x + \frac{1}{A} . \left(\frac{\Delta x}{x}\right) - \tfrac{1}{2} \left(\frac{\Delta x}{x}\right) + \tfrac{1}{3} \left(\frac{\Delta x}{x}\right)^3 - \&c.;)$$

$$l (x + \Delta x) = l . x . + \frac{\Delta x}{x} - \tfrac{1}{2} \left(\frac{\Delta x}{x}\right)^2 + \tfrac{1}{3} \left(\frac{\Delta x}{x}\right)^3 - \&c.$$

In the above expreſſions L . x denotes the common, and $l . x$ the Napierean or hyperbolic logarithm of x.

Of the expanſions of the forms x^m, a^x, e^x, $l . x$, when x is increaſed to $(x + \Delta x)$, it appears then, that there are certain common properties which can be predicated, and it becomes an object of analytic concern to deſignate theſe expreſſions x^m, e^x, &c. by a common ſymbol and name, and to comprehend their expanſions under a general formula. The advantage of this generalization is ſufficiently obvious (if it can be effected,) ſince it will enable us to announce generally and conciſely what otherwiſe we muſt announce tediouſly, by enumerating particular caſes.

The expreſſions x^m, a^x, $l . x$, are called functions of x, and are thus ſymbolically repreſented by F x, ϕx, $f x$, or $\downarrow x$, &c; and conſequently F $(x + \Delta x)$ or $\phi (x + \Delta x)$ or $f (x + \Delta x)$, $\downarrow (x + \Delta x)$, &c. mean either $(x + \Delta x)^m$, $a^{(x+\Delta x)}$, or $l (x + \Delta x)$.

Now the ſymbol D has hitherto only denoted that operation by which the co-efficient of the ſecond term in the expanſion of $(a + x)^m$ or $(x + \Delta x)^m$ is formed. Let it now be made to denote the operation made on x^m, a^x, $l . x$, &c. by which the co-efficient of the ſecond term, in the expanſions of $(x + \Delta x)^m$ $(a^{x+\Delta x})$, L . $(x + \Delta x)$ $(x + \Delta x = a^{L.(x+\Delta x)})$ is formed then under this ſignification; its former one will be comprehended, but it will no longer denote a ſimilar operation, as when reſtricted to expreſſions ſuch as x^m; D, however, when applied to ϕx, generally repreſents the ſecond term of the ſeries that ariſes from expanding ϕx, when for x we ſubſtitute its new value $x + \Delta x$; and that ſecond term can always be known, ſince all the expreſſions which $\phi (x + \Delta x)$ is made generally to repreſent, have been previouſly expanded.

Thus, $D x^m = m x^{m-1}$,

$D a^x = A a^x$, $D e^x = e^x$

$$D L . x = \frac{1}{A x} \quad D . l . x = \frac{1}{x}.$$

Hence D D x^m or $D^2 x^m$ denotes $m . (m-1) x^{m-2}$,
D D a^x or $D^2 a^x$ denotes D $(A a^x)$ or $A^2 a^x$,
D D D a^x or $D^3 a^x$ denotes $A^3 a^x$.

Again, D D $l . x$ or $D^2 l . x$ denotes $D \frac{1}{x}$ or $-\frac{1}{x^2}$,

D D D or $D^3 . l . x$ denotes D $(D^2 l . x)$ or $D \left(\frac{1}{x^2}\right)$ or $\frac{2}{x^3}$.

In like manner $D^4 l . x$ denotes D $(D^3 l . x)$ or $-\frac{2 . 3}{x^4}$.

Hence, ſince

$$(x + \Delta x)^m = x^m + m x^{m-1} \Delta x + \&c.$$
$$a^{x+\Delta x} = a^x + A a^x . \Delta x + \frac{A^2 a^x (\Delta x)^2}{1 . 2} + \&c.$$
$$L . (x + \Delta x) = L . x + \frac{\Delta x}{A x} + \frac{(\Delta x)^2}{2 . A . x^2} + \&c.$$
$$\text{and } l (x + \Delta x) = l . x + \frac{\Delta x}{x} - \tfrac{1}{2} \left(\frac{\Delta x}{x}\right)^2 + \&c.$$

It appears that all theſe forms may be comprehended under the following:

$$\phi (x + \Delta x) = \phi x + D \phi x . \Delta x + \overset{D^2}{c} \phi x (\Delta x)^2 + \&c.$$
$$\text{or} = \phi x + D \phi x . \Delta x + \frac{D \phi x (\Delta x)^2}{1 . 2} + \&c.$$

which agrees with the theorem known by the name of Taylor's theorem, and given by that learned mathematician in his "Methodus Incrementorum," wherein he ſays that z flowing uniformly and becoming $z + v$, x becomes

$$x + \dot{x} . \frac{v}{1} \dot{z} + \ddot{x} . \frac{v^2}{1 . 2} \dot{z}^2 + \dddot{x} . \frac{v^3}{1 . 2 . 3} \dot{z}^3 + \&c.$$

The co-efficients of the ſecond, third, &c. terms, are repreſented by $D \phi x$, $\overset{D^2}{c} \phi x$, $\overset{D^3}{c} \phi x$, &c.; and when ϕx is of the form $l . x$, $(x = e^{l . x})$ then the firſt term is $l . x$, and the co-efficient of the ſecond is $\frac{1}{x}$; but $-\frac{1}{x^2}$, the co-efficient of the third term, is not formed from $\frac{1}{x}$ as $\frac{1}{x}$ is from $l . x$.

When $D \phi x$, $D^2 \phi x$, &c. are ſaid to be derived from each other by the ſame law, it ſhould always be previouſly defined, that by the ſame law is meant that which orders the ſecond term of the ſeries to be taken when the function of x, whatever it is, has been expanded after ſubſtituting $x + \Delta x$ for x.

Since $a^{\pm (x+\Delta x)}$ or $e^{\pm (x+\Delta x)}$ will likewiſe be included under the form $\phi (x + \Delta x) = \phi x + D \phi x . \Delta x + \overset{D^2}{c} \phi x (\Delta x)^2 + \&c.$ it is clear that if $\phi (x)$ be made to repreſent $e^x \pm e^{-x}$, that $e^{x+\Delta x} \pm e^{-(x+\Delta x)}$ will likewiſe be included under the above form $\phi (x + \Delta x)$, and its expanſion likewiſe under the ſame form as that of $\phi (x + \Delta x)$.

Again, if the ſymbol $\sqrt{-1}$ be employed, $e^{(\pm (x+\Delta x)\sqrt{-1}}$ may be included under the form $\phi (x + \Delta x = \phi x + D \phi x . \Delta x + \overset{D^2}{c} \phi x . (\Delta x)$, and conſequently if ϕx be made to repreſent $e^{x\sqrt{-1}} \pm e^{x-\sqrt{-1}}$; then $e^{(x\Delta+x)\sqrt{-1}} \pm e^{-(x+\Delta x)\sqrt{-1}}$ will be included under the form $\phi (x + \Delta x) = \phi x + D \phi x . \Delta x + \overset{D^2}{c} \phi x . (\Delta x)^2 + \&c.$

The ſymbols $2^{-1} (e^{x\sqrt{-1}} + e^{-x\sqrt{-1}})$; $(2\sqrt{-1})^{-1} (e^{x\sqrt{-1}} - e^{-x\sqrt{-1}})$ repreſent the coſine and ſine of an arc x, whoſe radius is unity, and conſequently with reference to their

their analytica repreſentation, the expreſſions cof. $(x + \Delta x)$, ſin. $(x + \Delta x)$ expanded may be ſaid to be included under the form $\varphi(x + \Delta x) = \varphi x + D\varphi x(\Delta x . + \frac{D^2}{c} \varphi x (\Delta x)^2 +$ &c. But ſtrictly there is no more reaſon for conſidering ſin. x cof. x as a ſimple analytical function of x diſtinct from e^x, than for conſidering $e^x \pm e^{-x}$, or generally $e^{\alpha x} + e^{\beta x} + e^{\gamma x}$, &c. ($\alpha, \beta, \gamma$, &c. being roots of $x^n \pm 1 = 0$) as functions of x diſtinct from e^x.

On the nature of the above analytical expreſſions for the ſine and coſine of an arc x, the reader is referred to a very learned paper in the Tranſactions of 1802 by Mr. Woodhouſe, and likewiſe to the Treatiſe of Trigonometry by Le Gendre, p. 354. Since this article was written Mr. Woodhouſe has publiſhed a Treatiſe on Trigonometry, to which the reader is referred.

The caſes which Mr. Woodhouſe next conſiders in his principles of analytical calculation are thoſe of fractions, whoſe numerators and denominators under particular circumſtances vaniſh. Let us take a ſimple caſe, that of $\frac{x^2 - a^2}{x - a}$; the ſignification of this expreſſion is, that $x^2 - a^2$ is to be divided by $x - a$; the reſult of that diviſion is $x + a$, or putting $x = a$, $a + a$, or $2a$. The reſult, however, is no direct and natural conſequence from the principles of calculation. To the queſtion, what does $\frac{x^2 - a^2}{x - a}$ become, when $x = a$; the obvious and logical anſwer is $\frac{a^2 - a^2}{a - a}$. And what would be the method of ſhewing that this value $\frac{a^2 - a^2}{a - a}$ was wrongly aſſigned? This, I apprehend; $x^2 - a^2 = (x - a)(x + a)$, $\therefore \frac{x^2 - a^2}{x - a} = \frac{(x - a)(x + a)}{(x - a)} = x + a = (x = a)$, $2a$; but herein is a manifeſt fallacy; $x^2 - a^2$ is not *generally* $= (x - a)(x + a)$: for inſtance, the particular caſe of $x = a$ is to be excluded; the proof eſſentially demanding this circumſtance, to wit, that $x - a$ be a quantity, or that x be greater than a;

By the inſtances ſubjoined, it will more fully appear, that the values of vaniſhing fractions are arbitrarily obtained, that is, obtained by extending a rule, and obſerving a certain order in the proceſs of calculation.

Suppoſe the fraction $\frac{\sqrt{x} - \sqrt{a} + \sqrt{(x - a)}}{\sqrt{(x^2 - a^2)}}$; for x, put $a + (x - a)$, then,

$$(a + x - a)^{\frac{1}{2}} = a^{\frac{1}{2}} + \frac{(x - a)}{2a^{\frac{1}{2}}} - \frac{(x - a)^2}{8a^{\frac{3}{2}}} + \&c.$$

$$\therefore \text{fraction} = \frac{(x - a)^{\frac{1}{2}} + \frac{(x - a)}{2a^{\frac{1}{2}}} - \frac{(x - a)^2}{8a^{\frac{3}{2}}} + \&c.}{(x^2 - a^2)^{\frac{1}{2}}}$$

$$= \frac{1 + \frac{1}{2}\left(\frac{x - a}{a}\right)^{\frac{1}{2}} - \&c.}{(x + a)^{\frac{1}{2}}}$$; in this part of the operation put $x = a$, and the expreſſion is reduced to $\frac{1}{(2a)^{\frac{1}{2}}}$.

This reſult is the ſame as what the rules derived from the differential calculus give: and that the reſult is obtained arbitrarily, by artifice, and by obſerving in the proceſs, an order not indicated in the expreſſion, appears ſimply thus; inſtead of putting $a + (x - a)$ for x, put $(x - a) + a$, and $\sqrt{x}$ becomes $(x - a)^{\frac{1}{2}} + \frac{a}{2(x - a)^{\frac{1}{2}}} -$ &c. by which method we could arrive at no finite concluſion, ſince putting $x = a$, the co-efficients of the terms of $(x - a + a)^{\frac{1}{2}}$ expanded, would be infinite: yet, without a particular purpoſe in view, the latter ſeries is as true as the former; and, inſtead of x is ſubſtituted not $(x - a) + a$, but $a + (x - a)$, for the ſame reaſon, as 9 would be put $(8 + 1)$, and not $(1 + 8)$, if it were required to compute $9\frac{1}{2}$ by the binomial theorem.

Let now the fraction (F) be $\frac{(2r^3 x - x^4)^{\frac{1}{2}} - (r x^3)^{\frac{1}{2}}}{r - (r x)^{\frac{1}{2}}}$ which is the inſtance given by Bernouilli, and ſubſequently by Landen in his Reſidual Analyſis; the value of the fraction (F) is required when $x = r$;

$$\text{now } F = \frac{\left((r^3 x + x(r^3 - x^3)\right)^{\frac{1}{2}} - (r x^3)^{\frac{1}{2}}}{r^{\frac{1}{2}}(r^{\frac{1}{2}} - x^{\frac{1}{2}})}$$

$$= \frac{(r^3 x)^{\frac{1}{2}} + \frac{x \cdot (r^3 - x^3)}{2(r^3 x)^{\frac{1}{2}}} + A(r^3 - x^3)^2 + \&c. - (r x^3)^{\frac{1}{2}}}{r^{\frac{1}{2}}(r^{\frac{1}{2}} - x^{\frac{1}{2}})}$$

(A the co-efficient of the third term)

$$= \frac{(r x)^{\frac{1}{2}} \times (r - x) + \frac{x(r^3 - x^3)}{2(r^3 x)^{\frac{1}{2}}} + A(r^3 - x^3)^2 + \&c.}{r^{\frac{1}{2}}(r^{\frac{1}{2}} - x^{\frac{1}{2}})}$$

$$= \frac{(r x)^{\frac{1}{2}} \cdot (r^{\frac{1}{2}} + x^{\frac{1}{2}}) + \frac{x^{\frac{1}{2}}}{2 r r^{\frac{1}{2}}}(r^2 + r x + x^2) \cdot (r^{\frac{1}{2}} + x^{\frac{1}{2}}) + A \cdot (r^3 - x^3) \times \&c. + \&c.}{r^{\frac{1}{2}}}$$

when $x = r$, $= r^{\frac{1}{2}}(r^{\frac{1}{2}} + r^{\frac{1}{2}}) + \frac{1}{2 r r^{\frac{1}{2}}}(r^2 + r^2 + r^2)(r^{\frac{1}{2}} + r^{\frac{1}{2}}) = 2r + \frac{3r \times 2r}{2r} = 5r.$

Again, let the fraction (F) be $\frac{(2a^2 + 2x^2)^{\frac{1}{2}} - 2a^{\frac{2}{3}} x^{\frac{1}{3}}}{x - a}$, an inſtance given by Euler; the value of this fraction is required, when $x = a$;

$$\text{now } F = \frac{2^{\frac{1}{2}}\left(2x^2 - (x^2 - a^2)\right)^{\frac{1}{2}} - 2a^{\frac{2}{3}} x^{\frac{1}{3}}}{x - a}$$

$$= \frac{2^{\frac{1}{2}} \times \left(2^{\frac{1}{2}} x - \frac{x^2 - a^2}{2(2x^2)^{\frac{1}{2}}} + A(x^2 - a)^2 + \&c.\right) - 2a^{\frac{2}{3}} x^{\frac{1}{3}}}{x - a}$$

$$= \frac{2x^{\frac{1}{3}}(x^{\frac{2}{3}} - a^2) - \frac{x^2 - a^2}{2x} + A(x^2 - a^2)^2 + \&c.}{x - a}$$

$$= \frac{2x^{\frac{1}{3}}(x^{\frac{1}{3}} + a^{\frac{1}{3}})}{x^{\frac{2}{3}} + a^{\frac{1}{3}} x^{\frac{1}{3}} + a^{\frac{2}{3}}} - \frac{x + a}{2x} + A(x^2 - a^2)(x + a),$$

&c. $= (x = a)\ \frac{4}{3} - 1$ or $\frac{1}{3}$.

The ſimple rule for finding the value of theſe fractions is to take the differentials of the numerator and denominator:

Thus, in $F = \frac{x^2 - a^2}{x - a}$, $d(x^2 - a^2) = 2x\, d\, x$, $d(x - a)$

$d(x-a) = dx \therefore F = \frac{2x\,dx}{dx} = 2x = 2a$,

again, in $F = \frac{\sqrt{(2a^3x - x^4)} - a^3\sqrt{a^2x}}{a - \sqrt[4]{ax^3}} \left(\frac{N}{D}\right) d(N)$

$= \left\{ (a^3 - 2x^3)\ (2a^3x - x^4)^{-\frac{1}{2}} - \frac{1}{3}a^{\frac{1}{3}}x^{-\frac{2}{3}} \right\}$

$dx\,d(D) = -\frac{3}{4}a^{\frac{1}{4}}x^{-\frac{1}{4}} . dx$

when $x = a$, $d(N) = \left(-a^3 . (a^1)^{\frac{1}{3}} - \frac{a}{3}\right) dx = -\frac{4a}{3}$

and $d(D) = -\frac{3}{4} . dx \therefore F = \frac{d(N)}{d(D)} = \frac{9a}{1b}$.

This rule is ſufficient for the generality of caſes; and the proceſs continued will give the value of F; this continuation of the proceſs is neceſſary when after the firſt differentiation, and the ſubſtitution of $x = a$, the numerator and denominator each $= 0$: an inſtance of this caſe is $\frac{a^3\sqrt{(4a^3 + 4x)} - ax - a^2}{\sqrt{(2a^2 + 2x^2)} - x - a}$.

If after the ſecond differentiation, N and D each $= 0$, then continue the differentiation as long as N and D ſhall $= 0$.

Generally to find the value of $\frac{fx}{Fx}$, when fx, and Fx, $= 0$ on making $x = a$; for x ſubſtitute $a + (x - a)$,

then $fx = f(a + (x - a)) = fa + Dfa . (x - a) + \underset{c}{D^2}fa . (x - a)^2 +$ &c.

and $Fx = F(a + (x - a)) = Fa + DFa(x - a) + \underset{c}{D^2}Fa\,(x - a)^2 +$ &c.

but when $x = a$, fx, Fx, or fa, $Fa = 0$,

$$\therefore \frac{fx}{Fx} = \frac{Dfa + \underset{c}{D^2}fa . (x - a) + \text{&c.}}{DFa + \underset{c}{D^2}Fa\,(x - a) + \text{&c.}}$$

$=$ (putting $x = a$), $\frac{Dfa}{DFa}$, except Dfa, DFa likewiſe $= 0$, and then $\frac{fx}{Fx} = \frac{\underset{c}{D^2}fa + \underset{c}{D^3}fa . (x - a) + \text{&c.}}{\underset{c}{D^2}Fa + \underset{c}{D^3}Fa\,(x - a) + \text{&c.}}$

$=$ (putting $x = a$) $\frac{\underset{c}{D^2}fa}{\underset{c}{D^2}Fa}$, and if $\underset{c}{D^2}fa$, $\underset{c}{D^2}Fa$ likewiſe $= 0$, then $\frac{fx}{Fx} = \frac{D^3fa}{DFa}$, and generally, if the terms of the expanded ſeries up to the n^{th} terms, to wit, $\underset{c}{D^n}fa$, $\underset{c}{D^n}Fa$, $= 0$, then $\frac{fx}{Fx}(x = a) = \frac{D^nfa}{D^nFa}$.

This rule may be demonſtrated thus:

Let $y = \frac{fx}{Fx} \therefore y . Fx = fx \therefore \frac{dy}{dx} . Fx + \frac{dFx}{dx} = \frac{d . fx}{dx}$

but when $x = a$, by hypotheſis $Fx = 0$,

$$\therefore y = \frac{dFx}{dx} = \frac{dfx}{dx}, \text{ or } y = \frac{D . fx}{D . Fx}$$

which is the firſt part of the rule.

If when $Fx = 0$, DFx, $DFx = 0$ alſo; then by taking the differential of equation (1)

$\frac{d^2y}{dx^2} . Fx + \frac{2\,dy}{dx} . D . Fx + y\,D^2 . Fx = D^2 . fx$;

but when $x = a$, Fx, DFx, $= 0$ or $y = \frac{D^2fx}{D^2Fx}$, which is the proof of the ſecond part of the rule 1, or of the proceſs continued.

The values then of fractions, ſuch as $\frac{fx}{Fx}$, whoſe numerators and denominators vaniſh, on aſſigning particular values to x, may be computed by the preceding proceſs: which proceſs is arbitrary, and not neceſſarily to be followed, from any thing contained in the ſignificancy of the expreſſion $\left(\frac{fx}{Fx}\right)$. Propoſe the queſtion ſeparately, what does $\frac{x^m - a^m}{x^n - a^n}$ become $x = a$? and the obvious anſwer to any mind undebauched with mathematical ſophiſtry, is $\frac{a^m - a^m}{a^n - a^n}$ or $\frac{0}{0}$. A different reſult can be obtained by a different proceſs: but why ought that proceſs to be followed? No ſatisfactory anſwer can be given to this queſtion, when it is abſtractedly propoſed to find the value of $\frac{fx}{Fx}$, and we can only remove our doubts by viewing the circumſtances under which, in the application of analyſis, it is neceſſary to compute $\frac{fx}{Fx}$.

Now the fact is, that in inveſtigating the properties of extenſion, or of motion, the nature of the caſe directs us to follow, in computing the value of a vaniſhing fraction, a proceſs exactly ſimilar to that by which $\frac{fx}{Fx}$ has been computed; thus, if y be the ordinate of a curve, and $= \frac{x^2}{b}$, and y' be another ordinate, at an interval $(x' - x)$, and $= \frac{x'^2}{b}$, then $\frac{\text{ordinate}}{L}$ (L being a part of the axis intercepted between the points where the ordinate and a ſecant of the curve cut the axis) $= \frac{1}{b}\left(\frac{x'^2 - x^2}{x' - x}\right) = \frac{1}{b}(x' + x)$. Here x' is greater than x, and the line L approaches more nearly to the value of the ſubtangent, the nearer the points of interſection are, or the leſs the difference is between x' and x; and the tangent being, what the ſecant becomes, when the two points of interſection unite, the value of $\frac{\text{ordinate}}{\text{ſubtangent}}$ is expreſſed by the limit of $\frac{1}{b}\left(\frac{x'^2 - x^2}{x' - x}\right)$, or by what $\frac{1}{b}(x' + x)$ becomes, when $x' = x$, or by $\frac{2x}{b}$.

Hence, too, it appears, why in finding the value of $\frac{fx}{Fx}$, $a + (x - a)$, is put for x and not $(x - a)$: for ſince, in finding the ſubtangent or velocity, an expreſſion is required near to the truth, and which approaches to it the more nearly, the leſs is the interval between x and a (or x' and x), it is neceſſary to expand $\frac{fx}{Fx}$ by a ſeries that converges, and it is plain that $f((x - a) + a)$ is the ſymbol of a diverging, and $f(a + (x - a))$ of a converging ſeries.

Theſe vaniſhing fractions have cauſed many diſcuſſions amongſt mathematicians; they have cauſed many falſe

reaſonings. It was not perceived that, to aſſign the value of $\frac{x^m - a^m}{x^n - a^n}$ $(x = a)$, there was an abſolute neceſſity of ſome definition, convention, or extenſion. The notion of an inherent ſignification, and of an eſſential value, belonging to ſuch an expreſſion, as $\frac{x^m - a^m}{x^n - a^n}$, bewildered men who valued themſelves on the clearneſs of their apprehenſion, and the juſtneſs of their inferences.

The method of limits, or of prime and ultimate ratios, Landen's method, the method of finding the value of $\frac{f x}{\mathrm{F} x}$ $(f x, \mathrm{F} x = 0)$ are related methods: they all demand the ſame arbitrary aſſumption, which has never been expreſsly made; they are all equally ſubject to an objection, which has never been ſatisfactorily removed.

Such is the theory of theſe quantities as given by Mr. Woodhouſe, and which is ſo clear and ſatisfactory as to ſuperſede the neceſſity of any further inveſtigation.

It has been ſhewn that if φx denote a ſimple analytical function of x, $\varphi (x + \Delta x)$ expanded may be expreſſed by this formula, $\varphi x + \mathrm{D} \varphi x \cdot \Delta x + \overset{\mathrm{D}^2}{\mathrm{c}} \varphi x (\Delta x)^2 +$ &c.; D being the note of an operation by which the co-efficient of the ſecond term of the expanded expreſſion is obtained; thus if φx reſpectively repreſents x^m, a^x, e^x, $l \cdot x$; $\mathrm{D} \varphi x$ repreſents $m x^{m-1}$, $\mathrm{A} a^x$, e^x, $\frac{1}{x}$; now in the expanded expreſſion of $\varphi (x + \Delta x)$, for Δx put the ſymbol $\mathrm{d} x$, then $\varphi (x + \mathrm{d} x) = \varphi x + \mathrm{D} \varphi x \cdot \mathrm{d} x + \overset{\mathrm{D}^2}{\mathrm{c}} \varphi x \cdot (\mathrm{d} x)^2 +$ &c. and let d denote that operation by which the ſecond term of $\varphi (x + \mathrm{d} x)$ is found, in which caſe it muſt alſo denote the firſt term of the entire difference of $\varphi (x + \mathrm{d} x)$ and φx. Hence $\mathrm{d} \cdot \varphi x = \mathrm{D} \varphi x \cdot \mathrm{d} x$, conſequently $\mathrm{D} \varphi x = \frac{\mathrm{d} \varphi x}{\mathrm{d} x}$; again $\mathrm{d} (\mathrm{d} \varphi x)$ = firſt term of $\left(\mathrm{D} \varphi (x + \mathrm{d} x) - \mathrm{D} \varphi x\right)$, $\mathrm{d} x$ expanded $= \mathrm{D}^2 \varphi x \cdot (\mathrm{d} x)^2$, conſequently $\mathrm{D}^2 \varphi x = \frac{\mathrm{d} \cdot (\mathrm{d} \varphi x)}{(\mathrm{d} x)^2} = \frac{\mathrm{d}^2 \varphi x}{\mathrm{d} x^2}$ (employing $\mathrm{d} x^2$, $\mathrm{d} x^3$..... $\mathrm{d} x^n$ to repreſent $(\mathrm{d} x)^2$ $((\mathrm{d} x)^3$ ..... $(\mathrm{d} x)^n)$; again $\mathrm{d} (\mathrm{d}^2 \varphi x)$ or $\mathrm{d}^2 \varphi x = \mathrm{D} (\mathrm{d}^2 \varphi x) \mathrm{d} x = \mathrm{D} (\mathrm{D}^2 \varphi x \cdot \mathrm{d} x^2) \cdot \mathrm{d} x = \mathrm{D}^3 \varphi x \cdot \mathrm{d} x^3$; conſequently $\mathrm{D}^3 \varphi x = \frac{\mathrm{d}^3 \varphi x}{\mathrm{d} x^3}$; and generally $\mathrm{D}^n \varphi x = \frac{\mathrm{d}^n \varphi x}{\mathrm{d} x^n}$. The expanded form for $\varphi (x + \Delta x)$ may then be thus repreſented;

$$\varphi x + \frac{\mathrm{d} \varphi x}{\mathrm{d} x} \cdot \Delta x + \frac{\overset{\mathrm{d}^2}{\mathrm{c}} \varphi x}{\mathrm{d} x^2} \cdot (\Delta x)^2 + \&\mathrm{c.}$$

and ſimilarly

$$\varphi (x + \mathrm{d} x) = \varphi x + \frac{\mathrm{d} \varphi x}{\mathrm{d} x} \cdot \mathrm{d} x + \frac{\overset{\mathrm{d}^2}{\mathrm{c}} \varphi x}{\mathrm{d} x^2} \cdot \mathrm{d} x^2 + \&\mathrm{c.}$$

The difference between $\varphi (x + \mathrm{d} x)$ and φx is called the *entire difference*, and its note or ſymbol is Δ; thus $\Delta \varphi x$ or $\varphi (x + \mathrm{d} x) - \varphi x = \frac{\mathrm{d} \varphi x}{\mathrm{d} x} \cdot \mathrm{d} x + \frac{\overset{\mathrm{d}^2}{\mathrm{c}} \varphi x}{\mathrm{d} x^2} +$ &c. A part of this entire difference, *viz.* the ſecond term, is called the *differential*, and its note or ſymbol is d; thus $\mathrm{d} (\varphi x) = \frac{\mathrm{d} \varphi x}{\mathrm{d} x} \mathrm{d} x$, or $\mathrm{D} \varphi x \cdot \mathrm{d} x$; the ſecond, third, &c. nth terms of the ſeries for $\Delta \varphi x$ (abſtracting the numerical part of the co-efficients) are called the 2d, 3d, &c. nth differentials; thus,

$$\Delta \varphi x = \frac{\mathrm{d} \varphi x}{\mathrm{d} x} \cdot \mathrm{d} x + \frac{\mathrm{d}^2 \varphi x}{1 \cdot 2 \cdot \mathrm{d} x^2} \cdot \mathrm{d} x^2 + \frac{\mathrm{d}^3 \varphi x}{1 \cdot 2 \cdot 3 \cdot \mathrm{d} x^3} \cdot \mathrm{d} x^3 + \&\mathrm{c.}$$

and $\frac{\overset{\mathrm{d}^2}{\mathrm{c}} \varphi x}{\mathrm{d} x^2} \cdot \mathrm{d} x^2$, $\frac{\overset{\mathrm{d}^3}{\mathrm{c}} \varphi x}{\mathrm{d} x^3} \cdot \mathrm{d} x^3$ &c. $\frac{\overset{\mathrm{d}^n}{\mathrm{c}} \varphi x}{\mathrm{d} x^n} \cdot \mathrm{d} x^n$ are the ſecond, third, nth, &c. differentials.

Since Δ is the note of the entire difference, and d of the firſt term of that difference, when theſe notes are applied to a ſimple quantity, as x, they are equally ſignificant; thus $\Delta x = \mathrm{d} x$. $\frac{\mathrm{d} \varphi x}{\mathrm{d} x}, \frac{\mathrm{d}^2 \varphi x}{\mathrm{d} x^2}$, &c. are to be conſidered as types of calculation; thus $\frac{\mathrm{d} \varphi x}{\mathrm{d} x}$ denotes, that in φx, for x, $x + \mathrm{d} x$ is to be put, and the co-efficient of the ſecond term of $\varphi (x + \mathrm{d} x)$ expanded to be taken; $\frac{\mathrm{d} \varphi x}{\mathrm{d} x}, \frac{\mathrm{d}^2 \varphi x}{\mathrm{d} x^2}$, &c. are called the differential co-efficients.

A few inſtances will ſhew the ſignification of the ſymbols Δ, D, d;

$$\Delta x^m = m x^{m-1} \cdot \Delta x + \frac{m \cdot (m-1)}{1 \cdot 2} x^{m-2} \cdot (\Delta x)^2 + \&\mathrm{c.}$$

when $\Delta x^m = (x + \Delta x)^m - x^m$, or $= m x^{m-1} \cdot \mathrm{d} x + \frac{m \cdot (m-1)}{1 \cdot 2} x^{m-2} \cdot \mathrm{d} x^2 +$ &c.

when $\Delta x^m = (x + \mathrm{d} x)^m - x^m$;

$\mathrm{D} x^m = m x^{m-1}$, ſince $\mathrm{D} x^m$ denotes the ſecond term of $(x + 1)^m$ expanded, to be taken

$\mathrm{d} (x^m) = m x^{m-1} \mathrm{d} x$; x^m is included within brackets to prevent ambiguity, ſince $\mathrm{d} x^m$ has already been uſed to denote $(\mathrm{d} x)^m$.

Again, if $x + \Delta x$ be put for x, $\Delta a^x = \mathrm{A} a^x \cdot \Delta x + \frac{\mathrm{A}^2 a^x}{1 \cdot 2} \cdot (\Delta x)^2 +$ &c.;

if $x + \mathrm{d} x$ be put for x, $\Delta a^x = \mathrm{A} a^x \cdot \mathrm{d} x + \frac{\mathrm{A}^2 a^x}{1 \cdot 2} \cdot (\mathrm{d} x)^2 +$ &c.

$\mathrm{D} a^x =$ (ſecond term of a^{x+1} expanded) $= \mathrm{A} a^x$, $\mathrm{d} (a) = \mathrm{A} a^x \cdot \mathrm{d} x$, and $\mathrm{d} (e) = e^x \cdot \mathrm{d} x$.

Again, $l \cdot x$ being dependant on the equation $x = e^{l \cdot x}$, $\Delta l \cdot x =$ (the difference between two ſucceſſive values of x being Δx)

$$\frac{\Delta x}{x} - \tfrac{1}{2} \cdot \left(\frac{\Delta x}{x}\right)^2 + \tfrac{1}{3} \cdot \left(\frac{\Delta x}{x}\right)^3 - \&\mathrm{c.}$$

$$\mathrm{D} l \cdot x = \frac{1}{x},$$

$$\mathrm{d} (l \cdot x) = \frac{\mathrm{d} x}{x}.$$

Generally, if y be any function (φx) of x, and $y + \Delta y$ be what y becomes, when $x + \Delta x$ is put for x; then $\Delta y = \varphi (x + \Delta x) - \varphi x = \mathrm{D} \varphi x \cdot \Delta x + \overset{\mathrm{D}^2}{\mathrm{c}} \varphi x \cdot (\Delta x)^2 +$ &c. or $= \frac{\mathrm{d} y}{\mathrm{d} x} \Delta x + \frac{\overset{\mathrm{d}^2}{\mathrm{c}} y}{\mathrm{d} x^2} (\Delta x)^2 +$ &c.; in which formula $\frac{\mathrm{d} y}{\mathrm{d} x}, \frac{\overset{\mathrm{d}^2}{\mathrm{c}} y}{\mathrm{d} x^2}$, &c. are to be conſidered as types of calculation, $\frac{\mathrm{d} y}{\mathrm{d} x}$ denoting that in y a function of x, $x + \mathrm{d} x$ is to

to be put for x, and the co-efficient of the ſecond term of the expanded expreſſion is to be taken.

To find the entire difference, and the differential of y, a function of p, q, r, s, &c. when p, q, r, s, &c. are ſimple functions of x.

Then when x becomes $x + \Delta x$, p becomes $p + \Delta p$, q becomes $q + \Delta q$, &c. and y becomes $y + \Delta y$; and

$$y + \Delta y = y^{2} + \mathrm{D}y \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} y\,(\Delta x)^{2} + \overset{\mathrm{D}^{3}}{c} y\,(\Delta x)^{3}$$

$$p + \Delta p = p^{2} + \mathrm{D}p \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} p\,(\Delta x)^{2} + \overset{\mathrm{D}^{3}}{c} p\,(\Delta x)^{3}$$

$$q + \Delta q = q^{2} + \mathrm{D}q \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} q\,(\Delta x)^{2} + \overset{\mathrm{D}^{3}}{c} q\,(\Delta x)^{3}$$

$$r + \Delta r = r^{2} + \mathrm{D}r \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} r\,(\Delta x)^{2} + \overset{\mathrm{D}^{3}}{c} r\,(\Delta x)^{3}$$

Therefore in the expreſſion for the value of y ſubſtitute the new values of p, q, r, &c. and the co-efficient of Δx ſhall be equal $\mathrm{D}y$, or the differential co-efficient of y.

Example 1ſt.—Let $y = ap + q + r$ &c.

Then ſince $y + \mathrm{D}y \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} y\,(\Delta x)^{2}$

$$= p + \mathrm{D}p \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} p\,(\Delta x)^{2} \text{ &c.}$$
$$+ q + \mathrm{D}q \cdot \Delta x + \overset{\mathrm{D}^{2}}{c} q\,(\Delta x)^{2} \text{ &c.}$$
$$+ r + \mathrm{D}r \cdot \Delta x + \overset{\mathrm{D}}{c} r\,(\Delta x)^{2} \text{ &c.}$$
$$\mathrm{D}y = \mathrm{D}p + \mathrm{D}q + \mathrm{D}r \text{ &c.}$$

Therefore

$$\mathrm{d}y = \mathrm{D}y \cdot \mathrm{d}x = \mathrm{D}p \cdot \mathrm{d}x + \mathrm{D}q \cdot \mathrm{d}x + \mathrm{D} \cdot r \cdot \mathrm{d}x \text{ &c.}$$
$$= \frac{\mathrm{d}y}{\mathrm{d}x} \cdot \mathrm{d}x = \frac{\mathrm{d}p}{\mathrm{d}x} \cdot \mathrm{d}x + \frac{\mathrm{d}y}{\mathrm{d}x}\,\mathrm{d}x + \frac{\mathrm{d}r}{\mathrm{d}x} \text{ &c.}$$

The entire difference $\Delta y =$ evidently

$$\Delta (p + q + r + \text{&c.}) = (\mathrm{D}p + \mathrm{D}q + \mathrm{D}r)\,\Delta x + (\overset{\mathrm{D}^{2}}{c} p + \overset{\mathrm{D}^{2}}{c} q + \overset{\mathrm{D}}{c} r \text{ &c})\,\Delta x^{2} + \text{&c.}$$

Let y be a ſimple function of p, then p becomes $p + \Delta p$; y becomes $y + \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \Delta p + \frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} \cdot \frac{\Delta p^{2}}{1.2} + \frac{\mathrm{d}^{3}y}{\mathrm{d}p^{3}} \cdot \frac{\Delta p^{3}}{1.2.3}$.

If p be at the ſame time ſuppoſed a function of x, then x becoming $x + \Delta x$, y becomes likewiſe $y + \Delta y = y + \frac{\mathrm{d}y}{\mathrm{d}x} \cdot \Delta x + \frac{\mathrm{d}^{2}y}{\mathrm{d}x^{2}} \cdot \frac{\Delta x^{2}}{1.2} + \frac{\mathrm{d}^{3}y}{\mathrm{d}x^{3}} \cdot \frac{\Delta x^{3}}{1.2.3}$.

Now p being conſidered as a function of x, x becoming $x + \Delta x$, p becomes

$$p + \frac{\mathrm{d}p}{\mathrm{d}x} \cdot \Delta x + \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} \cdot \frac{\Delta x^{2}}{1.2} + \frac{\mathrm{d}^{3}p}{\mathrm{d}x^{3}} \cdot \frac{\Delta x^{3}}{1.2.3} \text{ &c.}$$

$$\therefore \Delta p = \frac{\mathrm{d}p}{\mathrm{d}x} \cdot \Delta x + \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} \cdot \frac{\Delta x^{2}}{1.2} + \frac{\mathrm{d}^{3}p}{\mathrm{d}x^{3}} \cdot \frac{\Delta x^{3}}{1.2.3} \text{ &c.}$$

Now ſubſtitute this value of Δp in the equation for the value of $y + \Delta y$,

$$y + \Delta y = y + \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}p}{\mathrm{d}x} \cdot \Delta x + \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} \cdot \frac{\Delta x^{2}}{1.2} + \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} \cdot \frac{\Delta x^{3}}{1.2.3} + \text{&c.} + \frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} \cdot \frac{1}{2}\left(\frac{\mathrm{d}p}{\mathrm{d}x} \cdot \Delta x + \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} \cdot \frac{\Delta x^{2}}{1.2} + \text{&c.}\right)^{2} + \text{&c.}$$

Then by comparing the co-efficients of Δx in the two values of y,

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}p}{\mathrm{d}x} \quad \therefore \frac{\mathrm{d}y}{\mathrm{d}p} = \frac{\frac{\mathrm{d}y}{\mathrm{d}x}}{\frac{\mathrm{d}p}{\mathrm{d}x}}$$

$$\frac{\mathrm{d}^{2}y}{\mathrm{d}x^{2}} = \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} + \frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}}\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2}$$

$$\text{And } \frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} = \frac{\frac{\mathrm{d}y^{2}}{\mathrm{d}x^{2}} - \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}}}{\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2}}$$

$$= \frac{\frac{\mathrm{d}^{2}y}{\mathrm{d}x^{2}} - \frac{\frac{\mathrm{d}y}{\mathrm{d}x}}{\frac{\mathrm{d}p}{\mathrm{d}x}} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}}}{\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2}}$$

$$= \frac{\frac{\mathrm{d}^{2}y}{\mathrm{d}x^{2}}}{\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{3}} - \frac{\frac{\mathrm{d}y}{\mathrm{d}x} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}}}{\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{3}}$$

Example 2d.—Let $y = (ax - x^{2})^{\frac{1}{2}}$ required the values of $\frac{\mathrm{d}y}{\mathrm{d}x}, \frac{\mathrm{d}^{2}y}{\mathrm{d}x^{2}}, \frac{\mathrm{d}^{3}y}{\mathrm{d}x^{3}}$, &c. Put $ax - x^{2} = p$:

$$\frac{\mathrm{d}p}{\mathrm{d}x} = a - 2x$$

$$\frac{\mathrm{d}y}{\mathrm{d}p} = \tfrac{1}{2}p^{-\frac{1}{2}} = \frac{1}{2\sqrt{ax - x^{2}}}$$

$$\therefore \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}p}{\mathrm{d}x} = \frac{a - 2x}{2\sqrt{ax - x^{2}}}.$$

Again $\frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} = 2 \therefore \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} = \frac{1}{\sqrt{ax - x^{2}}} =$ 1ſt term

$$\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2} = \overline{a - 2x}^{2}$$

$$\frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} = -\tfrac{1}{4}p^{-\frac{3}{2}} = -\frac{1}{4\sqrt{(ax - x^{2})^{3}}}$$

$$\therefore \left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2} \cdot \frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} = -\frac{(a - 2x)^{2}}{4\sqrt{(ax - x^{2})^{3}}}$$

$$\therefore \frac{\mathrm{d}^{2}y}{\mathrm{d}x^{2}} = \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} \cdot \frac{\mathrm{d}y}{\mathrm{d}p} + \left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2} \cdot \frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} = \frac{1}{\sqrt{ax - x^{2}}} - \frac{(a - 2x)^{2}}{4\sqrt{(ax - x)^{3}}}$$

Example 3d: $y = (x^{2} - a^{2})^{\frac{1}{2}}$ $p = (x^{2} - a^{2})$

$$\frac{\mathrm{d}p}{\mathrm{d}x} = 2x$$

$$\frac{\mathrm{d}y}{\mathrm{d}p} = \tfrac{1}{2}p^{-\frac{1}{2}} = \frac{1}{2\sqrt{x^{2} - a^{2}}}$$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{x}{\sqrt{x^{2} - a^{2}}}$$

$$\frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} = 2; \quad \frac{\mathrm{d}y}{\mathrm{d}p} \cdot \frac{\mathrm{d}^{2}p}{\mathrm{d}x^{2}} = \frac{1}{\sqrt{x^{2} - a^{2}}} = \text{1ſt term}$$

$$\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2} = 4x^{2}$$

$$\frac{\mathrm{d}^{2}y}{\mathrm{d}p^{2}} = -\tfrac{1}{4}p^{-\frac{3}{2}} = -\frac{1}{4(x^{2} - a^{2})^{\frac{1}{2}}}$$

$$\left(\frac{\mathrm{d}p}{\mathrm{d}x}\right)^{2}$$

$\left(\frac{d p}{d x}\right)^2 \cdot \frac{d^2 y}{d p^2} = \frac{-x^2}{(x^2 - a^2)^{\frac{1}{2}}}$ = 2d term

$\frac{d^2 y}{d x^2} = \frac{1}{\sqrt{x^2 - a^2}} - \frac{x^2}{(x^2 - a^2)^{\frac{1}{2}}}$

Example 4th.—Let $y = b + (r^2 - (a - x)^2)^{\frac{1}{2}}$

Suppoſe $(a - x)^2 = p$; then $y = (r^2 - p)^{\frac{1}{2}}$ required the value of $\frac{d y}{d x}$ and $\frac{d^2 y}{d x^2}$

$\frac{d p}{d x} = 2x - 2a$

$\frac{d y}{d p} = \frac{1}{2}(r^2 - p)^{-\frac{1}{2}} \therefore \frac{d p}{d x} \cdot \frac{d y}{d p} = \frac{d y}{d x} = \frac{x - a}{(r^2 - (a-x)^2)^{\frac{1}{2}}}$

$\frac{d^2 p}{d x^2} = 2 \therefore \frac{d y}{d p} \cdot \frac{d^2 p}{d x^2} = \frac{1}{\sqrt{r^2 - (a - x)^2}}$

$\left(\frac{d p}{d x}\right)^2 = 4(a - x)^2$

$\frac{d^2 y}{d p^2} = -\frac{1}{4}(r^2 - p)^{-\frac{3}{2}} = \frac{1}{4(r^2 - (a-x)^2)^{\frac{3}{2}}}$

$\left(\frac{d p}{d x}\right)^2 \cdot \frac{d^2 y}{d p^2} = -\frac{(a-x)^2}{(r^2 - (a-x)^2)^{\frac{1}{2}}}$

$\therefore \frac{d^2 y}{d x^2} = \frac{1}{\sqrt{r^2 - (a-x)^2}} + \frac{-(a-x)^2}{(r^2 - (a-x)^2)^{\frac{3}{2}}}$

$= \frac{r^2 - (a-x)^2}{(r^2 - (a-x)^2)^{\frac{3}{2}}} + \frac{(a-x)^2}{(r^2 - (a-x)^2)^{\frac{3}{2}}} = \frac{r^2}{(r^2 - (a-x)^2)^{\frac{1}{2}}}$

Example 5th. Let $y = (x - a)^2 \cdot \sqrt{x - b}$

$p = (x - a)^2$
$q = (x - b)^{\frac{1}{2}}$

$\frac{d y}{d x} = p \cdot \frac{d q}{d x} + q \cdot \frac{d p}{d x}$

$= (x-a)^2 \cdot \frac{1}{2}(x-b)^{-\frac{1}{2}} + (x-b)^{\frac{1}{2}} \cdot 2(x-a)^1$

$= \frac{(x-a)^2}{2\sqrt{x-b}} + 2(x-a) \cdot \sqrt{x-b}$

$\frac{d^2 y}{d x^2} = p \cdot \frac{d q}{d x^2} + q \cdot \frac{d^2 p}{d x^2} + 2\left(\frac{d p}{d x} \cdot \frac{d q}{d x}\right)$

$= (x-a)^2 \cdot \frac{1}{4}(x-b)^{-\frac{3}{2}} + (x-b)^{\frac{1}{2}} \cdot 2(x-a)^{1-1}$
$+ 2(x-a) \cdot \frac{1}{2}(x-b)^{-\frac{1}{2}}$

$= 2\sqrt{x-b} + \frac{2(x-a)}{\sqrt{x-b}} - \frac{(x-a)^2}{4(x-b)^{\frac{3}{2}}}$

Let it now be required to find the differential of $\varphi(p, q)$, p and q being functions of x.

Let p become $p + \Delta p$, and q, $q + \Delta q$, then $\varphi(p, q)$ becomes $q(p + \Delta p, q + \Delta q)$, in which latter form $p + \Delta p$, $q + \Delta q$, are to be combined in the ſame manner as p, q are in $\varphi(p, q)$, hence expanding $\varphi(p + \Delta p, q + \Delta q)$, according to the powers of Δp,

$\varphi(p + \Delta p, q + \Delta q) = \varphi(p, q + \Delta q) + \frac{d(\varphi p, q + \Delta q)}{d p} \cdot \Delta p$
$+ \frac{d^2 \varphi(p, q + \Delta q)}{1 \cdot 2 \cdot d p^2} \cdot (\Delta p)^2 + \&c.$

= (expanding $\varphi(p, q + \Delta q)$, &c.)

$\varphi(p, q) + \frac{d \varphi(p, q)}{d q} \cdot \Delta p + \frac{d^2 \varphi(p, q)}{1 \cdot 2 \cdot d q^2} (\Delta q)^2 + \&c.$
$+ \frac{d \varphi(p, q)}{d p} \cdot \Delta p + \frac{d^2 \varphi(p, q)}{d p \cdot d q} \cdot \Delta p \cdot \Delta q + \&c.$

in which form the ſymbols $\frac{d \varphi(p, q)}{d q}$, $\frac{d \varphi(p, q)}{d p}$, reſpectively denote the differential co-efficients of $\varphi(p, q)$, on the hypotheſis, that q is alone variable in $\varphi(p, q)$, and that p is alone variable in $\varphi(p, q)$; hence putting $d q$, $d p$, for Δq, Δp, the differential of $\varphi(p, q)$, or the term affected with $d x$ (ſince $d p = \frac{d p}{d x} \cdot d x$, $d q = \frac{d q}{d x} \cdot d x$) $= \frac{d \varphi(p, q)}{d q} \cdot d q + \frac{d \varphi(p, q)}{d p} \cdot d p$.

If P be put for $\varphi(p, q)$, then the ſymbols $\frac{d \varphi(p, q)}{d q}$, $\frac{d \varphi(p, q)}{d p}$ are expreſſed by $\frac{d P}{d q}$, $\frac{d P}{d p}$, conſequently the differential of P or $d P = \frac{d P}{d q} \cdot d q + \frac{d P}{d p} \cdot d p$.

In like manner, if P denote a function of p, q, r, s, &c. or $= \varphi(p, q, r, s, \&c.)$ then its differential $= \frac{d P}{d p} \cdot d p + \frac{d P}{d q} \cdot d q + \frac{d P}{d r} \cdot d r + \frac{d P}{d s} \cdot d s + \&c.$

The expreſſions $\frac{d P}{d p} \cdot d p$, $\frac{d P}{d q} \cdot d q$, &c. are called partial differentials of the function P, and $\frac{d P}{d p}$, $\frac{d P}{d q}$, &c. partial differential co-efficients.

Ex. Let $\varphi(p, q)$ or P be repreſented by $(1 + p^2)^m \cdot e^q$, then $\frac{d P}{d q} = 2mp \cdot (1 + p^2)^{m-1} e^q$ $\frac{d P}{d q} = (1 + p^2)^m \cdot e^q$,

$\therefore d P = 2mp\, d q \cdot (1 + p^2)^{m-1} \cdot e^q + e^q d q \cdot (1 + p^2)^m$; again, let $P = p^2 (2pq + q^2)^{\frac{1}{2}}$,

then $\frac{d P}{d q} = (2pq + q^2)^{\frac{1}{2}} + \frac{qp}{(2pq + q^2)^{\frac{1}{2}}} = \frac{3pq + q^2}{(2pq + q^2)^{\frac{1}{2}}}$

$\frac{d P}{d q} = \frac{p^2 + pq}{(2pq + q^2)^{\frac{1}{2}}}$

$\therefore d P = \frac{3pq + q^2}{(2pq + q^2)^{\frac{1}{2}}} \cdot d p + \frac{p^2 + pq}{(2pq + q^2)^{\frac{1}{2}}} \cdot d q$.

Suppoſe now y to be determined by an equation between x and y, as in $y^2 - 2xy + x^2 - a^2 = 0$, $x^3 - axy + y^3 = 0$; in which caſes y is ſaid to be an implicit function of x, the explicit functions being thoſe which are under the form $y = ax + bx^2 + cx^3 + \&c.$ $y = \frac{1 + \alpha x}{1 + \beta x^2 + \gamma x^3}$ &c.; and let the equation on which the value of the implicit function of y depends, be generally repreſented by $\varphi(x, y) = 0$; then if y can thence be determined to be a function of x, when x becomes $x + \Delta x$, y becomes $y + D \cdot y \cdot \Delta x + \frac{D^2}{c} \cdot y \cdot (\Delta x)^2 + \&c.$

$\therefore$ Subſtituting in the equation $\varphi(x, y) = 0$, for x and y the above values, we have $\varphi\left(x + \Delta x, y + D \cdot y \cdot \Delta x + \frac{D^2}{c} y \cdot (\Delta x)^2 + \&c.\right) = 0$; or putting $\varphi(x, y) = X$, and expanding $X + \frac{d(X)}{d x} \cdot \Delta x + \frac{d^2(X)}{d x^2} \cdot (\Delta x)^2$ &c. $= 0$,

and as this equation ſubſiſts, whatever Δx is, each ſeparate co-efficient affected with a different power of Δx muſt be put $= 0$;

hence $\frac{d(X)}{dx} = 0$, or $\frac{dX}{dy} \cdot \frac{dy}{dx} + \frac{dX}{dx} = 0$;

again $\frac{d^2X}{dx^2} = 0$, or

$$\frac{dX}{dy} \cdot \frac{d^2y}{dx^2} + \frac{dX}{dy \cdot dx} \cdot \frac{dy}{dx} + \frac{d^2X}{dy^2}\left(\frac{dy}{dx}\right) + \frac{d^2X}{dx^2} = 0;$$

again $\frac{d^3X}{dx^3} = 0$, or &c. &c.

in which forms $\frac{dX}{dy}$ means the partial differential co-efficient of X, or $\varphi(x, y)$ relatively to y, $\frac{d^2X}{dx \cdot dy}$ the partial differential co-efficient of X, when the differential is taken twice, firſt relatively to x, and next relatively to y.

Hence it follows, that when there is an equation between two variable quantities x, y, the equation likewiſe ſubſiſts between their firſt differential equations, between their ſecond differential equations, &c. and ſo on.

Ex. $y^2 + 2xy + m^2x^2 - a^2 = 0$

$\therefore 2y\,dy + 2x\,dy + 2y\,dx + 2m^2x\,dx = 0$

$\therefore \frac{dy}{dx} = -\frac{y + m^2x}{y + x}$.

Again, let $y^3 + 3axy + x^3 = 0$

$\therefore 3y^2\,dy - 3ax\,dy - 3ay\,dx + 3x^2\,dx = 0$

$\therefore \frac{dy}{dx} = \frac{3ay - 3x^2}{3y^2 - 3ax} = \frac{ay - x^2}{y^2 - ax}$.

When $y = \frac{fx}{Fx}$, or when y repreſents ſuch a function of x as $\frac{fx}{Fx}$, $y\,Fx = fx$.

But it has been ſhewn that $d(y\,Fx) = d(fx)$; or expanding $Fx \cdot \frac{dy}{dx} \cdot dx + y\frac{dFx}{dx} \cdot dx = \frac{dfx}{dx} \cdot dx$; or ſince $Dy = \frac{dy}{dx}$, $DFx = \frac{dFx}{dx}$, &c.

$Fx \cdot D \cdot y + y \cdot DFx = Dfx$.

Suppoſe now $\frac{fx}{Fx}$ to be one of thoſe fractions whoſe numerators and denominators vaniſh on giving x a particular value (a); put $x = a$, then $Fx = 0$, and the preceding equation becomes

$$y \cdot \frac{dFx}{dx} = \frac{dfx}{dx} \qquad \text{and } y = \frac{\frac{dfx}{dx}}{\frac{dFx}{dx}}$$

$$\text{or} = \frac{Dfx}{DFx},$$

which is the ſame reſult as was found above, as indeed it muſt neceſſarily be, ſince each method is derived from the ſame ſource, and conducted by a like reaſoning.

If it ſo happens that Dfx, DFx, become nothing when $x = a$, then the ſecond differential of the equation $y\,Fx = fx$ muſt be taken, thus ſince it has been proved that $Fx \cdot D \cdot y + y \cdot DFx = Dfx$,

$$d(Fx \cdot D \cdot y) + d(y \cdot DFx) = d(Dfx),$$

or $dFx \cdot D \cdot y + Fx \cdot d(D \cdot y) + dy \cdot DFx + y\,d(DFx) = d(Dfx)$,

or $DFx \cdot D \cdot y + Fx \cdot D^2 \cdot y + D \cdot y \cdot DFx + y \cdot D^2Fx = D^2fx$, (putting for dFx, dy, their values $DFx \cdot dx$, $D \cdot y \cdot dx$, and dividing every term by dx),

or $2\,DFx \cdot D \cdot y + Fx \cdot D^2 \cdot y + y \cdot DFx = D^2fx$;

putting $x = a$, ſince by hypotheſes fx, Fx, Dfx, $DFx = 0$, the above equation is reduced to $y \cdot D^2Fx = D^2fx$, and conſequently $y = \frac{D^2fx}{DFx}$, the ſame reſult as already given, and the two reſults muſt neceſſarily agree, being derived from the ſame principle, and by the ſame proceſs.

If D^2fx, D^2Fx, putting $x = a$, likewiſe become 0, then the third differential of the equation $y\,Fx = fx$ muſt be taken, and then we ſhall obtain $y\frac{D^3fx}{D^3Fx}$, and ſo on.

The following inveſtigation of the differential of the ſines and coſines of angles is given by Lagrange, but the notation uſed by Mr. Woodhouſe is ſubſtituted inſtead of that given in the "Fonctions Analytiques."

$$\text{ſin.}(x + y) = \text{ſin. } x \cdot \text{coſ. } y + \text{coſ. } x \cdot \text{ſin. } y$$
$$\text{coſ.}(x + y) = \text{coſ. } x \cdot \text{coſ. } y - \text{ſin. } x \cdot \text{ſin. } y$$

For x ſubſtitute $x + \Delta x$, and expand the functions ſin. $(x + \Delta x)$ and coſ. $(x + \Delta x)$ according to the powers of Δx; the co-efficients of Δx in theſe expanſions will be the derived functions or differential co-efficients required. By the preceding formulæ

$$\text{ſin.}(x + \Delta x) = \text{ſin. } x \cdot \text{coſ. } \Delta x + \text{coſ. } x \cdot \text{ſin. } \Delta x$$
$$\text{coſ.}(x + \Delta x) = \text{coſ. } x \cdot \text{coſ. } \Delta x - \text{ſin. } x \cdot \text{ſin. } \Delta x$$

It remains now to expand into ſeries the quantities ſin. Δx, coſ. Δx.

Aſſuming with Lagrange that the ſeries for the ſin. Δx muſt be of this form $A(\Delta x)^m + B(\Delta x)^n +$ &c. m and n being whole numbers and increaſing, then making x and $y = \Delta x$

ſin. $2 \cdot \Delta x = 2$ ſin. $\Delta x \cdot$ coſ. $\Delta x = 2$ ſin. $\Delta x \sqrt{1 - \text{ſin.}^2 \Delta x}$; and ſince the ſine of $\Delta x = A(\Delta x)^m + B\Delta x^n +$ &c.

ſin. $2\Delta x = 2^m \cdot A(\Delta x)^m + 2^n \cdot B(\Delta x)^n +$ &c.

Alſo, ſin.$^2 \Delta x = A^2(\Delta x)^{2m} + 2A \cdot B \cdot (\Delta x)^{m+n}$ &c. and $\sqrt{1 - \text{ſin.}^2 \Delta x} = (1 - \text{ſin.}^2 \Delta x)^{\frac{1}{2}} = 1 - \frac{1}{2}A^2\Delta x^{2m} - A \cdot B \cdot (\Delta x)^{m+n} -$ &c. therefore $2\,\text{ſin.}\,\Delta x \sqrt{1 - \text{ſin.}^2 \Delta x} = 2A(\Delta x)^m + 2B(\Delta x)^n +$ &c. $- A^3(\Delta x)^{3m} -$ &c. which ſeries being identical with the following:

$$2^m A(\Delta x)^m + 2^n B(\Delta x)^n + \text{&c.}$$

which expreſſes the value of ſin. $2\Delta x$; the compariſon of the firſt terms which contain the ſame power $(\Delta x)^m$ will give

$$2A = 2^m A; \text{ hence } m = 1.$$

Hence it appears that the firſt term of the ſeries of ſin. Δx is $A \cdot \Delta x$, conſequently, the two firſt terms of the ſeries for coſ. Δx will be $1 - \frac{A^2\Delta x^2}{2}$, making theſe ſubſtitutions in the expreſſions ſin. $(x + \Delta x)$ and coſ. $(x + \Delta x)$, and conſidering only the firſt power of Δx,

$$\text{ſin.}(x + \Delta x) = \text{ſin. } x + A \cdot \Delta x \cdot \text{coſ. } x + \text{&c.}$$
$$\text{coſ.}(x + \Delta x) = \text{coſ. } x - A \cdot \Delta x \text{ ſin. } x + \text{&c.}$$

Hence the derived function, or differential co-efficient of ſin. x will be $A \cdot$ coſ. x, and that of coſ. x will be $-A \cdot$ ſin. x.

The co-efficient A is an unknown conſtant quantity, to be determined by the nature of the circle.

Having thus found the firſt differential co-efficients, the others may be found in the ſame manner; thus, $D \cdot$ ſin. x being A coſ. x, $D^2 \cdot$ ſin. x will be $-A^2$ ſin. x, and $D^3 \cdot$ ſin. x will be $-A^2$ coſ. x.

Therefore,

Therefore, in general, if y or $\varphi x = \text{fin. } x$

$\frac{dy}{dx} = A \cdot \text{cof. } x$; $\frac{d^2y}{dx^2} = A^2 \cdot \text{fin. } x$; $\frac{d^3y}{dx^3} = -A^3 \text{ cof. } x$ &c.

Making theſe ſubſtitutions in the expanded ſeries for $\varphi(x + \Delta x)$

$$\text{fin. } (x + \Delta x) = \text{fin. } x + A \cdot \Delta x \cdot \text{cof. } x - \frac{A^2 \Delta x^2}{2} \text{ fin. } x - \frac{A^3 \Delta x^3}{2 \cdot 3} \text{ cof. } x + \frac{A^4 \Delta x^4}{2 \cdot 3 \cdot 4} \text{ fin. } x + \text{ &c.}$$

In the ſame manner, if y or $\varphi x = \text{cof. } x$

$\frac{dy}{dx} = -A \text{ fin. } x$; $\frac{d^2y}{dx^2} = -A^2 \text{ cof. } x$; $\frac{d^3y}{dx^3} = A^3 \text{ fin. } x$; $\frac{d^4y}{dx^4} = A^4 \text{ cof. } x$, &c.

And theſe ſubſtitutions will give

$$\text{cof. } x + \Delta x = \text{cof. } x - A \cdot (\Delta x) \text{ fin. } x - \frac{A^2 (\Delta x)^2}{2} \text{cof. } x + \frac{A^3 (\Delta x)^3}{2 \cdot 3} \text{ fin. } x + \frac{A^4 (\Delta x)^4}{2 \cdot 3 \cdot 4} \text{ cof. } x - \text{ &c.}$$

Let $P = A \cdot \Delta x - \frac{A^3 (\Delta x)^3}{2 \cdot 3} + \frac{A^5 (\Delta x)^5}{2 \cdot 3 \cdot 4 \cdot 5}$ &c.

$$Q = 1 - \frac{A^2 (\Delta x)^2}{2} + \frac{A^4 (\Delta x)^4}{2 \cdot 3 \cdot 4} - \frac{A^6 (\Delta x)^6}{2 \cdot 3 \cdot 4 \cdot 5 \cdot 6} + \text{ &c.}$$

Then $\text{fin. } (x + \Delta x) = Q \text{ fin. } x + P \text{ cof. } x$

$\text{cof. } (x + \Delta x) = Q \text{ cof. } x - P \text{ fin. } x$

Hence $\text{fin. } \Delta x = P$, and $\text{cof. } \Delta x = Q$.

Thus, whatever be the angle Δx

$$\text{fin. } \Delta x = A \cdot \Delta x - A^3 \frac{(\Delta x)^3}{2 \cdot 3} + A^5 \frac{(\Delta x)^5}{2 \cdot 3 \cdot 4 \cdot 5} - \text{ &c.}$$

$$\text{cof. } \Delta x = 1 - A^2 \frac{(\Delta x)^2}{2} + A^4 \frac{(\Delta x)^4}{2 \cdot 3 \cdot 4} - \text{ &c.}$$

It is evident that theſe ſeries are both of them convergent, provided the angle Δx is ſuch that $A \cdot \Delta x$ be leſs or equal to unity; in that caſe

$$\text{fin. } \Delta x \angle A \cdot \Delta x \text{ and } \rangle A \cdot \Delta x - \frac{A^3 \cdot \Delta x^3}{2 \cdot 3}$$

for the terms having alternate ſigns and continually diminiſhing, the ſum of the ſecond and third of the fourth and fifth, &c. will be all negative, and on the contrary, the ſums of the third and fourth, the fifth and ſixth, &c. will be all poſitive.

Now by the theorem of Archimedes, we may aſſume, that the ſine is always leſs than the arc, and the tangent always greater. Hence

$$\text{fin. } \Delta x < \Delta x, \text{ and } \frac{\text{fin. } \Delta x}{\text{cof. } \Delta x} > \Delta x$$

but $\text{cof. } \Delta x = \sqrt{1 - \text{fin.}^2 \Delta x}$

therefore $\frac{\text{fin. } \Delta x}{\sqrt{1 - \text{fin.}^2 \Delta x}} > \Delta x$; $\text{fin.}^2 \Delta x > (\Delta x)^2 \cdot (1 - \text{fin.}^2 \Delta x)$

$$\text{hence } \text{fin. } \Delta x > \frac{\Delta x}{\sqrt{1 + (\Delta x)^2}}$$

And from the property of the circle

$$\text{fin. } \Delta x < \Delta x, \text{ and } > \frac{1}{\sqrt{1 + (\Delta x)^2}}$$

If the angle Δx be taken leſs than 90°, and ſo ſmall that $A \cdot \Delta x$ be leſs than unity, then

$$\text{fin. } \Delta x < A \cdot \Delta x, \text{ and } > \frac{1}{\sqrt{1 + (\Delta x)^2}}$$

and conſequently $A \cdot \Delta x > \frac{1}{\sqrt{1 + \Delta x^2}}$ and $A > \frac{1}{\sqrt{1 + (\Delta x)^2}}$; likewiſe $\text{fin. } \Delta x > A \cdot \Delta x - \frac{A^3 \Delta x^3}{2 \cdot 3}$ and $< \Delta x$, and conſequently $A \Delta x - \frac{A^3 \cdot (\Delta x)^3}{2 \cdot 3} < \Delta x$ and $A - \frac{A^3 (\Delta x)^3}{2 \cdot 3} < \Delta x$, or $A < 1 + \frac{A^3 (\Delta x)^3}{2 \cdot 3}$.

As theſe conditions muſt take place however ſmall Δx, it reſults that A cannot be leſs than unity, for if $A < 1$ we ſhould have $\frac{1}{A} > 1$; but the condition $A > \frac{1}{\sqrt{1 + (\Delta x)^2}}$ gives $\frac{1}{A} < \sqrt{1 + (\Delta x)^2}$; therefore if $\frac{1}{A}$ ſurpaſſes unity by ever ſo ſmall a quantity, it will be always poſſible to take Δx ſuch, that $\sqrt{1 + (\Delta x)^2} < \frac{1}{A}$, whereas this quantity muſt always be $> \frac{1}{A}$.

It appears from the ſecond condition that A cannot be greater than unity, for if A ſurpaſſes unity by ever ſo ſmall a quantity, it will always be poſſible to take Δx ſo ſmall, that $1 + \frac{A^3 (\Delta x)^3}{2 \cdot 3} < A$, whereas we ſhould always have $1 + \frac{A^3 (\Delta x)^3}{2 \cdot 3} > A$.

Therefore ſince A can neither be leſs or greater than unity, it follows that $A = 1$.

Therefore the derived function of the differential co-efficient of $\text{fin. } x$ is ſimply $= \text{cof. } x$;

and that of $\text{cof. } x = -\text{fin. } x$; x denoting any angle whatever, that is, an arc of a circle whoſe rad. $= 1$. Therefore for any angle Δx

$$\text{fin. } \Delta x = \Delta x - \frac{(\Delta x)^3}{2 \cdot 3} + \frac{(\Delta x)^5}{2 \cdot 3 \cdot 4 \cdot 5} + \frac{(\Delta x)^7}{2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7} + \text{ &c.}$$

$$\text{cof. } \Delta x = 1 - \frac{(\Delta x)^2}{2} + \frac{(\Delta x)^4}{2 \cdot 3 \cdot 4} + \frac{(\Delta x)^6}{2 \cdot 3 \cdot 4 \cdot 5 \cdot 6} + \text{ &c.}$$

which well known formulæ were diſcovered by Newton. In the ſame manner as the ſine and co-ſine are functions of the angle; the angle itſelf may be conſidered as a function of the ſine or co-ſine and its differential found.

Let $\varphi x z =$ angle of ſine x; then $\text{fin. } \varphi x = x$; let x become $x + \Delta x$, and ſuppoſe

$$\frac{dz}{dx} \cdot \Delta x + \frac{d^2 z}{2 \cdot dx^2} \cdot (\Delta x)^2 + \frac{d^3 x}{2 \cdot 3 \cdot dx^2} (\Delta x)^3 + \text{ &c.}$$

$= n$; then $\text{fin. } (\varphi x + n) = x + \Delta x = \text{fin. } (\varphi x) \text{ cof. } n + \text{cof. } (\varphi x) \cdot \text{fin. } n$; and $\text{fin. } (\varphi x) = x$; $\text{cof. } (\varphi x) = \sqrt{1 - \text{fin.}^2 \varphi x} = \sqrt{1 - x^2}$.

Moreover by the above formulæ

$$\text{fin. } n = n - \frac{n^3}{2 \cdot 3} + \text{ &c. and } \text{cof. } n = n - \frac{n}{2} + \text{ &c.}$$

Making

Making therefore theſe ſubſtitutions, and reſtoring the value of n, we ſhall have

$$x + \Delta x = x + \Delta x \sqrt{(1 - x^2)} \cdot \frac{dz}{dx} + \frac{(\Delta x)^2}{2}$$

$\left(\sqrt{(1-x)} \cdot \frac{d^2 z}{dx^2}\right)$ + &c. which, by comparing the firſt terms affected with Δx, gives

$$1 = \sqrt{(1 - x^2)} \cdot \frac{dz}{dx}, \text{ from which reſults}$$

$$\frac{dz}{dx} = \frac{1}{\sqrt{1 - x^2}}$$

The compariſon of the other terms will give the ſecond and third, &c. differentials.

In like manner, if

φx = angle cof. x; x = cof. (φx)

for x put $x + \Delta x$, and $\varphi x + n$ for φx; then

$x + \Delta x$ = cof. $(\varphi x + n)$ = cof. (φx) . cof. n − ſin. (φx) ſin. n; and cof. $(\varphi x) = x$, and ſin. $(\varphi x) = \sqrt{(1 - \text{cof.}^2 (\varphi x))} = \sqrt{1 - x^2}$.

Making theſe ſubſtitutions, and putting for ſin. n . cof. n, their values in ſeries, $n - \frac{n^3}{2 \cdot 3}$ &c.

and $1 - \frac{n^2}{2}$ + &c. as in the former example; then

$$x + \Delta x = x - \Delta x \sqrt{(1 - x^2)} \frac{dz}{dx} - \frac{(\Delta x)^2}{2}$$

$\left(\sqrt{(1-x^2)} \frac{d^2 z}{dx}\right)$ + &c. which gives $1 = -\sqrt{(1-x^2)}$ $\frac{dz}{dx}$ and $\frac{dz}{dx} = -\frac{1}{\sqrt{1-x}}$.

Since therefore x being the ſine of an angle, $\sqrt{1-x^2}$ is the coſine, and x being the coſine, $\sqrt{1-x^2}$ is the ſine; it follows from the above inveſtigation, that the differential of an angle expreſſed by its ſine is equal to unity divided by its coſine, and the differential of an angle expreſſed by its coſine is equal to unity divided by its ſine, taken with a negative ſign.

On the uſe of differential Equations in the transformation of Functions —When the function of a variable quantity is preſented under two different forms, by equalling theſe expreſſions we obtain what is called an identical equation, becauſe of the identity of the value, and which muſt ſubſiſt independently of the variable quantity, that is, we may aſſign to the variable quantity x any value Δx whatever.

Let $\varphi x = 0$ be a ſimilar equation, then

$\varphi (x + \Delta x) = 0$, and

$\varphi x + D \varphi x . \Delta x + \overset{D^2}{c} \varphi x . (\Delta x)^2 + \text{&c.} = 0$;

and therefore ſeparately

$\varphi x = 0$; $D \varphi x = 0$; $\overset{D^2}{c} \varphi x = 0$, &c.

The ſame equation therefore ſubſiſts between the differentials of any order whatever,

Suppoſe now an equation, as $\varphi (x,y) = 0$ between two variable quantities x and y, in which y muſt be ſome function of x, then from what has been ſaid it follows that the ſame equation ſubſiſts between all the differential equations of any order whatever.

And in general, firſt and ſecond differential equations, &c. are ſo termed, not only when they are directly deduced from the primitive equation, but when they conſiſt of any combination of the differential and primitive equation; thus, when the primitive equation contains x and y, the firſt differential equation will contain x, y, and $\frac{dy}{dx}$, the ſecond, y, x, $\frac{dy}{dx}$, $\frac{d^2 y}{dx^2}$ and ſo on; and by what has preceded, one of thoſe ſyſtems of equations may always be transformed into another.

To illuſtrate the uſe of theſe equations in the transformation of functions by an example, let us take the caſe of ſin. x, and coſ. x, the differentials of which have been already inveſtigated.

Let y = ſin. x; z = coſ. x; then

$\frac{dy}{dx}$ = coſ. x, and $\frac{dz}{dx} = -$ ſin. x, conſequently

$\frac{dy}{dx} = z$, and $\frac{dz}{dx} = -y$.

If we multiply the firſt of theſe equations by $\sqrt{-1}$, and then add it to the ſecond, $\frac{dz}{dx} + \frac{dy}{dx}\sqrt{-1} = z\sqrt{-1}$

$-y = (z + y\sqrt{-1})\sqrt{-1}$;

hence the equation

$$\frac{\frac{dz}{dy} + \frac{dy}{dx}\sqrt{-1}}{z + y\sqrt{-1}} = \sqrt{-1}$$

Now from what has preceded, it appears that if p be any function of x, $\frac{\frac{dp}{dx}}{p}$ is the differential of the log. p; therefore log. $(z + y\sqrt{-1}) = x\sqrt{-1} + k$ will be the primitive equation from which the preceding one may be conſidered as derived; k is an arbitrary conſtant quantity to be determined by the nature of the functions y and z, conformably to the method of what we call finding fluents.

For this purpoſe we may obſerve that on making $x = 0$, we have ſin. $x = 0$, and coſ. $x = 1$; therefore $y = 0$, $z = 1$.

It is therefore neceſſary that the equation above found ſatisfies theſe ſuppoſitions; but in this caſe it becomes log. $1 = k$, and ſince log. $1 = 0$; $k = 0$; the equation therefore will ſimply be log. $(z + y\sqrt{-1}) = x\sqrt{-1}$; hence $z + y\sqrt{-1} = e^{x\sqrt{-1}}$; e being the number whoſe Naperian log. is unity.

For y and z ſubſtitute their values ſin. x, coſ. x, and we obtain this remarkable formula

$$\text{coſ. } x + \text{ſin. } x\sqrt{-1} = e^{x\sqrt{-1}}$$

which from the double ſignification of the radical $\sqrt{-1}$ gives equally

$$\text{coſ. } x - \text{ſin. } x\sqrt{-1} = e^{x\sqrt{-1}}$$

and theſe equations combined are ſufficient to determine the values of ſin. x and coſ. x. For by adding them or ſubtracting them we have

$$\text{coſ. } x = \frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{2}$$

$$\text{ſin. } x = \frac{e^{x\sqrt{-1}} - e^{-x\sqrt{-1}}}{2}$$

in

in which the ſine and coſine is expreſſed in terms of imaginary exponentials, which may be conſidered as one of the moſt curious analytical diſcoveries of the laſt century.

Theſe formulæ may likewiſe be derived immediately from the ſeries already given which expreſs the functions ſin. x, coſ. x, e^x. It is in this manner that Euler has given them in vol. viſ. of the Miſcellanea Berolinenſia.

The expreſſion for the value of arcs in imaginary logarithms was diſcovered by John Bernouilli, who has given it in the Memoirs of the Academy of Sciences for 1702. He obtained it by integrating by means of logarithms the elements of the arc expreſſed in terms of the tangent in the ſame manner as Leibnitz had found the ſeries which expreſſes the arc by the tangent, by integrating the ſame element in ſeries.

The equation coſ. x + ſin. $x\sqrt{-1} = e^{x\sqrt{-1}}$, where the radical $\sqrt{-1}$ may equally have the ſign + or −, forms the baſis of the theory of the calculation of angles; for by multiplying this equation by the ſimilar equation coſ. y + ſin. $y\sqrt{-1} = e^{y\sqrt{-1}}$ we have $(\text{coſ. } x + \text{ſin. } x\sqrt{-1})\ (\text{coſ. } y + \text{ſin. } y\sqrt{-1} = e^{(x+y)\sqrt{-1}}$, and ſubſtituting in the ſame equation $x + y$ in the place of x,

$\text{coſ. } (x+y) + \text{ſin. } (x+y)\sqrt{-1} = e^{(x+y)\sqrt{-1}}$;

comparing and expanding the product,

coſ. x . coſ. y − ſin. x . ſin. y + (coſ. x . ſin. y + coſ. y ſin. x) $\sqrt{-1}$ = coſ. $(x+y)$ + ſin. $(x+y)\sqrt{-1}$;

and as this equation muſt ſubſiſt for the two ſigns of $\sqrt{-1}$ it follows that ſeparately

coſ. x . coſ. y − ſin. x . ſin. y = coſ. $(x+y)$
coſ. x ſin. y + ſin. x coſ. y = ſin. $(x+y)$

which formulæ may be demonſtrated geometrically, and form the baſis of the theory of angles.

In addition to the following inveſtigation of what is uſually called the inverſe method of fluxions, as given by Mr. Woodhouſe, the reader is referred to the article FLUENT, the ſubſtance of which is likewiſe taken from the works of this learned analyſt.

In contradiſtinction to the direct operations of multiplication and involution, diviſion and evolution are called reverſe operations; but when all the reſults of theſe operations are comprehended under a common formula ($\varphi x + \mathrm{D}\,\varphi x \,.\, \Delta x$ + &c.), or expreſſed by a general method, it is commodious to conſider the latter method by which algebraic functions are expanded, and any term aſſigned as a direct method; and the method by which, from any term of an expanded function, we aſcend to the original function, a reverſe method.

On the former method depends the *differential calculus*, by which from φx the ſecond, third, &c. terms of $\varphi(x + \mathrm{d}x)$ expanded, are aſſigned; on the reverſe depends the *integral calculus*, by which from $\mathrm{X}\,.\,\mathrm{d}x$, $\mathrm{X}'\,.\,\mathrm{d}x^2$, &c. the functions fx, $f'x$, of which functions $\mathrm{X}\,.\,\mathrm{d}x$, $\mathrm{X}'\,.\,\mathrm{d}x^2$ &c. are the firſt, ſecond differentials, &c. or are the ſecond, third, &c. terms of $f(x + \mathrm{d}x)$, $f'(x + \mathrm{d}x)$ &c. expanded, are to be aſſigned. The integral calculus is unable, however, in all caſes, to aſſign the original or primitive functions of fx, from which a differential $\mathrm{X}\,\mathrm{d}x$ is derived; its rules (like thoſe for the extraction of roots) are eſtabliſhed by inſpection of the direct proceſs, by which, from primitive functions, differentials are obtained; thus $\mathrm{d}(x^m) = m x^{m-1}\,.\,\mathrm{d}x$, ∴ from $m x^{m-1}\,.\,\mathrm{d}x$ we may aſcend to x^m by this proceſs; increaſe the index $(m-1)$ of the power of the variable quantity (x) in the differential $(m x^{m-1}\,.\,\mathrm{d}x)$ by 1; and then divide the differential by the index ſo increaſed (m), and by the differential $(\mathrm{d}x)$ of the variable quantity (x): the reſult of this proceſs is the integral or primitive function (x^m). Let d^{-1} be the ſymbol of the operation by which the integral is obtained, (the reverſe of that operation which d indicates),

then $\mathrm{d}^{-1}(m x^{m-1}\,\mathrm{d}x) = x^m$, or $\mathrm{d}^{-1}\,\mathrm{d}(x^m) = x^m$,

Again, $\mathrm{d}^{-1}(x^{\frac{m}{n}}\,\mathrm{d}x) = \dfrac{x^{\frac{m}{n}+1}}{\frac{m}{n}+1}$; and $\mathrm{d}^{-1}(x^{r-1} = \dfrac{x^r}{r\,.\,\mathrm{d}x}$

Again, from what has preceded it appears, that if p be a function of x, the differential of $\varphi p = \mathrm{D}\,\varphi p\,.\,\mathrm{d}p$ or $= \dfrac{\mathrm{d}\,\varphi p}{\mathrm{d}p}\,.\,\mathrm{d}p$; hence to find the integral or primitive function of ſuch a differential as $\mathrm{D}\,\varphi p\,.\,\mathrm{d}p$, we have only to find the function of which $\mathrm{D}\,\varphi p$ is the differential co-efficient: but it muſt be obſerved, that the integral of a differential, as $fp\,.\,\mathrm{d}q$ (q a function of x) can only be found under certain conditions: for if $\mathrm{F}p$ be the function of which fp is the differential co-efficient, then $fp = \dfrac{\mathrm{d}\,\mathrm{F}p}{\mathrm{d}p}$

$\therefore fp\,.\,\mathrm{d}q = \dfrac{\mathrm{d}\,\mathrm{F}p}{\mathrm{d}q}\,.\,\mathrm{d}q$ ∴ if $\mathrm{d}p = a\,\mathrm{d}q$, a an invariable quantity, the integral can be found: but if $\mathrm{d}p$ does not $= \mathrm{d}q$, the integral cannot be found, at leaſt not immediately: for inſtance, let $fp\,.\,\mathrm{d}q = (a + bx + cx^2)^m\,.\,(b\,\mathrm{d}x + 2cx\,\mathrm{d}x)$, then $p = a + bx + cx^2$, and ∴ $\mathrm{d}p = b\,\mathrm{d}x + 2cx\,\mathrm{d}x$; but $\mathrm{d}q = b\,\mathrm{d}x + 2cx\,\mathrm{d}x$, conſequently the integral can be found $= \dfrac{(a + bx + cx^2)^{m+1}}{m+1}$;

again let $fp\,.\,\mathrm{d}q = (a + bx^n)^m\,.\,x^r\,\mathrm{d}x$, then $p = a + bx^n$, and $\mathrm{d}p = nbx^{n-1}\,\mathrm{d}x$, and $\mathrm{d}q = x^r\,\mathrm{d}x$, conſequently the integral cannot be found (at leaſt not immediately) except $r = n - 1$, or except the index of the power of the variable quantity, without the vinculum, be leſs by unity than the index of the power of the variable quantity under the vinculum;

again, if $fp\,.\,\mathrm{d}q = (a + bx^n + cx^r)^m\,(nbx^t + rcx^t)\,\mathrm{d}x$, ∴ $p = a + bx^n + cx^n$ and ∴ $\mathrm{d}p = nbx^{t-1}\,\mathrm{d}x + rcx^{r-1}\,\mathrm{d}x$; but $\mathrm{d}q = nbx^t\,\mathrm{d}x + rcx^t\,\mathrm{d}x$, conſequently the integral of $fp\,.\,\mathrm{d}q$ cannot be aſſigned (at leaſt not immediately) except $t = n - 1$, and $s = r - 1$; again, if $fp\,.\,q = e^{x^2}\,.\,x\,\mathrm{d}x$, $p = x^2$, $fp = e^{x^2}$, $\mathrm{d}p = 2x\,\mathrm{d}x$, but $\mathrm{d}q = x\,\mathrm{d}x$, conſequently the integral of e^{x^2}, $x\,\mathrm{d}x$ can be found $\left(= \dfrac{e^{x^2}}{2}\right)$

The integrals of $a^x\,.\,\mathrm{d}x$, $e^x\,.\,\mathrm{d}x$, are $\dfrac{a^x}{\mathrm{A}}$, e^x, and are obtained on the ſame grounds as the integrals of $x^{n-1}\,\mathrm{d}x$, $(a + bx^n)^m\,.\,x^{n-1}\,\mathrm{d}x$, &c. are; that is, by inſpection of the reſults, which the operation of *differentiation* performed on known functions, gives

$\mathrm{d}(a + bx) = b\,\mathrm{d}x$, $\mathrm{d}(a' + bx) = b\,\mathrm{d}x$,
$\mathrm{d}(a'' + bx) = b\,\mathrm{d}x$, &c.

Hence, reverſely, $\mathrm{d}^{-1}(b\,\mathrm{d}x) = a + bx$, or $= a' + bx$, or $= a'' + bx$, or = &c.

Theſe conſtant quantities a, a', a'', &c. are called *corrections*, and in integrating ſuch an expreſſion as $b\,\mathrm{d}x$, which of the corrections a, a', a'' is to be uſed, muſt be determined

by

by the nature of the inveſtigation, in which ſuch an expreſſion as $b\,\mathrm{d}\,x$ occurs.

Let $x^2 - 2ay + y^2 = 0$, then $x\,\mathrm{d}\,x - a\,\mathrm{d}\,y + y\,\mathrm{d}\,y = 0$; but from the original equation $a = \frac{x^2 + y^2}{2y}$; and ſubſtituting

$$x\,\mathrm{d}\,x - \frac{x^2 + y^2}{2y}\,\mathrm{d}\,y + y\,\mathrm{d}\,y = 0;$$

$$\text{or } 2y\,x\,\mathrm{d}\,x - x^2\,\mathrm{d}\,y + y^2\,\mathrm{d}\,y = 0;$$

in which differential equation the arbitrary quantity a does not appear.

In like manner, if the equation were $x^2 - 2ay + by^2 = 0$, the firſt differential equation would be $x\,\mathrm{d}\,x - a\,\mathrm{d}\,y + b\,y\,\mathrm{d}\,y = 0$; the ſecond differential equation

$$x\,\mathrm{d}^2 x + \mathrm{d}\,x^2 - a\,\mathrm{d}^2 y + by\,\mathrm{d}^2 y + b\,\mathrm{d}\,y^2 = 0;$$

from which three equations the two arbitrary quantities a and b may be eliminated, and the reſulting differential equation will be of the ſecond order, containing neither a nor b.

Generally, ſuppoſe $\varphi\,(x, y) = 0$, an equation between x and y to contain arbitrary quantities a, b, c, &c. then theſe arbitrary quantities will be the ſame in the firſt, ſecond, &c. differential equations deſignated by $\mathrm{d}\,(\varphi\,(x, y)) = 0$, $\mathrm{d}^2\,(\varphi\,(x, y)) = 0$, $\mathrm{d}^3\,(\varphi\,(x, y)) = 0$, &c. Now from $\varphi\,(x, y) = 0$, and $\mathrm{d}\,(\varphi\,(x, y)) = 0$, a conſtant quantity as a, may be eliminated, and the reſulting equation will be a differential equation of the firſt order, between x, y, $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$, containing a conſtant arbitrary quantity, leſs than the original equation; again, from $\varphi\,(x, y) = 0$, $(\varphi\,(x, y)) = 0$, $\mathrm{d}^2\,(\varphi\,(x, y)) = 0$, two conſtant quantities a and b may be eliminated, and the reſulting equation will be of the ſecond order between x, y, $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$, $\frac{\mathrm{d}^2 y}{\mathrm{d}\,x^2}$, and containing two conſtant quantities leſs than the original or primitive equation, and ſo on.

Hence, ſince a differential equation of the firſt order may contain a conſtant quantity leſs than the primitive equation, and ſince a differential equation of the ſecond order may contain two conſtant quantities leſs than the primitive equation, &c.; reverſely, a primitive equation ought to have one more conſtant quantity than the differential equation of the firſt order, two more conſtant quantities than the differential equation of the ſecond order, and ſo on; and it cannot contain more, ſince if you ſuppoſe $\varphi\,(x, y)$ to contain three more than the differential equation of the ſecond order, it is plain that from $\varphi\,(x, y) = 0$, $\mathrm{d}\,(\varphi\,(x, y)) = 0$, $\mathrm{d}^2\,(\varphi\,(x, y)) = 0$, no more than two can be eliminated, conſequently one muſt remain in the equation betwecn x, y, $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$, $\frac{\mathrm{d}^2 y}{\mathrm{d}\,x^2}$, &c.

Theſe conſtant quantities are arbitrary, that is, they are to be expreſſed by general characters; what their values are to be muſt depend on the nature of the ſubject inveſtigated.

It does not neceſſarily happen that the primitive equation has one more conſtant quantity than the differential equation, or two more conſtant quantities than the ſecond differential equation; only as it may have, in taking the integral, you aſſign the primitive equation in its moſt general form; and if, inſtead of arbitrary quantities, it really has only $n - n'$, then the proceſs for determining the value of the arbitrary quantities will ſhew, that n' ſuch are equal to 0; hence no error or ambiguity can ariſe from introducing into the primitive equation by the proceſs of integration as many conſtant arbitrary quantities as it *can* have more than the differential equation.

Thus ſuppoſe $\frac{y\,\mathrm{d}^2 y}{\mathrm{d}\,x^2} + \frac{\mathrm{d}\,y^2}{\mathrm{d}\,x^2} - \frac{x\,\mathrm{d}^2 y}{\mathrm{d}\,x^2} - \frac{2\,\mathrm{d}\,y}{\mathrm{d}\,x} + 1 = 0$ (y a function of x), then integrating $\frac{y\,\mathrm{d}\,y}{\mathrm{d}\,x} - \frac{x\,\mathrm{d}\,y}{\mathrm{d}\,x} - y + x = a$,

$$\text{or } y\,\mathrm{d}\,y - x\,\mathrm{d}\,y - y\,\mathrm{d}\,x + x\,\mathrm{d}\,x = a\,\mathrm{d}\,x.$$

Again, integrating $\frac{y^2}{2} - xy + \frac{x^2}{2} = ax + b$.

Now the arbitrary conſtant quantities a and b are to be determined by the nature of the ſubject of inveſtigation; ſuppoſe it ſuch, that when $x = 0$, $y = 0$, and that when $x = r$, y alſo $= r$, hence putting $x = 0$, it appears that b muſt $= 0$, $\therefore$ equation is reduced to $y^2 - 2xy + x^2 = 2ax$, put $x = r$, then $y = r$, $\therefore r^2 - 2r^2 + r^2 = 2ar$, or $0 = 2ar$, $\therefore a = 0$, and the primitive equation is $x^2 - 2xy + y^2 = 0$; hence no error can ariſe from introducing the arbitrary conſtant quantities a and b; but in aſſigning the general form of the primitive equation, they muſt both be introduced, ſince if the conditions by which they are to be determined are altered, one or both may be retained.

It has appeared that differential equations of the firſt order have one arbitrary conſtant quantity leſs than the primitive equation; that differential equations of the ſecond order have two leſs, and ſo on; ſuppoſe now that from the equations $\varphi\,(x, y) = 0$, $\mathrm{d}\,(\varphi\,(x, y)) = 0$, two differential equations of the firſt order are formed, the one containing a conſtant quantity a, the other a conſtant quantity b; let the firſt equation be $\mathrm{d}\,(\mathrm{A}) = 0$, the ſecond $\mathrm{d}\,(\mathrm{B}) = 0$; from $\mathrm{d}\,(\mathrm{A}) = 0$, and $\mathrm{d}\,(\mathrm{A}) = 0$, eliminate a, from $\mathrm{d}^2\,(\mathrm{B}) = 0$, and $\mathrm{d}\,(\mathrm{B}) = 0$, eliminate b, then the two reſulting differential equations ought to agree with one another, and with the differential equation of the ſecond order $(\mathrm{d}^2\,(\mathrm{X}))$, obtained by eliminating a and b from the three equations $\varphi\,(x, y) = 0$, $\mathrm{d}\,\varphi\,(x, y) = 0$, $\mathrm{d}^2\,\varphi\,(x, y) = 0$.

Hence a differential equation of the ſecond order may be derived from two differential equations of the firſt order, each containing one additional arbitrary conſtant quantity.

Hence, if for a differential equation of the ſecond order $(\mathrm{d}^2\,\mathrm{U} = 0)$, we find two differential equations of the firſt order, which ſatisfy the equation $\mathrm{d}^2\,\mathrm{U} = 0$, to wit $\mathrm{d}\,\mathrm{X} = 0$, containing an arbitrary conſtant quantity a, and $\mathrm{d}\,\mathrm{Y} = 0$, containing an arbitrary conſtant quantity b, by eliminating $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$ from the equations $\mathrm{d}\,\mathrm{X} = 0$, $\mathrm{d}\,\mathrm{Y} = 0$, there will reſult an equation between x and y, containing the two arbitrary quantities a and b, and which is the primitive or integral equation of $\mathrm{d}^2\,\mathrm{U} = 0$.

Having thus given an abſtract of the principles of analytical calculation, we ſhall now ſhew in what manner Mr. Woodhouſe applies them to ſuch inveſtigations as are uſually performed by the method of fluxions.

Inveſtigation of the Property of Curve Lines.—The curve lines, the properties of which are to be inveſtigated, are not ſuch as are generated by mechanical deſcription, but ſuch as are defined by equation, and having no exiſtence independant of what they receive from arbitrary appointment; and conſequently in deducing their properties, recourſe is to be had to the analytical expreſſions, of which

which, under certain conditions, the curves are to be made the repreſentatives.

In a ſtraight line, to be called the line of the abſciſſas, from a certain point, let a line, arbitrarily taken, be called the abſciſſa, and be denoted by x: at the ſeveral points correſponding to the different values of x, let ſtraight lines be continually drawn, making a certain angle with the line of the abſciſſas; theſe ſtraight lines are to be called ordinates, and the line or figure in which their extremities are continually found, is generally to be called a curve line.

The values of theſe are to be determined by an equation between y and x: thus $y = \varphi x$, and if x be increaſed by Δx, then by the preceding methods $y + \Delta y$ becomes $\varphi(x + \Delta x)$ or

$$y + \frac{dy}{dx} \cdot \Delta x + \frac{d\,y}{1 \cdot 2 \cdot dx} (\Delta x)^2 + \frac{d\,y}{1 \cdot 2 \cdot 3 \cdot dx} (\Delta x)^3$$

+ &c. and ſince the value of $y + \Delta y$ is to be calculated, ſuch ſeries muſt converge. For greater ſimplicity in the following demonſtrations the ordinates are ſuppoſed to be rightly applied.

According to the above definition of a curve line, the locus of the extremities of the ordinates muſt, in one inſtance, be a ſtraight line; for the function φx being of the form $ax + b$ (a and b conſtant quantities) the extremities of all the ordinates will be found in a ſtraight line.

There are certain propoſitions, it is known, relative to curves, which have not been ſatisfactorily eſtabliſhed, and the want of perſpicuity and accuracy in the demonſtrations of ſuch propoſitions is attributed to the definition that has been given of a curve line which is negative, making a curve to be that of which no portion is a ſtraight line. Admitting, however, the foregoing definition of a curve line, which merely ſtates it to be locus of the extremities of the ordinates, the negative definition will become a property, and capable of being demonſtrated. Thus, let the interval between any two ordinates be Δx, then y being one ordinate, the next (y') ſeparated by an interval Δx, is $y + \mathrm{D} \cdot y \cdot \Delta x + \overset{c}{\mathrm{D}}{}^2 \cdot y\,(\Delta x)^2 + \overset{c}{\mathrm{D}}{}^3 \cdot y\,(\Delta x)^3 +$ &c. Again, the value of another ordinate between y and $y + \Delta y$ at an interval δx ($\delta x \angle \Delta x$), is $y + \mathrm{D} \cdot y \cdot \delta x + \overset{c}{\mathrm{D}}{}^2 \cdot y \cdot (\delta x)^2 +$ &c. But if the line joining the extremities of y and y' were a ſtraight line, then $y + \mathrm{D} \cdot y \cdot \delta x + \overset{c}{\mathrm{D}}{}^2 \cdot y \cdot (\delta x)^2 +$ &c. ought to $= y + \frac{\delta x}{\Delta x}$, or $y + \mathrm{D} \cdot y \cdot \delta x + \overset{c}{\mathrm{D}}{}^2 \cdot y \cdot \delta x \cdot \Delta x +$ &c. which it evidently does not, except $\overset{c}{\mathrm{D}}{}^2 \cdot y$, $\overset{c}{\mathrm{D}}{}^3 \cdot y$, &c. $= 0$; that is, it does not, the caſe of the curve belonging to an equation, as $y = ax + b$ being excluded.

In order to prepare the way for the demonſtrations relative to tangents, radii of curvature, lengths of curve lines, &c. it is neceſſary to eſtabliſh this propoſition, namely, that in the ſeries $\varphi x + \mathrm{D}\,\varphi x \cdot \Delta x + \overset{c}{\mathrm{D}}{}^2 \varphi x \cdot (\Delta x)^2 +$ &c.; Δx may be taken of ſuch a magnitude, that any term $\overset{c}{\mathrm{D}}{}^m \varphi x\,(\Delta x)^m$, ſhall be greater than the ſum of all the ſucceeding terms.

In the method of fluxions and of limits, I have already mentioned that this propoſition, or one equivalent to it, is required; for to prove that the limiting ratio of $1 : nx^{n-1} + \frac{n \cdot (n-1)}{1 \cdot 2} x^{n-2} \cdot \Delta x + \frac{n \cdot (n-1)\,(n-2)}{1 \cdot 2 \cdot 3} x^{n-3} \cdot (\Delta x)^2 +$ &c. is $1 : nx^{n-1}$, it is neceſſary to ſhew, that by diminiſhing Δx, the ratio may be brought nearer to the ratio $1 : nx^{n-1}$, than by any aſſignable quantity, and conſequently it is neceſſary to ſhew within what limits the magnitude of the rejectaneous quantity $\frac{n \cdot n-1}{1 \cdot 2} \cdot x^{n-2} \cdot \Delta x + \frac{\overline{n \cdot n-1} \cdot \overline{n-2}}{1 \cdot 2 \cdot 3} x^{n-3} \cdot (\Delta x)^2 +$ &c. is contained: φx being a function of x, when x is increaſed to $x + \Delta x$, $\varphi(x + \Delta x)$ expanded, becomes $\varphi x + \mathrm{D}\,\varphi x \cdot \Delta x +$ &c. $+ \overset{c}{\mathrm{D}}{}^n \varphi x \cdot (\Delta x)^n + \overset{c}{\mathrm{D}}{}^{n+1} \varphi x \cdot (\Delta x)^{n+1} +$ &c. Now if there are two ſucceſſive terms $\overset{c}{\mathrm{D}}{}^n \varphi x \cdot (\Delta x)^n$, $\overset{c}{\mathrm{D}}{}^{n+1} \varphi x \cdot (\Delta x)^{n+1}$ ſuch, that $\frac{\overset{c}{\mathrm{D}}{}^{n+1} \varphi x}{\overset{c}{\mathrm{D}}{}^n \varphi x}$ is greater than $\frac{\overset{c}{\mathrm{D}}{}^{s+1} \varphi x}{\overset{c}{\mathrm{D}}{}^s \varphi x}$, whatever s is, then Δx may be taken ſo ſmall, that any term, as $\mathrm{D}^m \varphi x \cdot (\Delta x)^m$, ſhall be greater than the ſum of all ſucceeding terms; for take $\Delta x \angle \frac{\overset{c}{\mathrm{D}}{}^n \varphi x}{2 \cdot \overset{c}{\mathrm{D}}{}^{n+1} \varphi x}$, then $\overset{c}{\mathrm{D}}{}^n \varphi x \cdot (\Delta x)^n + \overset{c}{\mathrm{D}}{}^{n+1} \varphi x \cdot (\Delta x)^{n+1}$ is $\angle \overset{c}{\mathrm{D}}{}^n \varphi x \cdot (\Delta x)^n\,(1 + \frac{1}{2})$.

Again, $\overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m + \overset{c}{\mathrm{D}}{}^{m+1} \varphi x \cdot (\Delta x)^{m+1}$ is $\angle \overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m\,(1 + \frac{1}{2})$, and ſo on, every term being leſs than half the preceding term, and conſequently, $\overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m + \overset{c}{\mathrm{D}}{}^{m+1} \varphi x \cdot (\Delta x)^{m+1} + \overset{c}{\mathrm{D}}{}^{m+2} \varphi x \cdot (\Delta x)^{m+2} +$ &c. is $\angle \mathrm{D}^m \varphi x \cdot (\Delta x)^m\,(1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} +$ &c.); conſequently, $\angle \overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m \left(\frac{1}{1 - \frac{1}{2}}\right)$ or $\overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m \cdot 2$; and therefore the ſum of terms after $\overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m$ muſt be leſs than $\overset{c}{\mathrm{D}}{}^m \varphi x \cdot (\Delta x)^m$.

The propoſition then will be demonſtrated if it can be ſhewn that $\frac{\overset{c}{\mathrm{D}}{}^{n+1} \varphi x}{\overset{c}{\mathrm{D}}{}^n \varphi x}$, however great n, is never greater than a finite aſſignable quantity; and in order to aſcertain this point, reference muſt be made to the particular expreſſions comprehended under the generic ſymbol ϕx; for, concerning the abſolute magnitude of ſuch a ſymbol, nothing, it is plain, can abſtractedly be affirmed. Now φx repreſents x^m, a^x, $l \cdot x$, and may be made to repreſent functions compoſed of theſe by addition or ſubtraction. Firſt, with regard to x^m, $\overset{c}{\mathrm{D}}{}^n \varphi x \cdot (\Delta x)^n = \overset{c}{\mathrm{D}}{}^n x^m \cdot (\Delta x)^n = \frac{m \cdot (m-1)\,(m-2) \ldots (m-(n-1))}{1 \cdot 2 \cdot 3 \ldots n} x^{m-n}$ $(\Delta x)^n$, call this term T; then the ſucceeding term (T′) is $\mathrm{T} \cdot \frac{m-n}{n+1} \cdot \frac{\Delta x}{x}$, and conſequently $\frac{\overset{c}{\mathrm{D}}{}^{n+1} \varphi x}{\overset{c}{\mathrm{D}}{}^n \varphi x}$ is $\frac{m-n}{n+1} \cdot \frac{1}{x}$, which quantity, it is clear, does not exceed any aſſignable quantity, for it $< \frac{m+n}{n+1} \cdot \frac{1}{x}$, and whatever values of n (always an integer) be taken, the quantity, namely, $\frac{m+n}{n+1} \cdot \frac{1}{x}$ muſt always be contained between $\frac{m}{x}$ and $\frac{1}{x}$. Hence it follows, that Δx can be taken $< \frac{(n+1)\,x}{2 \cdot (m-n)^2}$ whatever

whatever n is, that is, can be taken leſs, taking the quantity at its leaſt.

Let now φx be repreſented by a^x, then $D^n \varphi x \cdot (\Delta x)^n$, or $\overset{D^n}{c}\, a^x \cdot (\Delta x)^n = \frac{A^n \cdot a^x}{1 \cdot 2 \cdot 3 \ldots\ldots n} \cdot (\Delta x)^n$ (T), and conſequently, next term (T') is, $T : \frac{A \cdot \Delta x}{n+1}, \ldots \frac{\overset{D^{n+1}}{c}\, \varphi x}{\overset{D^n}{c}\, \varphi x} = \frac{A}{n+1}$, and all the ſucceeding values of $\frac{A}{n+1}$ after the greateſt (A) continually decreaſe; hence in this caſe it is clear that Δx can be taken $< \frac{n+1}{2A}$ whatever n is, or can be taken leſs than the leaſt value of $\frac{n+1}{2A}$.

Let φx be repreſented by $l \cdot x$, or $L \cdot x$ (which functions belong to the equations $x = e^{l \cdot x}$, $x = a^{L \cdot x}$), then $\overset{D^n}{c}\, \varphi x \cdot (\Delta x)^n = \pm \frac{1}{A x^n} \cdot (\Delta x)^n$ (T), and conſequently, $\frac{D^{n+1} \varphi x}{\overset{D^n}{c}\, \varphi x} = \mp \frac{n}{(n+1)x}$, which quantity is always between $\frac{1}{2x}$ and $\frac{1}{x}$, and conſequently, in this caſe Δx can be taken $< \frac{(n+1)x}{2n}$ whatever n is, or can be taken leſs than the leaſt value of $\frac{(n+1)x}{2n}$.

Hence in φx it is true, that Δx can be taken of a magnitude ſuch, that any one term, as $\overset{D^m}{c}\, \varphi x \cdot (\Delta x)^m$, ſhall exceed the ſum of all the ſucceeding terms; and à fortiori ſhall exceed that ſum, the ſmaller Δx is.

Hence too, if the functions ſin. x, coſ. x, are comprehended by the ſymbol φx, the propoſition will ſtill be true, ſince the analytical expreſſions for theſe functions are formed by means of the exponential e^x.

The above propoſition is true of any ſeries, as $A + Bx + Cx^2 +$ &c. in which it can be ſhewn that $\frac{A_{m-1}}{A_m}$ is $> \frac{A_{r+1}}{A_r}$ whatever r is. Since, then, x (the arbitrary quantity) can be taken $< \frac{A_m}{2A_{m+1}}$, there are ſeries in which $\frac{A_{r+1}}{A_r}$ increaſes with the increaſe of r, and becomes infinite; but ſuch ſeries cannot occur in thoſe caſes wherein it is neceſſary to apply the propoſition, *viz.* that the arbitrary quantity (x or Δx) can be taken ſuch, that any one term ſhall exceed the ſum of all the ſucceeding terms.

For inſtance, if $A + Bx + Cx^2 +$ &c. be $1 + 1 \cdot 2 \cdot x + 1 \cdot 2 \cdot 3 \cdot x^3 +$ &c. then $\frac{A_{r+1}}{A_r} = \frac{1 \cdot 2 \cdot 3 \ldots r+1}{1 \cdot 2 \cdot 3 \ldots r} = r + 1$, which becomes infinite when r does, and therefore x cannot be taken $< \frac{1}{2 \cdot r + 1}$, but then ſuch a ſeries can never occur, for it would be abſurd to propoſe to deduce, for inſtance, the value of the ordinate of a curve from a ſeries which cannot be made to converge.

To determine the conditions under which the contact of curves takes place.

Let y be the ordinate of a curve, and let it be expreſſed by the function of the abſciſſa φx, then x becoming $x + \Delta x$, y becomes $y + \frac{dy}{dx} \cdot \Delta x + \frac{d^2 y}{1 \cdot 2 \cdot dx^2} \cdot (\Delta x)^2 +$ &c. let u be the ordinate of another curve, and let $u = ft$, t being an abciſſa taken in the ſame line of the abciſſas that x is in, then t becoming $t + \Delta t$, u becomes $u + \frac{du}{dt} \cdot \Delta t + \frac{d^2 u}{1 \cdot 2 \cdot dt^2} \cdot (\Delta t)^2 +$ &c. Suppoſe now the curves to have a common point, and for greater ſimplicity let each abſciſſa be meaſured from the ſame point, or let $t = x$, when $y = u$; if now $dy = du$, then the contact between the two curves is ſuch, that betweeen them no other curve drawn through the common point can paſs, except the differential (dv) of its ordinate (v) equals dy; for ſuppoſe it poſſible, then the ordinate v', diſtant from v by the interval Δx, $= v + \frac{dv}{dx} \cdot \Delta x + \frac{d^2 v}{1 \cdot 2 \cdot dx^2} \cdot (\Delta x)^2 +$ &c. and ſince the courſe of the curve, of which v is the ordinate, paſſes between the two other curves whoſe ordinates are y and u, the difference $y' - v'$, or $\Delta y - \Delta v$, ought to be leſs than $y' - u'$, or $\Delta y - \Delta u$, however ſmall Δx is, or $\left(\frac{dy}{dx} - \frac{dv}{dx}\right) \cdot \Delta x + \left(\frac{d^2 y}{1 \cdot 2 \cdot dx^2} - \frac{d^2 v}{1 \cdot 2 \cdot dx^2}\right) \cdot (\Delta x)^2 +$ &c. is $< \left(\frac{dy}{1 \cdot 2 \cdot dx^2} - \frac{d^2 u}{1 \cdot 2 \cdot dx^2}\right) \cdot (\Delta x)^2 + \left(\frac{d^3 y}{1 \cdot 2 \cdot 3\, dx^3} - \frac{du}{1 \cdot 2 \cdot 3\, dx^3}\right) \cdot (\Delta x)^3 +$ &c. (for by hypotheſis $\frac{dy}{dx} = \frac{du}{dx}$), however ſmall Δx is, or dividing by Δx, $\left(\frac{dy}{dx} - \frac{dv}{dx}\right) + a \cdot \Delta x + b \cdot (\Delta x)^2 +$ &c. is always $< a' \cdot \Delta x + b' \cdot (\Delta x)^2 +$ &c. (a, a', b, b', &c. being put for the co-efficients of the powers of Δx), however ſmall Δx is, which is evidently impoſſible, except $\frac{dy}{dx} = \frac{dv}{dx}$, or $dy = dv$; for the difference of the two expreſſions, to wit, $\left(\frac{dy}{dx} - \frac{dv}{dx}\right) + (a - a') \Delta x + (b - b') (\Delta x)^2 +$ &c. may be made poſitive by taking Δx ſuch, that $\frac{dy}{dx} - \frac{dv}{dx}$ ſhall be greater than $(a - a') \Delta x + (b - b') (\Delta x)^2 +$ &c. which, by what has preceded, is evidently poſſible; hence, between the courſes of the two curves in which the ordinates y, u, are equal, and the differentials of the ordinates, namely, dy, du, likewiſe equal, no other curve drawn through the common point can paſs, except the differential of its ordinate (dv) equals the differential (dy) of the ordinate y.

Again, ſuppoſe $y = u$, $\frac{dy}{dx}$ or $D \cdot y = \frac{du}{dx}$ or $D \cdot u$, $\frac{d^2 y}{dx^2}$ or $D^2 \cdot y = \frac{d^2 u}{dx^2}$ or $D^2 \cdot u$, then between theſe two curves no other curve (whoſe equation is $v = \downarrow x$) drawn through the common point where the ordinates are equal, can paſs, except $\frac{dv}{dx} = \frac{dy}{dx}$, and $\frac{d^2 v}{dx^2} = \frac{d^2 y}{dx^2}$.

For if it be poſſible, then $y' - v'$, or $(y + \Delta y) - (v + \Delta v)$ or, (ſince $y = v$ by hypotheſis), $\Delta y - \Delta v$ muſt be $< \Delta y - \Delta u$, however ſmall the interval (Δx) between the ordinates is; that is, putting for Δy, Δu, Δv, the ſeries they are equal to, to wit,

D. y

$$D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x)^2 + \overset{D^3}{c} \cdot y \cdot (\Delta x)^3 + \&c.$$
$$D \cdot u \cdot \Delta x + \overset{D^2}{c} \cdot u \cdot (\Delta x)^2 + \overset{D^3}{c} \cdot u \cdot (\Delta x)^3 + \&c.$$
$$D \cdot v \cdot \Delta x + \overset{D^2}{c} \cdot v \cdot (\Delta x)^2 + \overset{D^3}{c} \cdot v \cdot (\Delta x)^3 + \&c.$$

it follows that $(D \cdot y - D \cdot v) \Delta x + (\overset{D^2}{c} \cdot y - \overset{D^2}{c} \cdot v) \cdot (\Delta x)^2$ &c. must always be less than $(\overset{D^3}{c} \cdot y - \overset{D^3}{c} \cdot u) \cdot (\Delta x)^3 + (\overset{D^4}{c} \cdot y - \overset{D^4}{c} \cdot u) \cdot (\Delta x)^4 + \&c.$ (for the two first terms in the difference $\Delta y - \Delta u$, to wit, $(D \cdot y - D \cdot u)$, $(\overset{D^2}{c} \cdot y - \overset{D^2}{c} \cdot u)$, by hypothesis $= 0$); but this is evidently impossible, except both, $D \cdot y - D \cdot v$, and $D^2 \cdot y - D \cdot v$, $= 0$; for, Δx can be taken of such a magnitude that $(D \cdot y - D \cdot v)$ shall be greater than $(\overset{D^2}{c} \cdot y - \overset{D^2}{c} \cdot v) \Delta x - (\overset{D^3}{c} \cdot y - \overset{D^3}{c} \cdot u) \cdot (\Delta x)^2 - \&c.$ or (in case that $D \cdot y = D \cdot v$) that, $(\overset{D^2}{c} \cdot y - \overset{D^2}{c} \cdot v)$ shall be greater than $(\overset{D^3}{c} \cdot u - \overset{D^3}{c} \cdot v) \Delta x + (\overset{D^4}{c} \cdot u - \overset{D^4}{c} \cdot v) \cdot (\Delta x)^2 + \&c.$ and generally, if two curves whose equations are $y = \varphi x$, $u = fx$ have these conditions, that at the same point of the abscissa, $y = u$, and moreover, $D \cdot y = D \cdot u$, $D^2 \cdot y = D^2 \cdot u$, $D^3 \cdot y = D^3 \cdot u$, &c. $D^{n-1} \cdot y = D^{n-1} \cdot u$, then between these two curves no other curve whose equation is $v = \downarrow x)$, drawn through the common point, can pass, except $D \cdot v = D \cdot y$, $D^2 \cdot v = D^2 \cdot y$, $D^3 \cdot v = D^3 \cdot y$, &c. and $D^{n-1} \cdot v = D^{n-1} \cdot y$; for, if such a curve can pass between the courses of the two other curves, then $\Delta y - \Delta v$ must be less than $\Delta y - \Delta u$, or less than $(\overset{D^n}{c} \cdot y - \overset{D^n}{c} \cdot u) \cdot (\Delta x)^n + (\overset{D^{n+1}}{c} \cdot y - \overset{D^{n+1}}{c} \cdot u) \cdot (\Delta x)^{n+1} + \&c.$ however small Δx is; but this is impossible, since the terms of the series representing $\Delta y - \Delta v$ must involve powers of Δx less than $(\Delta x)^n$, except $D \cdot v = D \cdot y$, $D^2 \cdot v = D^2 \cdot y$, $D^3 \cdot v = D^3 \cdot y$, &c. and $D^{n-1} \cdot v = D^{n-1} \cdot y$; and if these differentials are not equal, then dividing by a certain power of Δx, $\Delta y - \Delta v$ cannot always be less than $\Delta y - \Delta u$, if in a series, as $a + a' \cdot \Delta x + a'' \cdot (\Delta x)^2 + \&c.$ a can be made to exceed the sum of the succeeding terms; which evidently can be done by taking Δx of a proper smallness.

These are the principles on which the contact of curves is founded; the contact admits of different degrees; and arranging the contacts according to different orders, there are curves which admit with a given curve only of contacts of a certain order; for instance, a right line is capable only of a contact of the first order; a circle is only capable of a contact of the second order; a curve, whose equation is $y = a + b x + c x^2 + d x^3$, is not capable of a contact higher than that of the third order; a curve, whose equation $y = a + b x + c x^2 + d x^3 + e x^4$, is not capable of a contact higher than that of the fourth order, and so on; so that admitting these different degrees or orders of contact, they require a certain number of constant quantities, which may be called elements of contact: a contact of the first order will require two constant quantities; a contact of the second, three constant quantities, &c.; and a contact of the mth order $(m + 1)$, constant quantities.

As an example, let $u = a + b t$, which is the equation to a straight line; then since it is to pass through a point of the curve, $u = y$ and $t = x$, and $y = a + b x$, $\therefore D \cdot y$ or $\frac{d y}{d x} = b$, and $a = y - x \cdot b = y - x \cdot D \cdot y$, consequently the equation to the straight line is $u = y - x \cdot D \cdot y + D \cdot y \cdot t$, the abscissa x being considered constant.

The line determined by this equation is commonly called a tangent; and, agreeably to the theory of contacts laid down, its geometrical property consists in this, that no other straight line can pass between it and the curve whose equation is $y = \varphi x$: for, if possible, suppose a straight line whose equation is $v = \alpha + \beta t$, to pass between the curve and line, then since $v = y$, $t = x$, $y = \alpha + \beta x$, $\therefore \frac{d y}{d x}$ or $D \cdot y = \beta$, and $\alpha = y - \beta x = y - x \cdot D \cdot y$, and the equation to the straight line is $v = y - x \cdot D \cdot y + D \cdot y \cdot t$, which is the same equation as was deduced for the former straight line, consequently this latter straight line coincides or becomes identical with the former.

In the equation $u = a + b t$, A B (*Plate* VII. *Analysis*, *fig.* 6.) $= a$, A M $= t$, and b = tangent of angle $\angle$ P T M (radius 1) but $b = \frac{d y}{d x}$, and consequently T M $= \frac{y}{b} = \frac{y \, d x}{d y}$, and this is the value of the line T M called the subtangent; hence, in a given equation to a curve, find the value of $\frac{y \, d x}{d y}$, and make T M $= \frac{y \, d x}{d y}$, join T P, and the line T P is a tangent to the curve, or has the geometrical property before specified.

Example.—Let $y = \varphi x = (2 r x - x^2)^{\frac{1}{2}}$, then $\frac{d y}{d x} = \frac{r - x}{(2 r x - x^2)^{\frac{1}{2}}}$, consequently the subtangent $\frac{y \, d x}{d y} = y \cdot \frac{(2 r x - x^2)^{\frac{1}{2}}}{r - x} = \frac{y^2}{r - x}$.

Again, let the equation be $x^3 - 3 a x y + y^3 = 0$, then $3 x^2 d x - 3 a x d y - 3 a y d x + 3 y^2 d y = 0$, and consequently, $\frac{d x}{d y} = \frac{3 a x - 3 y^2}{3 x^2 - 3 a y} = \frac{a x - y^2}{x^2 - a y}$, and the subtangent $\left(\frac{y \, d x}{d y}\right) = \frac{a x y - y^3}{x^2 - a y}$.

Let a line K P be drawn perpendicular to the tangent T P, then it equals $y \sqrt{(1 + (D \cdot y)^2)}$, or $y \sqrt{\left(1 + \left(\frac{d y}{d x}\right)^2\right)}$, for T M : P M :: P M : M K; $y \cdot \frac{d x}{d y} : y ::$ $y : y \cdot \frac{d y}{d x} =$ M K; P K$^2 = y^2 \left(\frac{d y}{d x}\right)^2 + y^2$; P K $= y \sqrt{1 + (D y)^2}$, because P K is secant to the angle M P K, whose tangent is $\frac{d y}{d x}$ and rad. 1; and consequently, K M $= y \frac{d y}{d x}$, or $y \cdot D \cdot y$; the line K P is called the normal, the line K M the subnormal.

Draw the line $m p$ parallel to M P, then $m p =$ M P $+ p t = y +$ P $t \times$ tan. $\angle$ P T M $= y + b \cdot \Delta x = y + \frac{d y}{d x} \cdot \Delta x$, or $y + D \cdot y \cdot \Delta x$, but $m r = y + D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x)^2 + \&c.$ consequently, the difference or $p r = -\left(\overset{D^2}{c} \cdot y \cdot (\Delta x)^2 + \overset{D^3}{c} \cdot y \cdot (\Delta x)^3 + \&c.\right)$, take Δx such, that the first term shall be greater than the sum of all the succeeding terms, then $p r$ will be negative or positive, as $\overset{D^2}{c} \cdot y$ is positive or negative, for $(\Delta x)^2$ is always

positive, consequently if $D^2 . y$ be negative, the point r is between m and p, or the curve is said to be concave to the axis; if $\overset{D_2}{c} . y$ be positive, the point p is between m and r, and the curve is said to be convex to the axis.

Ex.—Let $y = a + bx + cx^2$, then $\frac{dy}{dx} = b + 2cx$, $\frac{d^2y}{dx^2}$, or $D^2 . y = 2c$, consequently the curve is convex to the axis.

Again, let $y = (ax)^{\frac{1}{m}}$, then $\frac{dy}{dx} = \frac{a^{\frac{1}{m}}}{m} x^{\frac{1-m}{m}}$, and $\frac{d^2y}{dx^2}$ or $D^2 . y = a^{\frac{1}{m}} \frac{1-m}{m^2} x^{\frac{1-2m}{m}}$, consequently if m is > 1, $D^2 . y$ is negative, and the curve is concave to the axis.

If $\frac{d^2y}{dx^2}$ or $D^2 . y = 0$, the curve is said to have a point of inflexion: for, in this case the difference between mp and mr or $pr = \overset{D_3}{c} . y . (\Delta x)^3 + \overset{D_4}{c} . y . (\Delta x)^4 +$ &c. now take Δx such, that the term $D^3 . y . (\Delta x)^3$, exceeds the sum of the remaining, then, since the first term $D^3 . y . (\Delta x)^3$ changes its sign, when Δx does, the difference pr will likewise change its sign when Δx does, or, if on one side of the ordinate (y) the curve is convex, on the other it will be concave.

If $D^2 . y$, $D^3 . y = 0$, then the curve will not have a point of inflexion, for the difference between mp and mr will be $-(\overset{D_4}{c} . y . (\Delta x)^4 + \overset{D_5}{c} . y . (\Delta x)^5 +$ &c.), and consequently its sign will depend solely on the sign of $D^4 . y$, and not on the sign of Δx, for $(\Delta x)^4$ is positive whether Δx is positive or negative; and generally if $D^2 . y = 0$, $D^3 . y = 0$, $D^4 y = 0$, &c. and $D^m . y = 0$, (m even) then the curve has a point of inflexion.

It has appeared, that generally the difference

$$pr = -(\overset{D_2}{c} . y . (\Delta x)^2 + \overset{D_3}{c} . y . (\Delta x)^3 + \text{&c.})$$
$$= -(\Delta x)^2 (\overset{D_2}{c} . y + \overset{D_3}{c} . y . \Delta x + \overset{D_4}{c} . y . (\Delta x)^2 + \text{&c.})$$

; now since Δx may be taken so small, that a term, as $\overset{D_3}{c} . y . \Delta x$, is greater than the sum of all the succeeding terms, it is plain that the difference between pr and $(\Delta x)^2 . \overset{D_2}{c} . y$ or $\frac{d^2y}{1 . 2 . dx^2} . (\Delta x)^2$ may be made less than any assignable quantity: this is all that is to be understood in the present method, concerning any equality between a certain state of pr and $D^2 . y . (\Delta x)^2$; in the method of fluxions, or of prime and ultimate ratios, the ultimate ratio of pr, or the sagitta of the arc or evanescent subtense, is made $= \frac{d^2y}{1 . 2 . dx^2} . dx^2$; not indeed absolutely and metaphysically equal, but equal according to the definition of equality necessary to be laid down in that method.

A straight line admits, it has appeared, only of a contact of the first order, its equation $u - a - bt = 0$, containing only two constant quantities (a, b) or elements of contact: a curve whose equation is $u = a + bt + ct^2$, in which there are three elements of contact, or constant quantities, admits of a contact of the second order; or its geometrical property is such, that if $t = x$, $u = y$, $du = dy$, $d^2u = d^2y$, no other curve of the same kind can pass between its course, and that of the curve whose equation is $y = fx$.

In like manner, the equation to the circle containing only three constant quantities, the circle admits of no contact higher than that of the second order. Although the principles on which its contact with curves depends are the principles of the general theory, and properly form no exception, yet the contact of circles may merit a particular examination, from the rank that the theory of osculation or of circles of curvature holds in the history of science: Newton was led by it to his theory of central forces.

Let the circle and curve have a common point P, then since $PL^2 + LO^2 = OP^2$, or $(PM - LM)^2 + (AN - AM)^2 = OP^2$ putting $PM = u$, LM or $ON = b$, $AN = a$, $AM = t$, $(u - b)^2 + (a - t)^2 = r^2$, and consequently $u = b + \sqrt{(r^2 - (a - t)^2)}$: at the common point $u = y$, $t = x$, $\therefore y = b + \sqrt{(r^2 - (a - x)^2)}$ $\therefore \frac{dy}{dx}$ or $D . y = (a - x)(r^2 - (a - x)^2)^{-\frac{1}{2}}$; and since

$LO : OP :: MK : PK$

$$a - x : r :: y\frac{dy}{dx} : y\sqrt{1 + Dy^2} :: D . y : \sqrt{1 + Dy^2},$$

$$a - x = \frac{r . D . y}{\sqrt{1 + Dy^2}}$$

but $PL : PO :: PM : PK$

$$y - b : r :: y : y\sqrt{1 + (Dy)^2}$$

$$y - b = \frac{r}{\sqrt{1 + (Dy)^2}}$$

hence, $a = x + \frac{r . D . y}{\sqrt{(1 + (D . y)^2)}}$ and $b = y - \frac{r}{\sqrt{(1 + (D . y)^2)}}$, and consequently, in terms of y or x, the co-ordinates a and b, by which the centre is determined, are expressed.

The elements a and b, on which the degree of contact depends, have been determined on these two conditions, *viz.* that $u = y$, and that $\frac{du}{dx} = \frac{dy}{dx}$, and agreeably to the theory laid down, the circle whose radius is r, and the position of whose centre is determined by the values of the co-ordinates deduced as above, is such, that between it and the curve no other circle of the same radius can be drawn, having its centre placed differently.

For if possible, let the equation to such a circle be $(v - \beta)^2 + (\alpha - t)^2 = r^2$ or $v = \beta + \sqrt{(r^2 - (\alpha - t)^2)}$, at the common point $v = y$, hence, α and β are to be determined from the equations $y = \beta + \sqrt{(r^2 - (\alpha - x)^2)}$ and $D . y = (\alpha - x)(r^2 - (\alpha - x)^2)^{-\frac{1}{2}}$, which equations are exactly similar to those from which a and b were determined: consequently α and β deduced, will be expressed by the same quantities as a and b are, or the new circle will become identical, or coincide, with the former.

Since the conclusions deduced as above do not depend on the magnitude of r, suppose it indeterminate in the expressions for a and b; then since from one expression r equals $\frac{(a - x)\sqrt{(1 + (D . y)^2)}}{D . y}$ and from the other $(y - b)\sqrt{(1 + (D . y)^2)}$, equate the two values, and there results $a - x = (y - b) . D . y$, or $b = y + \frac{x - a}{D . y}$ an equation to a right line in which are placed the centres of all the circles

circles that touch the curve, that is, that have with it a contact of the firſt order.

The value of the ſubnormal has been found $= y \cdot D \cdot y$ and the tangent of the angle which the normal makes with the axis is $\frac{1}{D \cdot y}$, ſuppoſe now P K to be the normal, then the equation to it, conſidered as a right line is (ſince P M = P L + O N = M N × tangent ∠ P K M + O N) $y = \frac{a - x}{D \cdot y} + b$, conſequently, $b = y + \frac{x - a}{D \cdot y}$, the ſame equation as has been juſt deduced for the right line in which the centres of all the circles that touch the curve are placed: hence, this right line coincides with the normal, and is conſequently perpendicular to the tangent of the curve.

Suppoſe it now were required, from all the circles which touch the curve, that is, which ſatisfy theſe conditions, *viz.* $y = u$, $\frac{d y}{d x} = \frac{d u}{d x}$, to ſelect that which has with the given curve a contact, ſuch, that between it and the curve no other circle can be drawn, or which, analytically ſpeaking, ſatisfies the condition $\frac{d^2 y}{d x^2} = \frac{d^2 u}{d x^2}$: now, by what has preceded,

$$a = x + \frac{r \cdot D \cdot y}{\sqrt{(1 + (D^2 \cdot y)^2)}}, \text{ and } b = y - \frac{r}{\sqrt{(1 + (D \cdot y)^2)}};$$

again, $\frac{d^2 y}{d x^2}$ or $D^2 \cdot y = \frac{1}{d x} \cdot d \left(\frac{d y}{d x}\right) = \frac{1}{d x} \cdot d$

$$\left(\frac{a - x}{\sqrt{(r^2 - (a - x)^2)}}\right) = - \frac{r^2}{(r^2 - (a - x)^2)^{\frac{3}{2}}} = -$$

$$\frac{r^2}{\left(r^2 - \frac{r^2 \cdot (D \cdot y)^2}{1 + (D \cdot y)^2}\right)^{\frac{3}{2}}} = - \frac{(1 + (D \cdot y)^2)^{\frac{3}{2}}}{r}$$

and conſequently, $r = \frac{(1 + (D \cdot y)^2)^{\frac{3}{2}}}{- D^2 \cdot y}$ or $= \frac{(d x^2 + d y^2)^{\frac{3}{2}}}{- d x \cdot d^2 y}$

and $a = x - \frac{D \cdot y \cdot (1 + (D \cdot y)^2)}{D^2 \cdot y}$ or $= - \frac{d y \cdot (d x^2 + d y^2)}{d x \cdot d^2 y}$,

and $b = y + \frac{1 + (D \cdot y)^2}{D^2 \cdot y}$ or $= y + \frac{d x^2 + d y^2}{d^2 y}$.

By theſe equations are determined the co-ordinates of the centre of a circle, and the radius of that circle which is ſuch, that between it and the curve no other circle can paſs; for, if it be poſſible for another circle to paſs between the curve and the former circle, let its equation be $v = \beta + \sqrt{(\varrho^2 - (\alpha - t)^2)}$, then the three elements of contact, to wit, α, β, ϱ, are to be determined from the three equations

$$y = \beta + \sqrt{(\varrho^2 - (\alpha - x)^2)}, \; D \cdot y = (\alpha - x)$$

$$(\varrho^2 - (\alpha - x)^2)^{-\frac{1}{2}} \text{ and } D^2 \cdot y = - \frac{\varrho^2}{(\varrho^2 - (\alpha - x)^2)},$$

which equations are exactly ſimilar to the equations by which the elements a, b, r were determined; conſequently, after elimination, α, β, ϱ will be exhibited by the ſame forms as a, b, r have been exhibited; or in other words, the new circle will become identical with the former.

Let it now be required to inveſtigate an expreſſion from which the areas of curves may be found. Suppoſe y the ordinate of the curve, then at an interval Δx the ordinate is $y + \Delta y = y + D \cdot y \cdot \Delta x + \overset{c}{D^2} \cdot y \cdot (\Delta x)^2 +$ &c. and the incremental area between the ordinates y and $y + \Delta y$ is $> y \cdot \Delta x$, and $< (y + \Delta y) \cdot \Delta x$, the ordinates increaſing, or $< y \cdot \Delta x$, and $> (y + \Delta y) \cdot \Delta x$; the ordinates diminiſhing; let now the area be repreſented by $f x = u$, a function of the abſciſſa, then $f \cdot (x + \Delta x) - f x$, or Δu is between the limits $(y + \Delta y) \cdot \Delta x$, and $y \cdot \Delta x$; hence $\Delta u - y \cdot \Delta x$ muſt always be leſs than $(y + \Delta y) \cdot \Delta x - y \cdot \Delta x$, however ſmall Δx is, or putting for Δu, Δy their expanded ſeries, $(D \cdot u - y) \cdot \Delta x + \overset{c}{D^2} \cdot u \, (\Delta x)^2 +$ &c. is $< \Delta y \cdot \Delta x$, or $< D \cdot y \cdot (\Delta x)^2 + \overset{c}{D^2} \cdot y \cdot (\Delta x)^3 +$ &c. and conſequently $(D \cdot u - y) + \overset{c}{D^2} \cdot u \cdot \Delta x +$ &c. muſt be $< D \cdot y \cdot \Delta x + \overset{c}{D^2} \cdot y \cdot (\Delta x)^2 +$ &c. however ſmall Δx is, which is evidently impoſſible, except $D \cdot u - y = 0$; for the difference of the two expreſſions being $(D \cdot u - y) + (\overset{c}{D} \cdot u - D \cdot y) \cdot \Delta x + (\overset{c}{D^2} \cdot u - \overset{c}{D^2} \cdot y) \cdot (\Delta x)^2 +$ &c. it is evident that Δx may be taken ſuch, that $(D \cdot u - y)$ ſhall be greater than the ſum of all the ſucceeding terms; hence $D \cdot u - y$ or $\frac{d u}{d x} = y$ or $d u = y \, d x$; and conſequently $d^{-1} (d u)$ or $u = d^{-1} (y \, d x)$.

Hence to find the area is merely an analytical queſtion, the ordinate being given a function of the abſciſſa; what is to be done, is, the determination of the integral of a given differential expreſſion.

If $y = a + b x^n + c x^r$, $d u = a \, d x + b x^n \, d x + c x^r \, d x$, and $u = a x + \frac{b x^{n+1}}{n + 1} + \frac{c x^{r+1}}{r + 1} + \alpha$, α being an arbitrary quantity, which in ſpecific caſes may be determined.

The differential expreſſion from which the ſolidity of a body is to be calculated, may be thus obtained.

Let $f x$ be a ſection of the ſolid, made perpendicular to the axis; let s, a function of the abſciſſa, repreſent the ſolidity, then Δs is contained between the limits $f (x + \Delta x) \Delta x$, and $f x \cdot \Delta x$, conſequently $\Delta s - f x \cdot \Delta x$ is $< (f (x + \Delta x) - f x) \cdot \Delta x$, or $(D \cdot s - f x) \cdot \Delta x + \overset{c}{D^2} s \cdot (\Delta x)^2 +$ &c. is $< D f x \cdot (\Delta x)^2 + \overset{c}{D^2} f x \cdot (\Delta x)^3 +$ &c. and conſequently, $(D \cdot s - f x) + \overset{c}{D^2} s \cdot \Delta x +$ &c. $< D f x \cdot \Delta x + \overset{c}{D^2} f x \cdot (\Delta x)^2 +$ &c. however ſmall Δx be taken, which is impoſſible, except $D \cdot s - f x = 0$, ſince Δx may be taken ſo ſmall, that $(D f x - \overset{c}{D^2} \cdot s) \Delta x + a \cdot (\Delta x)^2 + a' \cdot (\Delta x)^3 +$ &c. (putting a, a' &c. for the co-efficients of the terms affected with (Δx), $(\Delta x)^2$, &c.) is leſs than $D \cdot s - f x$, and à fortiori leſs for all ſmaller values of Δx; hence $D \cdot s = f x$, or $\frac{d s}{d x} = f x$, or $d s = f x \cdot d x$: if the ſolid can be conceived to be generated by the revolution of a figure round its axis, the ſection, the area of which is repreſented by $f x$, is a circle, conſequently if y be its radius, $p = 3{:}14159 +$ &c. $f x = p y^2$, and thence $d s = p y^2 \, d x$, and $s = d^{-1} (p y^2 \, d x)$.

The differential expreſſion next to be deduced is that on which the rectification of curves depends, or from which their lengths may be calculated. The expreſſion may eaſily be deduced if the aſſumption of Archimedes be admitted, which is nearly as follows, that of lines having the ſame terminations, that which is a right line is the leaſt, and if two figures have the ſame ſtraight line for their baſe, that which is contained within the other, if it is always concave towards the baſe, is the leaſt; from which it immediately follows that the arc M, M′, M″, (*fig.* 7.) is greater than the chord drawn from m to M″, and leſs than M q + q M″; the limits within

within which the arc is contained being determined, the differential expreſſion by which its length is to be calculated may be obtained thus:

Draw M Z perpendicular to Z P; let M′ r, M t, t Q, be tangents, then the arc M M′ > chord M M′ is > M′ r (ſuppoſing M′ r produced to cut the axis to the left of M P; again, arc M M′ Q is < M t + t Q, but arc M′ Q is > t Q (for ſame reaſon as arc M M′ is > M′ r); conſequently arc M M is < M t and > M′ r; now if P P′ be Δx, M t = $\Delta x \sqrt{(1 + (D \cdot y)^2)}$ and calling P′ M′, y', M′ r = $\Delta x \sqrt{(1 + (D \cdot y)^2)}$, therefore arc M M′, or ſuppoſing z a function of x to repreſent the arc, Δz is < $\Delta x \sqrt{(1 + (D \cdot y)^2)}$, > $\Delta x \sqrt{(1 + (D \cdot y)^2)}$, and conſequently

$\Delta x \sqrt{(1 + (D \cdot y)^2)} - \Delta z$ ought to be

$< \Delta x \sqrt{(1 + (D \cdot y)^2)} - \Delta x \sqrt{(1 + (D \cdot y)^2)}$

but $\Delta z = D \cdot z \cdot \Delta x + {}^{D_2}_{c} z \cdot (\Delta x)^2 +$ &c.

$y' = y + D \cdot y \cdot \Delta x + {}^{D_2}_{c} y \cdot (\Delta x)^2 +$ &c. conſequently $D \cdot y' = D \cdot y + {}^{D_2}_{c} \cdot y \cdot \Delta x + \frac{D^3 \cdot y}{1 \cdot 2} \cdot (\Delta x)^2$ + &c. and $\sqrt{(1 + (D \cdot y)^2)} = \sqrt{(1 + (D \cdot y)^2)} + 2 \cdot D \cdot y \, (D^2 \cdot y \cdot \Delta x + \frac{D^3 \cdot y}{1 \cdot 2} \cdot (\Delta x)^2 +$ &c.) $= \sqrt{(1 + (D \cdot y)^2)} + a \cdot \Delta x + (\Delta x)^2 +$ &c. putting a, a' &c. for the co-efficients of Δx. $(\Delta x)^2$, &c. hence

$\left(\sqrt{(1 + (D \cdot y)^2)} - D \cdot z\right) \Delta x - {}^{D_2}_{c} \cdot z \cdot (\Delta x)^2 - {}^{D_3}_{c} \cdot z \cdot (\Delta x)^3 -$ &c. muſt be $< a \cdot (\Delta x)^2 + a' \cdot (\Delta x)^3 +$ &c. or

$\left(\sqrt{(1 + (D \cdot y)^2)} - D \cdot z\right) - {}^{D_2}_{c} \cdot z \cdot \Delta x -$ &c. $< a \cdot \Delta x + a' \cdot (\Delta x)^2 +$ &c. however ſmall Δx is, but, as it has been ſhewn in preceding caſes, this is impoſſible, except $\sqrt{(1 + (D \cdot y)^2)} - D \cdot z = 0$; conſequently, ſince the difference between the arc and one of its limits muſt be leſs than the difference between the limits, $\sqrt{(1 + (D \cdot y)^2)} - D \cdot z$ muſt be = 0, or $D \cdot z = \sqrt{(1 + (D \cdot y)^2)}$,

$$\text{or } \frac{d z}{d x} = \sqrt{\left(1 + \left(\frac{d y}{d x}\right)^2\right)}$$

$$\text{or } d z = \sqrt{(d x^2 + d y^2)}.$$

Ex. 1.—Let $a^{\frac{1}{2}} y = x^{\frac{3}{2}}$, then $d y = \frac{3}{2\sqrt{a}} x^{\frac{1}{2}} \cdot d x$, and $d y^2 = \frac{9}{4a} x \, d x^2$, and $d x^2 + d y^2 = \frac{d x^2}{4a} (4a + 9x)$, conſequently, $d z = \sqrt{(d x^2 + d y^2)} = \frac{d x}{2\sqrt{a}} \sqrt{(4a + 9x)}$, and integrating $z = \frac{(4a + 9x)^{\frac{3}{2}}}{27\sqrt{a}} + \alpha$, α being an arbitrary quantity called the correction; if $z = A$, when $x = r$, then $A = \frac{(4a + 9r)^{\frac{3}{2}}}{27\sqrt{a}} + \alpha$, conſequently, $= A - \frac{(4a + 9r)^{\frac{3}{2}}}{27\sqrt{a}}$.

Ex. 2.—Let $y = \sqrt{(1 - x^2)}$, $\therefore d y = \frac{-x \, d x}{-\sqrt{1 - x^2}}$, $d y^2 = \frac{x^2 \cdot d x^2}{1 - x^2}$, and $d x^2 + d y^2 = d x^2 + \frac{x^2 \cdot d x^2}{1 - x^2} = \frac{d x^2}{1 - x}$, conſequently, $d z \frac{d x}{\sqrt{(1 - x)}}$ = (by expanſion), $d x \, (1^{-\frac{1}{2}} - D \, 1^{-\frac{1}{2}} \cdot x^2 + {}^{D_2}_{c} \, 1^{-\frac{1}{2}} \cdot x^4 -$ &c.) (in which $D \, 1^{-\frac{1}{2}}$, ${}^{D_2}_{c} \, 1^{-\frac{1}{2}}$, &c. are uſed as ſymbols, ſignifying reſpectively $-\frac{1}{2}$, $\frac{1}{8}$, &c) and $z = x - \frac{D \, 1^{-\frac{1}{2}} \cdot x^3}{3} + {}^{D_2}_{c} \, 1^{-\frac{1}{2}} \frac{x^5}{5}$ + &c. + α, or $= x + \frac{x^3}{2 \cdot 3} + \frac{3}{5 \cdot 8} x^5$ + &c. + α, (α an arbitrary conſtant quantity).

Let it now be required to inveſtigate the differential expreſſion from which the ſurface of a ſolid may be deduced.

It has been ſhewn that the arc M M′ is < M t > M′ r: now if the figure be conceived to revolve round T P, then P T, P M′ deſcribe circles, M t, M′ r conical ſurfaces, and M M′ a conoidal ſurface, which will be contained between the conical ſurfaces generated by M t, M′ r; now the conical ſurface belonging to M t = $\frac{1}{2}$ (2 p. P t + 2 p. P M) M t (p = 3.14159 + &c.) = p. M t (P′ t + P M), and the conical ſurface belonging to M′ r = p. M′ r (M′ P′ + P r), now P t = y + D . y . Δx, P r = y' − D . y' . Δx, M t = $\Delta x \sqrt{(1 + (D \cdot y)^2)}$, M′ r = $\Delta x \sqrt{(1 + (D \cdot y')^2)}$, let the expreſſion $\sqrt{(1 + (D \cdot y)^2)} = \downarrow x$, then ſince y' is what y becomes, putting for x, $x + \Delta x \sqrt{(1 + (D \cdot y')^2)} = \downarrow (x + \Delta x)$; hence the ſurface is < $p \cdot \Delta x \cdot \downarrow x \, (2y + D y \cdot \Delta x)$, > $p \cdot \Delta x \cdot \downarrow (x + \Delta x) \cdot (2y' - D y' \cdot \Delta x)$, let the function of x repreſenting the ſurface be V, then the portion belonging to M M′ = Δ V = D V . Δx + ${}^{D_2}_{c}$ V . $(\Delta x)^2$ + ${}^{D^3}_{c}$ V . $(\Delta x)^3$ + &c. hence this latter quantity being conſtantly contained between the two limits above-mentioned, the difference between it and one of the limits muſt be leſs than the difference between the limits, or $p \cdot \downarrow x \{(2y + D \cdot y \cdot \Delta x) - D \cdot V) \Delta x - {}^{D_2}_{c} V \cdot (\Delta x)^2 -$ &c. $< p \cdot \Delta x \{\downarrow x (2y + D \cdot y \cdot \Delta x) - \downarrow (x + \Delta x) \cdot (2y' - D y' \cdot \Delta x)\}$ or $(p \cdot \downarrow x \cdot 2y - D \cdot V) \cdot \Delta x + a \cdot (\Delta x)^2 + b \cdot (\Delta x)^3 +$ &c. $< a' \cdot (\Delta x)^2 + b' \cdot (\Delta x)^3 +$ &c. (a, a', b, b', &c. repreſenting co-efficients affected with powers of Δx) for ſince $\downarrow (x + \Delta x) = \downarrow x + D \downarrow x \cdot \Delta x + {}^{D_2}_{c} \downarrow x \cdot (\Delta x)^2 +$ &c. and $2y' = 2y + 2D \cdot y \cdot \Delta x +$ &c. the firſt term in the expanded ſeries, for $\downarrow (x + \Delta x) (2y' - D y' \cdot \Delta x) = 2y \cdot \downarrow x =$ firſt term in the expanded ſeries for $\downarrow x (2y + D \cdot y \cdot \Delta x)$, and hence it follows, that the firſt term in $p \cdot \Delta x \{\downarrow x \cdot (2y + D \cdot y \cdot \Delta x) - \downarrow (x \Delta + x) (2y' - D \cdot y' \cdot \Delta x)\}$ contains $(\Delta x)^2$; conſequently, ſince the difference between the limit and D . V, or $(p \cdot \downarrow x \cdot 2y - D \cdot V) \cdot \Delta x + a \cdot (\Delta x)^2 +$ &c. muſt be leſs than the difference between the limits, of the form $a' (\Delta x)^2 + b' (\Delta x)^3 +$ &c. however ſmall Δx is, this cannot happen except $p \cdot \downarrow x \cdot 2y - D \cdot V = 0$, or $p \cdot \downarrow x \cdot 2y = \frac{d V}{d x}$, or $p \cdot \sqrt{(1 + (D \cdot y)^2)} \cdot 2y = \frac{d V}{d x}$, or $p \cdot \sqrt{(d x^2 + d y^2)} \cdot 2y = d V$, or calling $\sqrt{(d x^2 + d y^2)}$, $d z$, $d V = 2 p y \, d z$, the differential expreſſion from which the ſurface is to be found.

If $y^2 = a x$, $d x^2 = \frac{4 y^2 \cdot d y^2}{a^2}$, and $\sqrt{(d x^2 + d y^2)} =$

$d y$

$\frac{dy\sqrt{(a^2+4y^2)}}{a}$, and $dV = \frac{2p}{a} y\,dy\sqrt{(a^2+4y^2)}$, consequently $V = \frac{2p}{a} \cdot \frac{(a^2+4y^2)^{\frac{3}{2}}}{12} = \frac{p}{6a}(a^2+4y^2)^{\frac{3}{2}} + \alpha$, ($\alpha$ being a conſtant arbitrary quantity).

The manner in which Mr. Woodhouſe applies theſe principles to explain ſome propoſitions in the doctrine of motion, is particularly deſerving of attention, as it is the converſe method to that moſt uſually followed by fluxionary writers.

The laws of motion are here beautifully illuſtrated from principles derived by fair induction from the proceſſes of common algebra, whereas, thoſe writers uſually purſue a method entirely the reverſe, and inſtitute algebraical proceſſes from the theory of motion.

To determine the circumſtances under which a function φx admits of a maximum or minimum,

Let x be increaſed by Δx; then $\varphi(x+\Delta x) = \varphi x + D\varphi x \cdot \Delta x + \overset{D^2}{c}\varphi x \cdot (\Delta x)^2 +$ &c. or $y + D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x)^2 +$ &c.; now in caſe of a maximum y is $> y + \Delta y$, or $> y + D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x)^2 +$ &c.; and in caſe of a minimum $< y + D \cdot y \cdot \Delta x + D^2 \cdot y \cdot (\Delta x)^2 +$ &c., or $D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x) +$ &c. is < 0 in caſe of a maximum, and > 0 in caſe of a minimum, whatever Δx is; now Δx may be taken ſuch, that the firſt term, to wit, $D \cdot y \cdot \Delta x$ is greater than the reſt of all the ſucceeding terms; conſequently $D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x)^2 +$ &c. is > 0, or < 0, accordingly as $D \cdot y \cdot \Delta x$ is poſitive or negative: but $D \cdot y \cdot \Delta x$ changes its ſigns with Δx, conſequently, taking Δx, $+\Delta x$, and $-\Delta x$, $D \cdot y \cdot \Delta x + \overset{D^2}{c} \cdot y \cdot (\Delta x)^2 +$ &c. cannot be always < 0, in caſe of the maximum, nor > 0 in caſe of the minimum, except $D \cdot y = 0$; hence, when y or φx is at a ſtate of maximum or minimum, $D \cdot y$ or $\frac{dy}{dx} = 0$.

Again, ſince the co-efficient $D \cdot y$ or $\frac{dy}{dx} = 0$, then $\overset{D^2}{c} \cdot y \cdot (\Delta x)^2 + \overset{D^3}{c} \cdot y \cdot (\Delta x)^3 +$ &c. muſt be < 0 in caſe of a maximum, and > 0 in caſe of a minimum: take Δx ſuch that the firſt term, namely, $\overset{D^2}{c} \cdot y \cdot (\Delta x)^2$, is greater than the ſum of all the ſucceeding terms; then ſince $(\Delta x)^2$ is poſitive, whether Δx be poſitive or negative, $\overset{D^2}{c} \cdot y \cdot (\Delta x)^2 + \overset{D^3}{c} \cdot y \cdot (\Delta x)^3 +$ &c. is < 0 or > 0, accordingly as $\overset{D^2}{c} \cdot y$ or $\frac{d^2y}{dx^2}$ is negative or poſitive; hence, for a maximum $\overset{D^2}{c} y$ is negative, for a minimum, poſitive.

Next, ſuppoſe the co-efficients $D \cdot y$, $D^2 \cdot y$, both to equal 0, then $\overset{D^3}{c} \cdot y \cdot (\Delta x)^3 + \overset{D^4}{c} \cdot y\,(\Delta x)^4 +$ &c. is < 0 for a maximum, and > 0 for a minimum; take Δx ſuch that the firſt term $D^3 y\,(\Delta x)^3$ is greater than the ſum of all the ſucceeding terms: then ſince $\overset{D^3}{c} \cdot y \cdot (\Delta y)^3$ changes its ſign as Δx does, $\overset{D^3}{c} \cdot y \cdot (\Delta x)^3 + \overset{D^4}{c} \cdot y\,(\Delta x)^4 +$ &c. cannot always < 0 for a maximum, nor > 0 for a minimum, except $\overset{D^3}{c} \cdot y = 0$, or $\frac{dy}{dx^3} = 0$.

And generally, if $D \cdot y$, $\overset{D^2}{c} \cdot y$, $\overset{D^3}{c} \cdot y$, &c. $D^m \cdot y$ (m even) $= 0$; then that the function $y\,(\varphi x)$ may admit a maximum or minimum, $D^{m+1} \cdot y$ muſt alſo be $= 0$; and for a maximum $D^{m+2} \cdot y$ muſt be negative, and for a minimum poſitive.

Such are the methods for determining the maxima and minima of quantities; the principles on which they are founded are ſufficiently evident, and merely analytical examples cannot illuſtrate them.

It was in attempting the ſolution of theſe problems *de maximis et minimis*, that the differential calculus is ſaid to have originated. Fermat is the firſt writer who has given a method purely analytical. His method conſiſts in making the quantity whoſe maximum or minimum is ſought equal to the expreſſion of the ſame quantity, in which the unknown quantity is augmented by an indeterminate quantity: in this equation he makes the radicals and fractions, if any diſappear, and having exterminated the common terms on each ſide of the equation, he divides the others by the indeterminate quantity by which they are multiplied; then he makes this quantity *zero*, and obtains an equation which ſerves to determine the unknown quantity. The following ſimple example will ſerve to illuſtrate the method of Fermat.

Let it be required to divide a right line into two parts, in ſuch a manner that the rectangle contained by the two parts may be a maximum.

Let a be the given line, x one part, and $a - x$ the other. The expreſſion $ax - x^2$ is then to be a maximum. Add the arbitrary quantity e to the unknown quantity x, and we obtain this new expreſſion,

$$a(x+e) - (x+e)^2.$$

Theſe expreſſions being ſuppoſed equal

$$ax - x^2 = a(x+e) - (x+e)^2,$$
$$\text{or } ax - x^2 = ax + ae - x^2 - 2ex - e^2;$$

ſubtract $a - x^2$ from each ſide, and divide by e

$$a - 2x - e = 0:$$

now ſuppoſe $e = 0$, then $a - 2x = 0$, and $x = \frac{a}{2}$.

This is the ſame reſult as obtained by the fluxional or differential method, and the baſis on which they are all founded is very ſimilar. The terms which are rejected as infinitely ſmall by ſome writers on the infiniteſimal calculus, are here ſuppreſſed, as vaniſhing or becoming zero in the method by Fermat. His method of drawing tangents depends on the ſame principle; in the equation between the abſciſſa and the ordinate, which Fermat calls the ſpecific property of the curve, he augments or diminiſhes the abſciſſa by an indeterminate quantity, and he regards the new ordinate as belonging at once to the curve and tangent, which produces an equation which he treats as in the above method *de maximis et minimis*.

Thus x being the abſciſſa and y the ordinate, if t is the ſubtangent at the point of the curve which anſwers to x and y, then by ſimilar triangles $\frac{y(t+e)}{t}$ for the ordinate to the tangent relative to the abſciſſa $x + e$; and this ordinate ſhould be equal to that of the curve for the ſame abſciſſa $x + e$: we ſhall therefore have the required equation, if in the equation for the curve we ſubſtitute $x + e$ in the place of x and $y + \frac{ye}{t}$ in the place of y. This equation will be diviſible by e; all its terms then are to be divided by e, and afterwards thoſe ſuppreſſed in which the indeterminate quantity e is found, becauſe this indeterminate quantity is ſuppoſed now to become zero. The remaining equation will give the value of t in the terms of x and y. Thus in the parabola for example,

whoſe equation $y^2 - ax = 0$, ſubſtituting $y + \frac{ye}{t}$ for y, and $x + e$ for x, the equation becomes

$$y^2 + \frac{2y^2e}{t} + \frac{y^2e^2}{t^2} - ax - ae = 0.$$

But $y^2 - ax = 0$; therefore rejecting theſe terms, and dividing others by e,

$$\frac{2y^2}{t} + \frac{y^2e}{t^2} - a = 0$$

rejecting the ſecond term, e being now ſuppoſed $= 0$,

$$t = \frac{2y^2}{a} = 2x.$$

We may here likewiſe trace the analogy between the method of Fermat and the differential calculus; for the indeterminate quantity e, by which x is augmented, anſwers to the differential dx; and $\frac{ye}{t}$, the correſponding augmentation of y, anſwers to its differential dy.

This idea of Fermat ſeems to have been original, but ſomewhat obſcure. It conſiſts in introducing into an equation an indeterminate quantity, which is afterwards ſuppoſed to become zero, by the conditions of the problem, but which is not made to vaniſh till the whole equation has been divided by it. This idea may be conſidered as the germ of the *new calculus*, by which ſuch rapid advances have been made in geometry and mechanics. But the obſcurity of its origin ſtill remains a blemiſh in the elementary principles, as delivered by moſt writers on this ſubject. They are all liable to the objection, urged by Berkly, of a *ſhifting of hypotheſis*; that is, equations are eſtabliſhed upon the ſuppoſition of a ſymbol having an actual exiſtence as a quantity, and conſequences are then eſtabliſhed which are preſumed to hold good, when the hypotheſis is entirely changed by making the ſymbol equal to zero.

The cotemporaries of Fermat did not enter into the ſpirit of this mode of calculation, they conſidered it as only a particular artifice, applicable to a few caſes, and ſubject to many difficulties. In the third volume of the letters of Deſcartes may be ſeen a long diſpute with Fermat upon this ſubject. Thus this invention, which appeared a ſhort time previous to the *geometrie de Deſcartes*, remained dormant and neglected for above forty years.

At length Barrow contrived to ſubſtitute for theſe vaniſhing quantities of Fermat others ſuppoſed infinitely ſmall. In 1674, he gave his method of tangents, which is only a geometrical conſtruction of the method of Fermat, by means of a triangle infinitely ſmall, formed by the ſides e and $\frac{ey}{t}$, and by an infinitely ſmall ſide of the curve ſuppoſed a polygon. With him originated the ſyſtem of infiniteſimal quantities, from which aroſe the differential calculus.

But to return to the ſubject. Queſtions relating to the maxima and minima of quantities were not unknown to the ancient geometricians. One entire book of Apollonius is devoted to the inveſtigation of the longeſt and ſhorteſt lines that can be drawn from a given point to the arcs of conic ſections. The method of Apollonius is reduced ſimply to the proof, that every other ſtraight line drawn to the conic ſection is leſs in caſe of the maximum, and greater in that of the minimum, than that which he has determined, and this method has ſince been generally followed by all thoſe who have endeavoured to ſolve theſe problems by ſimple geometry.

Fermat, as above ſtated, was the firſt who attempted to ſolve them analytically. His method, ſimplified and generalized by the fluxionary and differential calculus, conſiſts in making the differential or fluxion of the function, which is to be a maximum or minimum, equal to zero. Moſt of the methods we have been treating of derive their origin from the conſideration of curve lines; the determination of the greateſt and leaſt ordinates in curved lines and ſurfaces gave riſe to the above queſtions of *maxima* and *minima*. But there is a ſpecies of problems, related to theſe, of a much more difficult and general nature, and though our limits will not permit us to devote a very great portion of this work to them, yet we would not willingly omit a general illuſtration of the principle on which they depend. The problem of the *ſwifteſt deſcent* is of this nature; and was one of the firſt that was attempted. In theſe queſtions it is required to inveſtigate curves in which quantities, depending on the whole extent of the required curve, taken between certain limits, are a maximum or minimum, relative to all other poſſible curves, as for example, the curve which encloſes the greateſt ſpace according to ſome given conditions. There are many problems in mechanics of this nature. Newton firſt inveſtigated the nature of the curve which, by revolving on its axis, produced the ſolid which oppoſed the leaſt poſſible reſiſtance to a fluid moving in the direction of its axis. Though ſome of theſe problems had been occaſionally ſolved in particular inſtances, yet no general rule had been found applicable to them, till Lagrange deviſed the method known by the name of calculus variationum.

The firſt methods attempted towards the ſolution of theſe problems was, according to the differential notion, by dividing the curve into an infinite number of polygons, then determining the poſition of two adjacent ſides, ſo that the quantity propoſed becomes a maximum or minimum, by making the ordinate only vary according to the angle formed by the two ſides. By this contrivance the problem is reduced to the former claſs, and the only difficulty is to bring the reſult to the differential form. It was thus found that the curve of the quickeſt deſcent was ſuch, that the ſine of the angle which one of its infinitely ſmall ſides makes with the vertical, muſt always be proportional to the velocity, which is as the ſquare root of the height from which the body has deſcended; and this proportion, reduced to a differential equation, gives the cycloid. This method was afterwards applied to problems ſtill more complicated, particularly to thoſe called *iſoperimetrical*, in which it was required to find among all the curves having a given perimetre, that which within certain limits ſhould contain the greateſt or leaſt ſurface; and from the difficulty of theſe problems, joined to the celebrity which they acquired by the labours of Euler and the Bernouillis, the general name of iſoperimetrical was given to them, even in the caſe where the condition of equality in the length was not required.

In all the preceding inveſtigations relative to maxima and minima, when z has been ſuppoſed a function of x, y; x and y have been ſuppoſed to have ſome conſtant relation to each other during the courſe of the problem, but in many problems, particularly in thoſe under conſideration, theſe relations are ſuppoſed continually to change. In a given curve for inſtance, x and y and dx, and dy have a relation to each other defined by the nature of the curve, but in the method of variations, the ordinates y are no longer bounded by the original curve, but may paſs into another, having no determinate relation with the former.

Let

Let V denote ſome function of x and y, and of the differential co-efficients of y, then the value of x remaining the ſame, the integral $\int . V . dx$ is ſuſceptible of an infinity of values, depending on the relation between x and y. It may therefore become a queſtion, among all the poſſible relations of x and y, to determine that, in which the integral $\int V dx$ (between certain limits) is a maximum or minimum; the integral $\int V dx$, when no particular relation between x and y is ſpecified, expreſſing the meaſure of a property belonging to all curves, it is required to determine the curve in which this property is a maximum or minimum. It is evident that if C E (*fig.* 8.) repreſent this curve, then in any other, $\gamma\varepsilon$, the integral $\int V dx$ muſt be a value greater in the firſt caſe and leſs in the ſecond. To ſatisfy this condition, we muſt firſt inveſtigate the difference which any given change in the relation of x to y will make in the integral $\int V dx$; this change will be expreſſed by making y vary independently of x, for in conſidering the two curves C E, $\gamma\varepsilon$, the ſame abſciſſa A P correſponds to two ordinates P M, P μ, and their difference, M μ, ſhould be diſtinguiſhed from the differences M R, $\mu\varphi$, which take place between the conſecutive ordinates taken on the ſame curve.

In the calculus of variations as deviſed by La Grange, a differential equation, formed by conſidering the quantities as varying in one certain relation, is made the primitive of a new differential equation in which the quantities are ſuppoſed to vary in a new relation: and an hypotheſis is eſtabliſhed upon this ſecond operation ſuited to the nature of the ſubject under inveſtigation. It is by the ſymbol δ that this new operation is denoted; and taking for illuſtration the ſame curve lines as above, d denotes the variation or tranſition from one point to another on the ſame curve; δ that made in conſequence of a point moving into ſome new curve: thus M R being repreſented by dy, M μ will be δy; hence

$$P'M' = y + dy;\ P\mu = y + \delta y.$$

The point M′ paſſing to the point μ', we ſhall have

$$P'\mu' = y + dy + \delta(y + dy)$$
$$= y + dy + \delta y + \delta dy,$$

and by comparing theſe two expreſſions of the ſame line, this remarkable equation is obtained,

$$\delta dy = d\delta y.$$

The ſame reſult may be obtained without any reference to the nature of curve lines, by repreſenting by φx the primitive ſtate of y, and by $\downarrow x$ the conſequence of the ſuppoſed variation. Then $\delta y = \downarrow x - \varphi x$, will be a certain function of x, and likewiſe a function of y, becauſe of the primitive relation between x and y; let π denote this latter function, then $\delta y = \pi y$; let $y + dy = y'$; then $\delta y' = \pi y'$: hence $\delta y' - \delta y = \pi y' - \pi y = d\pi y = d\delta y$: but $dy = y' - y$, taking the variations

$$\delta dy = \pi y' - \pi y; \text{ hence } \delta dy = d\delta y.$$

In like manner $\delta d^2 y = d^2 \delta y$, and generally $\delta d^n y = d^n \delta y$, by which it appears that the ſymbols d and δ may always be tranſpoſed.

The principle of La Grange's method conſiſts in taking the differentials of x, y, dx, dy, &c. according to the uſual proceſs, but relatively to another characteriſtic or ſymbol δ different from d, uſed in the firſt caſe; then tranſpoſing δ after d and $\int$, if it happen to precede them, and making δx, δy, &c. diſappear by integration from under the ſign $\int$.

Let the formula, which within certain limits is to be a maximum or minimum, be $\int z$, a function of x, y, dy, &c. Suppoſing dx conſtant, then $\delta . \int z$ will be the differential value in the caſe of a maximum or minimum; therefore

$$\delta . \int z = 0, \text{ which may be transformed into } \int dz = 0.$$

Let the differential of this equation, found in the uſual manner, but with the ſymbol δ, be

$$\delta z = M\delta y + N\delta dy + P\delta d^2 y + \&c.;$$
$$\text{then } \int M\delta y + \int N\delta dy + \int P\delta d^2 y + \&c. = 0.$$

But $\int N\delta dy$ may be transformed into $\int N d\delta y$, and then by integration into

$$N\delta y - \int dN\delta y.$$

In the ſame manner $\int P\delta d y$ is transformed firſt into $\int P d^2 \delta y$; then into $P d\delta y - dP\delta y + \int d^2 P\delta y$, and ſo of the others.

Adding the conſtant quantity k, or correction to theſe integrations, the equation becomes

$$N\delta y + P d\delta y - dP\delta y + \&c. + k$$
$$+ \int (M - dN + d^2 P - \&c)\delta y = 0.$$

As all the differentials of δy have diſappeared from under the ſign $\int$, this part is not ſuſceptible of farther reduction. Therefore, to verify the equation independently of the variations, the co-efficient of δy under the ſign $\int$ muſt be made $= 0$, which gives the following equation,

$$M - dN + d^2 P - \&c. = 0;$$

which equation muſt ſubſiſt for all the values of x and y contained within the given limits.

Example.—Let it be required to aſſign the relation between x and y when $\sqrt{dx^2 + dy^2}$ is a minimum, which is equivalent to finding the ſhorteſt diſtance between two points,

$$\delta\sqrt{dx^2 + dy^2} = \frac{dx\delta dx + dy\delta dy}{\sqrt{dx^2 + dy^2}},$$

(which, ſuppoſing $ds = \sqrt{dx^2 + dy^2}$)

$$= \frac{dx d\delta x}{ds} + \frac{dy d\delta y}{ds}$$

Here $M = 0,\ N = \frac{dx}{ds},$

$$m = 0,\ n = \frac{dy}{ds},$$

$$M - dN = -d . \frac{dx}{ds} = 0,$$

$$m - dn = -d . \frac{dy}{ds} = 0.$$

Therefore $\frac{dx}{ds} = a$, a conſtant quantity,

$$\frac{dy}{ds} = b, \text{ a conſtant quantity.}$$

or $x : y :: a : b$, an equation to a ſtraight line.

We ſhall conclude this article with Mr. Woodhouſe's method of applying theſe principles to the inveſtigation of the properties of motions, which we particularly wiſh to recommend to the notice of the mathematical reader.

Let the relation between the ſpace x, and time t, be denoted by $x = \varphi t$, then t being increaſed to $t + \Delta t$, $x + \Delta x = \varphi(t + \Delta t) = \varphi t + D\varphi t . \Delta t + \overset{D^2}{c}\varphi t . (\Delta t)^2 + \&c. = x + D . x . \Delta t + \overset{D^2}{c} . x . (\Delta t)^2 + \&c.$ and conſequently $\Delta x = D . x . \Delta t + \overset{D^2}{c} . x . (\Delta t)^2 + \&c.$ let moreover the relation between any other ſpace, y, and time t, be denoted by $y = ft$, then $\Delta y = f(t + \Delta t) - ft = Dft . \Delta t + \overset{D}{c} ft . (\Delta t)^2 + \&c. = D . y . \Delta t + \overset{D^2}{c} . y . (\Delta t)^2 + \&c.$ Now, if $x = y$, $D . x = D . y$, $D^2 . x = D^2 . y$, &c. $D^{n-1} . x = D^{n-1} . y$, then the motion of the body deſcribing the ſpace Δy, approaches more nearly to the motion of the body deſcribing the ſpace Δx,

than can any other motion designated by an equation as $v = \downarrow t$, except $D \cdot v = D \cdot x$, $D^2 \cdot v = D^2 \cdot x \ldots$ &c. $D^{n-1} \cdot v = D^{n-1} \cdot x$; for, suppose it otherwise, then, since the motion to which corresponds $v = \downarrow t$, approaches more nearly to the motion to which corresponds $x = \varphi t$, than the motion to which corresponds $y = f t$, $\Delta x - \Delta v$ ought to be less than $\Delta x - \Delta y$, however small the time Δt be, or $(D \cdot x - D \cdot v)\, \Delta t + (\overset{c}{D^2} \cdot x - \overset{c}{D^2} \cdot v)\, (\Delta t)^2 +$ &c. (1) ought to be $< (\overset{c}{D^n} x - \overset{c}{D^n} \cdot y)\, (\Delta t)^n + (\overset{c}{D^{n+1}} \cdot x - \overset{c}{D^{n+1}} \cdot y)\, (\Delta t)^{n+1} +$ &c. (2) however small the element Δt be taken, which is clearly impossible, except $D \cdot x = D \cdot v$, $D^2 \cdot x = D^2 \cdot v$, &c. and $D^{n-1} \cdot x = D^{n-1} \cdot v$, for if these differential co-efficients up to the n^{th} are not equal, the first term of series (1), must contain a power $\left((\Delta t)^{n-m}\right)$ of Δt less than $(\Delta t)^n$, and consequently, dividing by $(\Delta x)^{n-m}$, for $\Delta x - \Delta v$ to be less than $\Delta x - \Delta y$, $(\overset{c}{D^{n-m}} \cdot x - \overset{c}{D^{n-m}} \cdot v) + (\overset{c}{D^{n-m+1}} \cdot x - \overset{c}{D^{n-m+1}} \cdot v) \cdot \Delta t +$ &c. must be $< (\overset{c}{D^n} \cdot x - \overset{c}{D^n} \cdot y) \cdot (\Delta t)^m + (\overset{c}{D^{n+1}} \cdot x - \overset{c}{D^{n+1}} \cdot y) \cdot (\Delta t)^{m+1} +$ &c. which, as has been shewn before, is impossible.

To apply this proposition to particular instances; let the equation between y and t be thus expressed, $y = a t$, a being a constant quantity, in which case the spaces are proportional to the times, and the motion is said to be uniform; then making $y = x = a t$, $\frac{d x}{d t}$ or $D \cdot x = a$, consequently there is no other uniform motion which can approach so nearly to the motion, to which corresponds $x = \varphi t$, as that to which corresponds the equation $y = \frac{d x}{d t} \cdot t$: for if possible, let $v = \alpha t$, then $v = x = \alpha t$, and $v = \frac{d x}{d t} \cdot t$, the same equation as before.

The constant quantity a in the equation $y = a t$ is the measure of what is called the velocity, and consequently in the equation $x = \varphi t$ the co-efficient $\frac{d x}{d t}$ may be called the velocity of the body in motion, or, if the body moved uniformly with a velocity measured by the co-efficient $\frac{d x}{d t}$, it would have the property above specified, namely, that the space described by it, for a certain value of (Δt) and for all lesser values, will differ less from the entire space (Δx), than the space described in any other uniform motion, depending on a different element, or measure (α) of the velocity.

As a second example, let $y = b t^2$, b being constant, in which motion, the spaces described from rest, vary as the squares of the times, make $y = x = b t^2$, therefore $\frac{d x}{d t} = 2 b t$, and $\frac{d^2 x}{2 \cdot d t^2} = b$, consequently, by what has preceded, the motion designated by the equation $y = \frac{d^2 x}{2 \cdot d t^2} \cdot t^2$ is (at the point where $y = x$, and $\frac{d y}{d t} = \frac{d x}{d t}$) more nearly equal the given motion $(x = \varphi t)$ than any other motion designated by a similar equation to the equation $y = b t^2$; for assuming $v = \beta t^2$ it appears, that $\beta = \frac{d^2 x}{2 \cdot d t^2}$, whence $v = \frac{d^2 x}{2 \cdot d t^2} \cdot t^2$, the same equation as has been deduced.

In the equation $y = b t^2$, in which the motion of the body is accelerated, the element b is the measure of what is called the accelerating force; and agreeably to such imposition of terms, the accelerating force belonging to a motion $x = \varphi t$, is equal $\frac{d^2 x}{2 \cdot d t^2}$ or has the property above specified; and moreover, when the accelerating force is required to be calculated, it is simply the co-efficient $\frac{d^2 x}{2 \cdot d t^2}$ that is to be estimated: the term itself has been introduced from the disposition men have to speak of the causes of effects, although it is clear, that by imposing a mere term on an effect, nothing is taught concerning the cause of that effect; when the term occurs, nothing more is to be understood by it, than the specification of an effect, that is, the uniform acceleration of the body's motion, or what amounts to the same, the continual and uniform augmentation of the velocities, the measure of velocity being a space described in a given time.

Hence, in the form $\Delta x = \frac{d x}{d t} \cdot \Delta t + \frac{\overset{c}{d_2} x}{d t^2} \cdot (\Delta t)^2 + \frac{\overset{c}{d_3} x}{d t^3} \cdot (\Delta t)^3 +$ &c. the whole space (Δx) may be conceived composed of a number of spaces due to particular kinds of motion; the first term $\frac{d x}{d t} \cdot \Delta t$ is the space described in uniform motion with a velocity $= \frac{d x}{d t}$, the second $\frac{\overset{c}{d_2} x}{d t^2} \cdot (\Delta t)^2$ is the space described in motion uniformly accelerated, the quantity of the acceleration depending on the co-efficient $\frac{\overset{c}{d_2} x}{d t}$, the third term $\frac{\overset{c}{d_3} x}{d t^3} \cdot (\Delta t)^3$ is another space due to a motion, the kind of which has not been described in terms as the two former have, because no such motion occurs in nature: its laws, however, are defined with the same precision as the laws of uniform, and uniformly accelerated motion: a like observation is to be extended to the other spaces $\frac{\overset{c}{d_4} x}{d t^4} \cdot (\Delta t)^4$, $\frac{\overset{c}{d_5} x}{d t^5} \cdot (\Delta t)^5$, &c.

Since the velocity $(V) = \frac{d x}{d t}$ and accelerating force $(F) = \frac{d^2 x}{2 \cdot d t}$, $F = \frac{1}{2 \cdot d t} d \left(\frac{d x}{d t}\right) = \frac{1}{2 \cdot d t} \cdot d V$, or $2 F \cdot d t = d V$, and $2 F \cdot d t \cdot \frac{d x}{d t} = V d V$, whence, if F be given a function of the time (t) the integral of $V d V$, to wit, $\frac{V^2}{2}$ may be exhibited by a function likewise of the time; and by making t a function of x, $\frac{d x}{d t} = \frac{1}{\frac{d t}{d x}}$, $\left(\frac{d x}{d}\right.$ $\left.\frac{d t}{d x}\right)$, representing the differential co-efficients of x a function of t, and of t a function of x) the expression becomes $\frac{1}{2 F \cdot d x}$

$2\,F\,.\,d\,x = V\,d\,V$, whence F being given a function of the pace V^2 may be deduced a function.

Since $\Delta\,x = \frac{d\,x}{d\,t}\,.\,\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ + &c. if the body fall from reſt, or the velocity $\frac{d\,x}{d\,t} = 0$, then $\Delta\,x = \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2 + \frac{d^3\,x}{1\,.\,2\,.\,3\,.\,d\,t^3}\,.\,(\Delta\,t)^3$ + &c. now ſince $\Delta\,t$ may be taken ſuch, that $\frac{d^3\,x}{1\,.\,2\,.\,3\,.\,d\,t^3}$ ſhall be greater than the ſum of all ſucceeding terms, ſo that $\left(\frac{d^3\,x}{1\,.\,2\,.\,d\,t^2} + \frac{d^4\,x}{1\,.\,2\,.\,3\,.\,d\,t^3}\,.\,\Delta\,t + \text{\&c.}\right) < \left(\frac{d^3\,x}{1\,.\,2\,.\,d\,t^2} + \frac{2\,.\,d^3\,x}{1\,.\,2\,.\,3\,.\,d\,t^3}\,.\,\Delta\,t\right)$ and à fortiori, leſs, for all leſſer values of $\Delta\,t$, it is clear, that by taking $\Delta\,t$ of a proper ſmallneſs, $\left(\frac{d^2\,x}{1\,.\,2\,.\,d\,t^2} + \frac{2\,.\,d^3\,x}{1\,.\,2\,.\,3\,.\,d\,t^3}\,.\,\Delta\,t\right)\,(\Delta\,t)^2$ may be made to differ from $\frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ by a difference leſs than any aſſignable quantity.

This is all that is to be underſtood in the preſent method, concerning an equality that is ſaid to ſubſiſt between the ſpaces deſcribed in initio motus, the ſquares of the times, and other conſtant quantities.

As, in the caſe of tangents and radii of curvature, the analytical properties were firſt ſtated and the geometrical deduced, ſo, in the caſe of velocities and accelerating forces, the analytical properties being firſt ſtated, the mechanical properties (if they may be ſo called) have been deduced; and a reverſe proceſs, it is evident, may be inſtituted; thus, defining the meaſure of the velocity of a body in variable motion, at a given point, to be a quantity, ſuch, that if the body moved uniformly, (the kind of uniform motion being determined by that conſtant quantity) the ſpace deſcribed would be nearer the entire ſpace ($\Delta\,x$), than any other ſpace deſcribed by another uniform motion, the velocity may be deduced; thus, let a be its meaſure, then the ſpace deſcribed in the time $\Delta\,t = a\,.\,\Delta\,t$, and $\Delta\,x$ being $= \frac{d\,x}{d\,t}\,.\,\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}(\Delta\,t)^2$ + &c.

$\left(\frac{d\,x}{d\,t} - a\right)\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ + &c. is $<$ $\left(\frac{d\,x}{d\,t} - \alpha\right)\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ + &c. which cannot be generally aſſerted; for, make the conſtant quantity $\alpha = \frac{d\,x}{d\,t}$, then $\Delta\,t$ may be taken ſo ſmall, that $\frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ + &c. ſhall be $< \left(\frac{d\,x}{d\,t} - \alpha\right)\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ + &c. but if $\frac{d\,x}{d\,t} = a$, then can $\left(\frac{d\,x}{d\,t} - a\right)\,.\,\Delta\,t$ + &c. be $< \left(\frac{d\,x}{d\,t} - \alpha\right)\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,(\Delta\,t)^2$ + &c. whilſt $\frac{d\,x}{d\,t}$ does not equal α, and conſequently, the element a put for the velocity, muſt $= \frac{d\,x}{d\,t}$.

In like manner taking the definition that has been given of the accelerating force, its value may be ſhewn equal $\frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}$.

The term velocity has cauſed much confuſion of ideas; its meaſure is the conſtant quantity expreſſing the ratio between the ſpace and time in uniform motion; in the equation $x = a\,t$, it is a, which element ſerves to diſtinguiſh one uniform motion from another; in variable motion, the meaſure of the velocity is $\frac{d\,x}{d\,t}$; and this only is meant, that a body moving uniformly with this velocity $\frac{d\,x}{d\,t}$, would deſcribe a ſpace $\frac{d\,x}{d\,t}\,.\,\Delta\,t$, which has the conditions above ſpecified: a like explanation is to be given of the term *accelerating force* in variable motion; when the accelerating force is ſaid to vary as a function ($f\,x$) of the ſpace deſcribed, what is to be underſtood, is, that the co-efficient $\frac{d^2\,x}{d\,t^2}$ varies as $f\,x$.

The ſpace $\Delta\,x = \frac{d\,x}{d\,t}\,.\,\Delta\,t + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,(\Delta\,t)^2$ + &c. and conſequently, $\frac{\Delta\,x}{\Delta\,t} = \frac{d\,x}{d\,t} + \frac{d^2\,x}{1\,.\,2\,.\,d\,t^2}\,.\,\Delta\,t$ + &c. now by what has appeared, $\frac{d\,x}{d\,t}$ may be made to differ from $\frac{\Delta\,x}{\Delta\,t}$ by a quantity leſs than any aſſignable quantity; and this is all that is clearly intelligible concerning any *equality* that can ſubſiſt between $\frac{d\,x}{d\,t}$ and a certain ſtate of $\frac{\Delta\,x}{\Delta\,t}$; in the language of limits, the limit of $\frac{\Delta\,x}{\Delta\,t}$ or L. $\frac{\Delta\,x}{\Delta\,t}$ is ſaid to equal $\frac{d\,x}{d\,t}$.

The definition of velocity being given, to determine its quantity, or meaſure in variable motion, becomes a matter of computation: and x being a function of the time, the differential co-efficient $\frac{d\,x}{d\,t}$, the meaſure of the velocity muſt be computed, which, by preceding methods, can always be effected; but the differential co-efficient, or what correſponds to it, may be eſtimated by ſeveral methods, although the principle on which they are founded is in fact the ſame; hence computing by ſuch methods the velocity, the quantity deduced muſt be what, really, $\frac{d\,x}{d\,t}$ is; not ſimply the firſt differential co-efficient of $x + \Delta\,x$ expanded, but the firſt differential co-efficient obtained by a particular hypotheſis; now the method the fluxioniſts have followed is this; they define fluxions to be velocities, and having, by certain proceſſes, obtained the quantity ſymbolical of the velocity, they, in fact, had obtained the fluxion or differential of a quantity: a procedure, it ſhould ſeem, not very philoſophical; ſince velocity, as a term by which fluxions are

defined, itſelf in variable motion, wants definition, and, as a principal, wants computation. And when, as has been already ſtated, a partial theory, itſelf to be included under the general theory of quantity, was employed to illuſtrate that theory, correſponding modes of conceiving quantity, and expreſſions to reaſon about quantity, became neceſſary: every thing that could become the ſubject of inveſtigation was to be conceived as generated by motion, or its increaſe to be analogous to the deſcription of right lined ſpace by a moving body; figurative expreſſions entered as parts of this theory, and the ſevere ſciences were diſcuſſed in terms and phraſes new to geometry.

Science, however, derived an incalculable advantage from the invention of the method of fluxions, but the excellence of this invention, one of the foundation ſtones of the immenſe fabric of Newton's fame, does not conſiſt in the principle by which quantity was conceived to be generated by motion, but in the proceſſes and rules by which it was taught, how the properties of motion might be inveſtigated, and conſequently, the ſimilar properties of continued quantity; in the ſimple excogitation of the principle of motion, Newton had been preceded by Roberval.

According to the view that has been taken of the differential calculus, it is to be conſidered as a branch of common algebra, or rather as a part of the common ſymbolical language in which quantity is treated of. In its mere proceſſes and rules it demands no hypotheſis, it requires the eſtabliſhment of no theory; the differential of $f x$ is ſimply the ſecond term of $f(x + \mathrm{d}\,x)$ expanded, $\mathrm{d}\,x$ being altogether arbitrary; and in particular caſes, as x^m, a^x, $\mathrm{L}\,.\,x$, &c. comprehended by $f\ x$, $m\,x^{m-1}\,\mathrm{d}\,x$, $\mathrm{A}\,a^x\,\mathrm{d}\,x$, $\frac{\mathrm{d}\,x}{\mathrm{A}\,x}$, &c. In its application, the calculus cannot be ſaid to demand any new hypotheſis, but ſimply requires this propoſition to be eſtabliſhed, *viz.* that in a ſeries $a + a'\,.\,x + a''\,.\,x^2 +$ &c. x may be taken of ſuch a magnitude, that any term, as $a'^{\cdots n}\,x^n$, ſhall be greater than ſum of all the ſucceeding terms. In the method of fluxions and of limits, the differential (or fluxion) of a function $f\ x$, although expreſſed by the ſecond term of $f(x + \mathrm{d}\,x)$, or $f(x + \dot{x})$ expanded, is not ſimply that ſecond term, but is expreſſed by it, under the circumſtances of a particular hypotheſis and of a particular theory; and conſequently, the mere analytical proceſſes and operations by which rules are founded become burthened with that theory.

Function, in *Phyſiology*, the office in the animal economy performed by any part of the body. In this ſenſe it is ſynonymous with the *uſe* of the part; we ſpeak of the function of the kidney, teſtis, &c. The term, however, is employed, more extenſively, to denote the great proceſſes of the living body, the performance of which requires the co-operation of many organs; as thoſe of digeſtion, ſenſation, &c. Theſe ſubjects will all be conſidered under their reſpective articles in the Cyclopædia. We have given here a view of the different functions, arranged in the form of a table, ſo as to exhibit their mutual relations, and to afford alſo a general claſſification of the ſubjects belonging to phyſiology. This table is taken from the elements of phyſiology of Richeraud. We do not attach any great importance to the peculiar mode of the arrangement: all ſuch diviſions muſt be in great meaſure arbitrary. The various parts of the living ſyſtem are connected together; the functions are mutually dependent, ariſe out of each other, and are executed ſimultaneouſly. They repreſent altogether a circle, in which we cannot aſſign a beginning or an end. Digeſtion, abſorption, circulation, the ſecretions, nutrition, ſenſation, motion, the voice, and even generation, may be all going on at once; but an obſerver would find himſelf much confuſed by attending at the ſame time to all this aſſemblage of proceſſes. Again, when he proceeds to the work of abſtraction, when he begins to contemplate ſome ſingle part of the vital phenomenon, he muſt not look upon this as inſulated or independent, but advert to its connection with other parts of the economy. A more detailed view of theſe matters will be exhibited in the article Life.

The older writers divide the functions into four claſſes, called the animal, vital, natural, and generative. The firſt of theſe includes the ſenſations and motions, which form the diſtinguiſhing characters of animals; the ſecond, the proceſſes of circulation and reſpiration, the continuance of which is neceſſary to life; the third, digeſtion, chylification, abſorption, urinary ſecretion, &c. by which the nouriſhment and growth of the body are performed; and the fourth, thoſe proceſſes by which the continuance of the ſpecies is provided for. Such an arrangement is very arbitrary, and open to numerous objections. The vital and animal functions are ſometimes claſſed together under the former name. Vicq d'Azyr has prefixed an arrangement of functions to his great work, the "Traité d'Anatomie avec des plauches colorieés." This is objectionable, ſince ſenſibility, irritability, and oſſification, are there included. Now the two former are the powers or properties by which certain parts are enabled to perform their functions, and the latter is merely a mode of nutrition peculiar to a certain ſtructure of the body.

TABULAR View of the Functions of the Animal Economy.

- **First Class.** FUNCTIONS CONCERNED IN THE PRESERVATION OF THE INDIVIDUAL. (*Life of the individual.*)
  - **First Order.** By assimilating food to his own substance. (*Interior, assimulative, or nutritive functions.*)
    - First Genus.—DIGESTION. Extracts from it the nutritive parts.
      - Prehension of the food,
      - Mastication
        - First dentition,
        - Second ditto,
      - Insalivation,
      - Deglutition,
      - Digestion in the stomach,
      - ——— duodenum,
      - ——— small intestine,
      - Excretion of fœces,
      - ——— urine.
    - Second Genus.—ABSORPTION. Conveys the nutritive matter into the blood.
      - Absorption of chyle,
      - ——— lymph,
      - Action of the absorbing vessels,
      - ——— glands,
      - ——— thoracic duct.
    - Third Genus.—CIRCULATION. Carries it to all the organs.
      - Action of the heart,
      - ——— arteries,
      - ——— capillary vessels,
      - ——— veins.
    - Fourth Genus.—RESPIRATION. Exposes it to the atmosphere.
      - Action of the parietes of the chest,
      - ——— lungs,
      - Changes produced in the air,
      - ——— blood,
      - Production of animal heat.
    - Fifth Genus.—SECRETIONS. Make it undergo various modifications.
      - Formation of serum,
      - Follicular or mucous secretion,
      - Glandular secretion.
    - Sixth Genus.—NUTRITION. Applies to the organs, for the purposes of growth and nourishment.
      - Different in each part, according to its peculiar composition.
  - **Second Order.** By establishing his relations to surrounding objects. (*Exterior* or *relative functions.*)
    - First Genus.—The SENSATIONS. Give him notice of their presence.
      - Organs
        - of sight,
        - — hearing,
        - — smelling,
        - — tasting,
        - — touching,
      - Action of the nerves,
      - ——— brain,
      - Faculties of the mind,
      - Perception,
      - Memory,
      - Judgment,
      - Volition,
      - Sleeping and waking,
      - Dreams and somnambulism.
    - Second Genus.—The MOTIONS. Bring him towards, or remove him from them.
      - Muscles,
      - Muscular action,
      - The skeleton,
      - Articulations,
      - Erect position, or
      - Standing at rest,
      - Progressive motions
        - Walking,
        - Running,
        - Leaping,
        - Swimming,
        - Flying,
        - Creeping.
      - Motions of the upper limbs,
      - Attitude, Gesture.
    - Third Genus.—VOICE and SPEECH. Enable him to communicate with is fellows without moving.
      - Voice,
        - Articulated, or speech,
        - Modulated, or singing,
      - Lisping,
      - Stammering,
      - Dumbness,
      - Ventriloquism.

Second

- Second Claſs. FUNCTIONS CONCERNED IN THE PRESERVATION OF THE SPECIES. (*Life of the ſpecies.*)
  - First Order. Requiring the concourſe of both ſexes.
    - CONCEPTION and GENERATION.
      - Sexual diſtinctions,
      - Hermaphrodites,
      - Syſtems concerning generation.
  - Second Order. Performed by the female.
    - GESTATION.
      - Pregnant uterus,
      - Hiſtory of the embryo,
      - ——— fœtus,
      - ——— its coverings.
    - PARTURITION.
      - Uterus after parturition,
      - Diſcharge of the lochia.
    - LACTATION.
      - Office of the mammæ,
      - Milk.
    - AGE OF GROWTH.
      - Infancy
        - Dentition,
        - Oſſification.
      - Puberty — Menſtruation.
      - Adoleſcence.
    - AGE OF MANHOOD.
      - Differences of temperament,
      - Idioſyncraſies,
      - Different races of mankind.
    - AGE OF DECAY.
      - Period of decline,
      - Old age,
      - Decrepitude.
    - DEATH.
    - PUTREFACTION.

FUND, FUNDUS, a Latin term, uſed for the bottom of certain things; and particularly of certain parts of the body.

FUND *of the eye*, *Fundus oculi*, is that part poſſeſſed by the choroides and retina.

The images of objects are repreſented in an inverted ſituation, in the fund of the eye. See VISION.

FUNDUS *Uteri*, or *bottom of the womb*, is the body or principal part thereof; ſo called in contradiction to the cervix, or neck; the oſculum, or mouth; and the vagina, or ſheath.

FUNDUS *Veſicæ*, or *bottom of the bladder*, is the cavity thereof, wherein the urine is contained. In men it is placed over the rectum; and in women over the matrix.

FUND *of the Gall-bladder*, the *Stomach*, &c. See GALL-*bladder*, STOMACH, &c.

FUNDUS *Plantæ*, is that part of a plant where the ſtalk juſt meets and joins the root.

FUNDUS *Cæli*, is the point oppoſite to the point of culmination; or the point of the ecliptic, wherein it is interſected by the meridian beneath the horizon.

FUND, in *Commerce*, is uſed for the capital or ſtock of a merchant, company, or corporation; or the ſum of money they put into trade.

In this ſenſe we ſay abſolutely, the funds, the public funds, meaning the ſtock of the great companies, or corporations, as the Bank, South-ſea, Eaſt-India, &c.

FUNDS, *Public*, are the taxes appropriated by parliament to the ſupport of civil government, and the payment of the principal and intereſt of money borrowed for public ſervices. Theſe funds, in Britain, have been all formed into the four following claſſes or diviſions: the *Aggregate Fund*, the *South-ſea Fund*, the *General Fund*, and the *Sinking Fund*. Of all theſe, but more eſpecially the laſt, we ſhall give an account in the order in which they have been now named.

The aggregate fund was eſtabliſhed by an act of Geo. I. cap. 12. in 1715. It had this name given it, becauſe it conſiſted of a great variety of taxes and ſurpluſſes of taxes and duties which were in that year conſolidated, and given as a ſecurity for the diſcharge of the intereſt and principal of debts due to the Bank of England, and ſome other public debts; and alſo for the payment of 120,000*l.* per ann. to the civil liſt. Into this fund were brought the two-thirds and one-half ſubſidy of tonnage and poundage; half the inland duties on tea and coffee; the houſe-money granted by the 7th of Will. III.; the duty on hops; the duties on low wines, brandy, and Britiſh ſpirits; all arrears of land-taxes; all public monies not appropriated; the ſurpluſſes of the nine-penny exciſe, of the five-ſevenths of the Bank nine-penny exciſe, of the revenues in the annuity acts of the 4th, 5th, and 6th of queen Anne, &c. and by an act of the 1ſt of Geo. III. all the duties conſtituting the revenue of the civil liſt.

The South-ſea fund was eſtabliſhed by ſtat. 3 Geo. I. cap. 9. in 1716; and was ſo called, becauſe appropriated to pay the intereſt of the South-ſea company's capital. It conſiſted of a duty on candles, and certain impoſts on wines, vinegar, tobacco, and Eaſt-India goods.

The general fund was alſo eſtabliſhed by ſtat. 3 Geo. I. cap. 7. in 1716, and conſiſted of a ſubſidy on goods exported; a tax on hackney-coaches and chairs; duties on ſoap, hides, ſtamps, and policies of inſurance; 700*l.* per week letter-money; a moiety of the inland duties on tea and coffee; and 39,855*l.* per annum out of the hereditary exciſe on beer for the bankers annuities. All theſe taxes were appropriated to the diſcharge of the intereſt of 7,808,087*l.* (originally 10,000,000*l.*) capital ſtock of South-ſea annuities, together with charges of management.

All that remained of the produce of the taxes thus digeſted into theſe three funds, after ſatisfying the charges upon them, was in the ſame year (or 1716) carried into a fourth fund, to which was given the name of the ſinking fund, becauſe appropriated to the *ſinking* of the public debts. The words of the act of the 3d of Geo. I. which eſtabliſhed this fund, are, "All the monies to ariſe from time to time, as well of the exceſs and ſurplus of an act made this ſeſſion for redeeming the funds of the Bank of England; and of the exceſs or ſurplus by virtue of one other act made likewiſe this ſeſſion for redeeming the funds of the South-ſea company; as alſo of the exceſs or ſurplus of the duties and revenues by this act appropriated as aforeſaid; and the overplus monies of the ſaid general fund by this act eſtabliſhed; ſhall be appropriated to the diſcharging the principal and intereſt of ſuch national debts as were incurred before the 25th of December, 1716, and are declared to be national debts;

debts; and to or for no other uſe, intent, or purpoſe whatſoever."

The tranſactions, with reſpect to this ſinking fund, form ſo important a part of the hiſtory of Britain, that it may not be improper here to give a more particular account of it.

Before its eſtabliſhment there had exiſted many ſmaller funds of the ſame nature: that is, ſuch duties or taxes had been provided for paying the intereſts of particular loans, as afforded ſurpluſſes by which the principal itſelf was to be gradually redeemed. This was the common practice in the reigns of king William and queen Anne. Moſt of the public duties were given for terms of years; and at the end of thoſe terms they ceaſed of courſe, unleſs continued for farther terms by new acts of parliament: and, in general, it was provided, when any money was raiſed, that the principal ſhould be cancelled either by time, as in the caſe of the ſale of long and ſhort annuities, or by the ſurpluſſes of the duties charged with the payment of the intereſt. This was an excellent plan; but it was by no means carried ſteadily into execution. In the year 1720, moſt of the long and ſhort annuities were converted into redeemable perpetuities, at the expence of above three millions; and the ſurpluſſes of the duties charged with particular loans were often ſo broken into, by being either charged with new loans before they had cancelled the old, or ſpent on current ſervices, as to be rendered incapable of anſwering the end intended by them. In conſequence partly of this bad management, the public debts at the acceſſion of the houſe of Hanover were ſo much increaſed as to be generally reckoned inſupportable: and their reduction was made one of the firſt objects of parliamentary attention. This gave riſe, in 1716, to the inſtitution of the fund of which we are giving an account, the father of which was (as has been generally ſaid) ſir Robert Walpole, but, in reality, the earl Stanhope. All the taxes, except the land-tax, and ſix-pence per buſhel malt-tax, were now made perpetual, and diſtributed into the three funds which have been deſcribed; the ſurpluſſes of which, for ever afterwards, were to be held ſacred, and to be applied inviolably, according to the words of the act juſt recited, to the redemption of the national debt.

A conſiderate perſon might have ſuſpected, that the ſame cauſes which had rendered former partial appropriations ineffectual, would deſtroy the efficacy of this. There ſeemed, however, to be reaſon for hoping the contrary: for,

Firſt, the future happineſs and glory of the kingdom were thought to depend on this appropriation; and the law which eſtabliſhed it was declared to be a fundamental law of the realm. Secondly, in conformity to theſe ſentiments, the words of this law were made as ſtrong as poſſible; and, in order to give additional force to it, a repetition of it in the ſame words, was inſerted in an act of the 5th of Geo. I. cap. 3. Particular notice ſhould be taken of theſe words: they order that all the ſurpluſſes of the taxes then made perpetual ſhall be applied to the diſcharge of the public debts, and "to no other uſe or intent whatever." When, therefore, a debt had been paid off, the addition ariſing from that payment to the ſurpluſſes (or the annuity diſengaged by it) became a part of the fund, and, together with it, was to be employed in diſcharging farther debts. And the ſame being true of every ſucceſſive annuity diſengaged by every payment, the fund, if never miſapplied, muſt neceſſarily have operated in ſinking the public debt, in the ſame manner that money accumulates, when put out to bear compound intereſt. And in this way this fund did in fact operate for a few years. While in its infancy, it was watched over with great care. The improvement, and the inviolable application of it, were recommended in moſt of the ſpeeches from the throne, and echoed back in the addreſſes of the houſe of commons. It is particularly obſervable, that ſo well did our miniſters then underſtand the nature and importance of this fund, that rather than encroach upon it, they frequently borrowed money, in order to defray the neceſſary expences of government. From ſome publications in 1726 it appears, that ſome perſons had been led to apprehend this zeal of the miniſtry would not be permanent, becauſe it was not their intereſt to pay off the public debt, on account of the dependence and influence created by it. In anſwering this objection, the writers on the ſide of the court called ſuch an apprehenſion an *indecent jealouſy*, and took upon them to aſſure the public, "that in no poſſible exigence of affairs could our miniſters ever approve of or recommend the alienation of the ſinking fund." Happy would it have been for Britain had this proved true: but in a little time it appeared, that the apprehenſions which had been ſtiled *indecent jealouſies* were too well grounded. Men in power came ſoon to ſee, that this fund was advancing too faſt in its operations, and to change their zeal for it into a reſolution to deſtroy it. This will abundantly appear from the following facts.

Charging the income of the ſinking fund with the payment of the intereſt of new loans, is an encroachment upon it, no leſs ſubverſive of its efficacy, than depriving it of groſs ſums; there being no difference between taking from it the annual intereſt of a ſum, and that ſum itſelf. Between the years 1727 and 1732 ſeveral encroachments of this kind had been made upon it; but, being of a leſs obvious nature, they paſſed without meeting with any particular oppoſition. The finiſhing blow was given in the year 1733. In that year, in order to keep the land-tax at one ſhilling in the pound, it was neceſſary either to borrow half a million for the current ſervice, or to take this ſum from the ſinking fund. The laſt method was choſen, and propoſed by ſir Robert Walpole to the houſe of commons. Long and warm debates enſued. A propoſal to alienate, in a time of profound peace, a fund which the law had made ſacred, and the alienation of which no poſſible exigence of public affairs could juſtify, only for the ſake of keeping the land-tax for one year at one ſhilling in the pound, juſtly kindled the indignation of the patriotic party. They urged the prohibition of the law, the faith of parliament, and the ſecurity of the kingdom. The propoſer of the alienation was reminded of his inconſiſtency and treachery, in endeavouring to beat down that very monument of glory which he had boaſted of having erected for himſelf; and ſir John Barnard warned him, that he was drawing upon himſelf the curſes of poſterity. But all arguments were vain. The miniſtry pleaded that the landed intereſt wanted eaſe; that there was no occaſion for being in a hurry to pay the national debt; and that the circumſtances of the kingdom had altered ſo much ſince the eſtabliſhment of the ſinking fund, that the competition then among the public creditors was, not who ſhould be firſt, but who ſhould be laſt paid. Thus argued, among others, ſir Robert Walpole. His reaſons prevailed; and the houſe of commons, not uſed to refuſe him any thing, conſented.

The practice of alienating the ſinking fund having been thus begun, went on of courſe. In the next year, or 1734, 1,200,000*l.* was taken from it. In 1735, and 1736, it was anticipated and mortgaged.

In 1737 and 1738, a million of the ſtock of Bank annuities, and two millions of the ſtock of South-ſea annuities, were redeemed with it. For twelve years after 1738, it was wholly applied to the current expences of every year. In 1749, the intereſt of near fifty-eight millions of the public

public debts was reduced from four to three one-half per cent. intereſt for ſeven years, and afterwards to three per cent. for ever; and by this third reduction, an addition was made to the ſinking fund of near 600,000*l.* per ann. But notwithſtanding the great addition which this *third* reduction of intereſt made to the ſinking fund, no more than three millions of the public debts were redeemed by it, during the interval of peace between the years 1748 and 1756.

By an act of the 25th of Geo. II. 1752, a change was made in the ſinking fund, which it is neceſſary to mention.

Before this act the ſinking fund conſiſted only of the clear ſurpluſſes of the aggregate, the general, and the South-ſea company's funds. By the war, which begun in 1740, there was an addition made to the public debts of near thirty-two millions. This occaſioned a great increaſe of taxes; and the practice was, whenever any new tax produced leſs than the intereſt with which it was charged, to make good the deficiency out of the ſinking fund, and afterwards to replace the ſum taken from it out of the ſupplies for the following year. But whenever a tax produced more than the charge upon it, the overplus, inſtead of being carried to the ſinking fund, was made a part of the ſupplies for the year. By the act juſt mentioned, all the new taxes, together with all the annuities to the payment of which they had been appropriated, were ordered to be carried into the ſinking fund, and formed into one general account. Moſt of the new taxes having proved deficient, this fund at firſt loſt more than it gained by the change. But the loſs was afterwards more than made up; firſt, by the ſaving which was produced by the reduction of intereſt from three one half per cent., to three per cent. in 1757; and, ſecondly, by the addition, in the ſame year, of the ſalt-duties to this fund, after they had completed the redemption of a million with which they had been charged in 1745.

The war which began in 1756 added ſeventy-one millions and a half to the public debts. This produced a new increaſe of taxes, which (in conformity to the conſolidating act juſt mentioned) were brought to the general ſinking fund account, together with the annuities or intereſts with the payment of which they were charged. And previous to the American war it became the conſtant practice, whenever a new fund or tax was created for paying the intereſt of a loan, to carry both into the ſinking fund; in conſequence of which this fund gained when the tax happened to produce more, but loſt when it produced leſs than the intereſt which it had been given to pay. The ſinking fund, therefore, which, before the conſolidating act, conſiſted only of the ſurpluſſes of the aggregate, general, and South-ſea company's funds, conſiſted afterwards of the clear ſurplus of all the appropriated taxes. There was only one exception, namely, the additional tax upon houſes and windows, granted in 1758 towards paying the intereſt of four millions and a half then borrowed. This tax was never made a part of the ſinking fund; and, having always proved deficient to the amount of about 43,000*l.* per ann. the deficiency was conſtantly made good by the ſinking fund, and afterwards replaced from the ſupplies.

Before the laſt reduction of the intereſt of the public debts, the ſinking fund, having ſuffered greatly from various encroachments upon it, produced little more than a million per ann. But after this reduction, and its increaſe by the addition of the ſalt-duties, it produced near two millions per ann. In 1764 it produced at Michaelmas, after making good deficiencies, 2,105,000*l.* nearly. For five years after 1764, its average produce, reckoned to Chriſtmas in every year, was 2,234,780*l.* For five years, ended in 1774, its average produce (after making good the deficiency in 1758) was 2,610,759*l.* In 1775 it produced 2,917,869*l.* In 1776, 3,166,517*l.* In 1777 it was charged with an annuity of 100,000*l.* per ann. to the civil liſt; and, after paying three quarters of this annuity, and half a year's intereſt of five millions borrowed in that year, it produced from Oct. 1776 to Oct. 1777, 2,685,669*l.* From Oct. 1777 to October 1778, 1779, and 1780, it produced 2,442,063*l.*—2,267,399*l.*—and 2,403,017*l.* after paying the ſaid annuity, and alſo after making good the deficiency of the fund in 1758, and all the deficiencies of the new taxes.

It appears from this detail, that after the peace in 1763 the income of the ſinking fund increaſed conſiderably. The cauſes of this were partly the falling in of life-annuities, and the greater productiveneſs of the taxes occaſioned by the increaſe of luxury. But the principal cauſe was the falling in of the intereſt of about ten millions and a half of the public debts, which had been diſcharged during the twelve years of peace between 1763 and 1775. This diminution of the public debts was made, not by the ſinking fund, but by a contribution from the Eaſt-India company of 400,000*l.* per ann. begun in 1768, and continued for five years; by the profits of ten lotteries; by the compoſition for maintaining French priſoners; ſale of French prizes taken before the declaration of war in 1756; and other extraordinary receipts, amounting in all to above eight millions. This fund, therefore, did not pay off more than two millions and a half, the reſt of its produce having been employed in bearing the expences of the peace eſtabliſhment, which, during that period, were nearly double to what they had been in any former period.

To the ſum juſt mentioned, add three millions paid off in the peace between 1748 and 1756, and three millions paid off in 1736 and 1737, and it will appear that the whole amount of the public debts paid off by the ſinking fund, ſince its firſt alienation in 1733, to the commencement of the American war, was only eight millions and a half. Had no ſuch alienation ever taken place; had even *half* its annual produce been invariably applied to the purpoſe for which it was originally formed, the whole debt would have been redeemed, and the nation at that period would conſequently have been relieved from the whole burden of its taxes; and it is poſſible alſo that the whole expence of that calamitous war, and the loſs of the Britiſh colonies, would have been prevented. But the preſſure of theſe burdens having continued with equal force, during the whole interval of a peace of eleven years without the moſt diſtant proſpect of being diminiſhed by any prudence or economy in the management of public affairs, the nation ſuffered itſelf to be plunged into a war with the hope of being relieved from a part of its burdens, by compelling the coloniſts to bear a ſhare in the ſupport of them. Unfortunately, however, this war, like all that preceded it, inſtead of diminiſhing, increaſed the public burdens, ſo that the debt, which at its commencement amounted to 136 millions, had accumulated at its termination in 1783 to more than 268 millions. At this period the ſeveral changes in the miniſtry prevented any improvement from being made in the management of the public finances. The immediate ſucceſſors of lord North, if they had been ſo diſpoſed, had ſcarcely time to form any plan for the purpoſe; and the meaſures which had been recommended in the king's ſpeech, during the ſhort adminiſtration of the earl of Shelburne, were totally diſregarded by the party that followed him into power; ſo that it may be truly ſaid, that until the end of that adminiſtration the management of the finances was conducted

with the ſame diſregard to economy and the public intereſt, as had uniformly diſtinguiſhed it from the firſt days of ſir Robert Walpole. In the year 1784, however, when Mr. Pitt, after having been forced to reſign with lord Shelburne in the preceding year, was raiſed to the chief adminiſtration of public affairs, the ruinous plans which had hitherto been purſued were diſcontinued, and very conſiderable improvements were made both in the mode of conducting the loans which were neceſſary for diſcharging the arrears of the late war, and in the general arrangement of the public accounts. Inſtead of borrowing at a low intereſt, and thus adding a needleſs capital to the public debt, the meaſure ſo often recommended by Dr. Price, of borrowing at a high intereſt, with the view of facilitating the redemption of the debt, was adopted, and the public accounts were thrown into new order, by aboliſhing the former diviſion of the taxes under the four heads of *Aggregate, South-ſea, General*, and *Sinking funds*, and including the whole in one fund called the *Conſolidated fund*. The ſurplus remaining, after deducting from the taxes thus conſolidated, all the expences of the public debts and the civil liſt, correſponded with what was formerly called the *Sinking fund*. This ſurplus, which Mr. Pitt eſtimated at a million annually, though it never fairly produced half that ſum during the whole time that intervened between the eſtabliſhment of the fund and the commencement of the French war, was appointed by parliament to be applied to the gradual diſcharge of the public debt. For this important meaſure the miniſter was wholly indebted not only to the writings but to the immediate advice and aſſiſtance of Dr. Price. But in claiming the honour of having his name inſcribed on a pillar to public credit for having adopted it, Mr. Pitt thought proper to aſſume the whole merit of the meaſure to himſelf, without the ſlighteſt notice of the ſource from which he had derived his information, and thus exhibited a much leſs equivocal proof of his ambition than either of his magnanimity or gratitude.

Of the three plans which Dr. Price communicated at his requeſt, Mr. Pitt choſe the moſt feeble, from the fear of adding to the taxes 600,000*l.* a year, which would have been required to aſſiſt the operations of the other plans. Happy had it been for the nation if he had always entertained the ſame apprehenſions, however much it may be regretted that he ſhould have been influenced by them on this occaſion.

In the firſt plan, it was propoſed by Dr. Price, in addition to the million ſurplus, to aid the operations of the fund by the falling in of the temporary and life annuities, by converting 60 millions of three per cents into four per cents, and providing in the firſt five years 600,000*l.* per annum, for paying the difference of intereſt. In the courſe of 30 years this would have redeemed 114,491,991*l.* of ſtock in the three, four, and five per cents, and given a free revenue of 6,345,566*l.* In the ſecond plan, all the ſame aids were propoſed, except that the converſion of the three per cents into four per cents was omitted. This would have retarded the operations of the fund in a ſmall degree, as the ſtock redeemed in the three, four, and five per cents, in the courſe of 30 years, would have amounted only to 101,721,266*l.*, and the free revenue would have been only 6,069,709*l.* In the third, which in fact is the plan adopted by Mr. Pitt, no other aid was propoſed to the million ſurplus than the temporary and life-annuities as they fell in, and ſuppoſing the ſtock to have been redeemed in the three, four, and five per cents, in the manner directed by Dr. Price, it would have amounted, in 30 years only, to 73,379,126*l.* and the free revenue to 4,579,731*l.*, or to little more than two-thirds its amount by the firſt plan. Since the eſtabliſhment of this plan, it has been the cuſtom of parliament to vote annually the ſum of 200,000*l.* in addition to the million ſurplus, by which its operations have been ſo far accelerated. But on the other hand they have been retarded, for the purpoſe of aſſiſting the public loans, by the partial, and at laſt the total alienation of the 30 years annuity, amounting to 418,333*l.* per annum.

When the ſinking fund was eſtabliſhed in the year 1786, the public debt, excluſive of the temporary annuities, conſiſted of

187,611,254*l.* in the three per cents,
32,750,000*l.* in the four per cents,
17,869,994*l.* in the five per cents;

amounting in the whole to 238,231,241*l.* By the operation of Dr. Price's plan, which was founded on a ſyſtem of peace, and conſequently on the ſuppoſition that in the courſe of a very few years the four per cents would have riſen to par, the whole of that ſtock and of the five per cents, together with 4,074,574*l.* ſtock in the three per cents, would have been redeemed at the preſent time, leaving a free revenue of 3,892,831*l.* and reducing the permanent debt to 183,536,680*l.* ſtock in the three per cents, which would have required little more than five millions and a half annually to pay the intereſt of it. Nor have the operations of this plan diſappointed the hopes and expectations of the public. They have in fact exceeded the computations of Dr. Price; but this has ariſen from a cauſe by no means favourable either to the credit or the welfare of the country. By a ruinous war, in which the nation has been almoſt inceſſantly involved during the laſt 18 years, and which, by increaſing the debt twenty times faſter than it could poſſibly be reduced, has at different times depreciated the funds ſo low, that the ſums appropriated for the redemption of the debt have purchaſed nearly twice as much ſtock as they would otherwiſe have done. From the manner, however, in which the accounts are laid before parliament, it is impoſſible to aſcertain the exact amount of the debt which has been redeemed by the ſinking fund, as it was firſt eſtabliſhed in 1786; for its operations are blended with thoſe of another fund which was eſtabliſhed ſoon after, for the purpoſe of redeeming any new debt which ſhould be incurred by the public.

In the ſeveral tracts which Dr. Price had written on the ſubject, he had ſtrongly inſiſted on the neceſſity, not only of redeeming the preſent, but alſo of diſcharging any future debt, by providing a ſpecial fund for that purpoſe, and with that view he recommended that 1*l.* on every 100*l.* borrowed ſhould be annually applied to the redemption of the capital, (which it would accompliſh in leſs than 40 years,) that by this means the debt might be prevented from becoming a perpetual burden on the country. In conformity with this recommendation of Dr. Price an act of parliament was paſſed, which directed, that in all future loans an additional ſum of 1*l.* per cent over and above the annual intereſt ſhould be raiſed by taxes towards redeeming the principal, and ſo enormous has been the expenditure ſince the paſſing of that act, that this additional ſum amounted, in February laſt (1810) to 3,841,567*l.* excluſive of 56,445,000*l.* which had been borrowed during Mr. Pitt's adminiſtration, on the ſecurity of the income-tax, and which has ſince been funded without any ſpecial proviſion for its redemption. With this ſum, and the accumulating dividends on the ſtock purchaſed with it, together with the ſurplus million, the annual ſum of 200,000*l.* voted by parliament, the dividends on the ſtock purchaſed with both, and about 91,000*l.* per ann. gained by the falling in of ſome life annuities, the commiſſioners had in February the ſum of 10,509,392*l.* as annually

nually applicable to the reduction of the debt of Great Britain, and the whole of what they had then redeemed amounted to

149,271,236*l.* ſtock in the three per cents,
6,629,700*l.* ſtock in the four per cents,
142,000*l.* ſtock in the five per cents, or 156,042,936*l.*

But in order to ſhew what progreſs has really been made in reducing the public debt by the financial operations of miniſters, it will be neceſſary to obſerve that the whole maſs, excluſive of the debt incurred in the preſent year and of the addition to the temporary annuities, amounted in February to

596,156,564*l.* ſtock in the three per cents,
66,076,985*l.* ſtock in the four per cents,
60,213,221*l.* ſtock in the five per cents, or 722,446,770*l.*

Deducting from this ſum 156,042,936*l.* purchaſed by the commiſſioners, there will remain unredeemed of the perpetual annuities 566,403,834*l.*; and as the purchaſes have almoſt wholly been made in the three per cents, a very conſiderable part of this debt conſiſts of four and five per cents, which makes the real amount of it, when compared with the debt in 1786, nearly four times greater than what it would have been, had no wars intervened to diſturb the operations of the ſinking fund.

In the courſe of the laſt five years about 140 millions have been added to the capital of the public debt, which, requiring an annual addition of ſix millions nearly to the permanent taxes, recourſe has been had, among a variety of other expedients for preventing the neceſſity of impoſing new burthens, to the perpetuating a part of the war-taxes which were meant only to be temporary, and to the alienation of the annuities that expired in 1808, which were originally to have been applied in aid of the ſinking fund. By theſe means, in conjunction with the meaſure of funding above 56 millions of three per cents, without any proviſion for their redemption; the country, ſhould the preſent deſolating war be ever ſucceeded by an interval of peace, will neither be relieved immediately from the extraordinary weight of its new burthens, nor, as it ought to have been, from the length of time in which it is to bear its old ones.

In a former period, when the miniſter began to encroach on the ſinking fund under pretence of relieving the public, he never ceaſed to repeat his encroachments with increaſing violence till he had entirely deſtroyed it. In the preſent period we have witneſſed ſimilar encroachments from ſimilar motives; and if the public expenditure ſhould proceed in the courſe which has diſtinguiſhed this war above all others for a few years longer, it is not improbable that the ſame ſpecious pretence will be urged for repeating thoſe encroachments; until at length the whole fund is alienated, and the laſt hope of the country to be ever relieved from its burthens is totally extinguiſhed.

FUND *for the Support of decayed Muſicians and their Families.* This fund, the firſt of the kind, has been the model of ſimilar eſtabliſhments abroad and at home. On the continent it has been imitated at Vienna, Gottingen, Leipſic, and Hamburg; and at home, in our theatres. Mr. Garrick, when he had quitted the ſtage, and only acted occaſionally, eſtabliſhed a fund for the ſupport of decayed actors and actreſſes; and continued to perform a capital part for its benefit, annually, to nearly the laſt year of his life. For this benefit he wrote, and ſpoke, the moſt humorous prologue, in a mock-heroic ſtyle, which his fertile pen in addreſſes to an audience ever produced. The ſame laudable kind of fund for decayed and worn out actors and their families has been eſtabliſhed at Covent Garden.

The original fund for decayed muſicians had its beginning in 1738, on a ſmall ſcale, by opening a ſubſcription among muſical profeſſors, of only half-a-crown a quarter; forming themſelves into a ſociety, electing 12 governors, to be renewed annually, and agreeing to 14 reſolutions, which are all inſerted in the appendix to the account of the Commemoration of Handel, publiſhed in 1785, 4to.

In 1739, a compact was formed with the corporation of "the Sons of the Clergy," by which the ſociety engaged to furniſh a band, ſelected from their ſubſcribing members, for the two annual performances at St. Paul's cathedral, in conſideration of the ſum of fifty pounds, which the corporation agreed to allow each year to the muſical ſociety; and this ſum has been conſtantly thrown into the fund, and appropriated to charitable purpoſes.

Beſides the caſual and fluctuating income ariſing from ſubſcriptions and benefits, the ſociety has been honoured with a few benefactions in the way of legacies, of which the following is an account:

In 1738, 100*l.* by Mr. Rojere, one of its profeſſional members.

In 1760, 50*l.* by Mr. Waldron, do.

In 1782, 50*l.* by Mr. James Mathias, an honorary ſubſcriber, with an excellent baſs voice; whoſe performance as a dilettanti at the Crown and Anchor concerts was long admired.

But the moſt conſiderable legacy which the ſociety ever received was from the admirable and benevolent Mr. Handel; who bequeathed to the eſtabliſhment 1000*l.*

From the performances at the commemoration of this great and illuſtrious muſician, whoſe works had been the chief attractions at their annual benefits, the fund received an addition to their capital from the noblemen and baronets who planned and directed this extraordinary celebration, 6000*l.*

At their annual benefits, the principal profeſſional ſubſcribers to the charity, who are not employed in the orcheſtra, are appointed to attend at the ſeveral doors and offices of the theatre; the whole buſineſs being tranſacted by themſelves, as ordered and regulated by a committee for the concert, or whatever the perfomance may be; and it ſeems as if no charitable inſtitution could be more out of the reach of abuſe, embezzlement, or partiality; regulated with more care, integrity, and economy; or have its income ſo immediately derived from the activity and talents of its own members.

Except a ſmall ſalary to the ſecretary, and another to the collector, there is no lucrative employment belonging to the inſtitution: ſo that the whole produce of benefits and ſubſcriptions is nett, and clear of all deduction or drawback.

Though the firſt ſubſcription from profeſſional members was only half-a-crown a quarter, in 1766 the ſum of 20 ſhillings per annum was required of all new members, inſtead of ten. And the old members then agreed, almoſt unanimouſly, to pay the ſame ſum. Since that period, the annual demand on the profeſſional ſubſcribers has been ſettled at one pound two ſhillings, and the benefit tickets have the ſame price as at the Commemoration; that is to ſay, a guinea each, ſo that the ſubſcription of honorary members has been doubled.

Mr. Michael Chriſtian Feſting, and doctor Maurice Green, took the lead at the time of inſtituting this ſociety, and for twelve or fourteen years afterwards. Since their deceaſe, other muſicians, who were high in the profeſſion, and of whoſe probity and honour their brethren had a good opinion, were placed alternately in the chair, and now, by the

the great acceſſion to the fund from the profits of the ever memorable Commemoration, its capital becomes a ſerious and weighty concern, amounting to upwards of 22,000 *l.* in South-ſea annuities and three per cents, which realizes and aſcertains an income of 678 *l.* a year, excluſive of benefits or ſubſcriptions.

The path therefore which the governors and court of aſſiſtants have now to purſue is perfectly plain and pleaſant. The power of alleviating diſtreſs and miſery, of feeding the hungry, cloathing the naked, and adminiſtering comfort to age and infirmities, is placed in their hands without the trouble of providing the means.

FUNDAMENT, the anus or aperture through which an animal voids his excrements.

FUNDAMENTAL, ſomething that ſerves as a baſe, reſt, ſupport, or foundation, for any thing.

The apoſtles creed contains the fundamental points of religion. The Salic law is the fundamental law of the polity of France.

FUNDAMENTAL, in *Muſic*, denotes the principal note of a ſong or compoſition, to which all the reſt are in ſome meaſure adapted, and by which they are ſwayed; called alſo the *key* of the ſong.

FUNDAMENTAL *Baſs*. See BASSE *Fondamentale*, and FONDAMENTALE.

FUNDAMENTAL *Concords* are of three kinds; *viz.* the perfect concord, the concord of the ſixth, and the concord of the ſeventh. The firſt or perfect concord is greater or leſs, according as the third is greater or leſs. The ſecond is of three ſorts: in the two firſt ſorts the ſixth is always greater, and the third greater or leſs, as the mode is greater or leſs. Theſe two concords differ only by their third. Between theſe two there is another concord, which on many occaſions produces a very good effect, and is particularly uſed by the Italians; whence it is called the concord of the ſuperfluous ſixth, or of the Italian ſixth. It is compoſed of a greater third, or ſuperfluous fourth, or tritone, and a greater third, as *fa la ſi rè* ※. There are ſeveral kinds of the fundamental ſeventh: the firſt is formed of a greater third, and two leſſer thirds, as *ſol ſi rè fa*; the ſecond is formed of a leſſer third, a greater third, and a leſſer third, as *re fa la ut*; the third is formed of two leſſer thirds, and a greater third, as *ſi rè fa la*; the fourth is formed of one greater third, one leſſer, and one greater, as *ut mi ſol ſi*; the fifth is called the concord of the diminiſhed ſeventh, and formed of three leſſer thirds, *ſo* ※ *ſi rè fa*. See CONCORD.

FUNDAMENTAL *Rock*, in *Geology*, (or baſis,) is a term uſed by Mr. Kirwan, and by many of the German geologiſts, for the baſis or ſolid nucleus of the earth, on which the ſuperficial ſtrata have been depoſited. This fundamental rock is ſaid to be granite, but we much doubt the truth of this poſition, except ſo far as it may abound in the lower part of the ſeries of ſtrata viſible on the ſurface; becauſe an immenſe maſs of matter, much heavier than granite, is neceſſary, in the central parts of the earth, to account for the ſpecific gravity (4.4 to 5.4) which modern and concurrent experiments have ſhewn to belong to the terraqueous globe. See EARTH and GRAVITY.

FUNDAMENTO, in the *Italian Muſic*, is in general every part that plays or ſings the baſs; but the thorough-baſs is more particularly ſo called, becauſe it is the baſis or foundation of all harmony.

FUNDAON, in *Geography*, a town of Portugal, in the province of Beira; 22 miles W. of Alfayates.

FUNDI. See FONDI.

FUNDO, a town of European Turkey, in Moldavia; 44 miles W.N.W. of Birlat.

FUNDUCLÆ, an Ægyptian coin, a ſort of ſequin, of the value of a hundred and forty-ſix medines. Pococke's Egypt, p. 175.

FUNDULUS, in *Zoology*, a name uſed by many for the ſmall fiſh, called by others *cobitis barbatula*, and by the generality of people in England the *loach*.

FUNDULUS is uſed alſo by Schoneveldt, and ſome others, to expreſs the common gudgeon, or CYPRINUS *gobio*.

FUNDY, in *Geography*, a large bay in North America, which opens between the iſlands in Penobſcot bay, in the county of Lincoln and ſtate of Maine, and Cape Sable, the ſouth-weſtern point of Nova Scotia. It extends about 200 miles in a N.E. direction; and with Verte bay, which projects into the land in a S.W. direction from the ſtraits of Northumberland, forms a very narrow iſthmus, uniting Nova-Scotia to the continent, where the diviſion line runs between that province and New Brunſwick. From its mouth up to Paſſamaquoddy bay, on its N.W. ſide, ſituated between the province of New Brunſwick and the diſtrict of Maine, are a number of bays and iſlands on both ſides, and thus far it contracts its breadth gradually. It is 12 leagues acroſs from St. John's in New Brunſwick to the gut of Annapolis, in Nova Scotia, where the tides are rapid, and riſe 30 feet. Above this it preſerves nearly an equal breadth, until its waters are formed into two arms by a peninſula, the weſtern point of which is called Cape Chigneeto. At the head of the north-eaſtern arm, called Chigneeto channel, which forms with bay Verte the iſthmus, the tides riſe 40 feet. Theſe tides are ſo rapid as to overtake animals feeding on the ſhore.

FUNEN, or FYEN, an iſland of Denmark, at the entrance of the Baltic, nearly of an oval form, extending from N. to S. about 35 miles, and from E. to W. about 30; it is a fertile and pleaſant iſland, in which many of the Daniſh nobility have ſeats. The ſoil yields great crops of corn, ſo that nearly 10,000 barrels are exported annually to Norway and Sweden, excluſively of the home-conſumption. The inhabitants keep large ſtocks of bees, and with the honey they make mead, which forms a conſiderable article of trade. In this iſland are ſeveral lakes and rivers abounding in fiſh, but none of them are navigable: great quantities of cod, herring, turbot, and other fiſh are caught in the bays along the coaſt. The capital is Odenſee. N. lat. 55° 7′ to 55° 36′. E. long. 9° 40′ to 10° 50′.

FUNERAL, the ceremonies performed at an interment; or the laſt offices paid to the deceaſed. See BURIAL.

The word is formed of the Latin *funus*; and that of *funalia*, on account of the torches (which were *funes, cera circumdati*) uſed in the funerals of the Romans; though others derive *funus* from the Greek φονος, *death* or *ſlaughter*.

The firſt perſons who ſeem to have paid any particular reſpect to their dead were the Egyptians, who erected monuments for tranſmitting the remembrance of their virtues to future ages. See PYRAMID.

Whenever a perſon died among the Egyptians, his parents and friends put on mournful habits, and abſtained from all banquets and entertainments. This mourning laſted from forty to ſeventy days, during which time they embalmed the body. See EMBALMING.

When this ceremony was finiſhed, the embalmed body was reſtored to the parents, who placed it in a kind of open cheſt, which was preſerved either in their houſes, or in the ſepulchres of their anceſtors. Before the dead were allowed to be depoſited in the tomb, they underwent a ſolemn judgment, which extended even to their kings; and if the iſſue of the judgment proved unfavourable, they were deprived of the rights of burial; and this cuſtom ſeems

to have been practiſed among the Iſraelites; for we read that their wicked kings were not interred in the ſepulchres of their anceſtors.

The funeral rites among the ancient Romans were very numerous. The deceaſed was kept ſeven days; and every day waſhed with hot water, and ſometimes with oil, that, in caſe he were only in a ſlumber, he might be thus waked; and every now and then his friends meeting, made a horrible outcry or ſhout, with the ſame view; which laſt action they called *conclamatio*.

The third conclamation was on the ſeventh day; when, if no ſigns of life appeared, the defunct was dreſſed and embalmed by the pollinctories: placed in a bed near the door, with his face and heels towards the ſtreet; and the outſide of the gate, if the deceaſed were of condition, was garniſhed with cypreſs boughs.

In the courſe of theſe ſeven days an altar was raiſed near his bed-ſide, called *acerra*; on which his friends every day offered incenſe; and the libitinarii provided things for the funeral.

On the ſeventh day a crier was ſent about the city to invite the people to the ſolemnization of the funeral in theſe words: "Exequias L. Tit. L. filii, quibus eſt commodum ire, jam tempus eſt. Ollus (i. e. ille) ex ædibus effertur."

The people being aſſembled, the laſt conclamation ended, and the bed was covered with purple; a trumpeter marched forth, followed by old women, called *præficæ*, ſinging ſongs in praiſe of the deceaſed; and laſtly, the bed followed, borne by the next relations. And if the perſon were of quality and office, the waxen images of all his predeceſſors were carried before him on poles.

The bed was followed by his children, kindred, &c. *atrati*, or in mourning: from which act of following the corpſe, theſe funeral rites were called *exequiæ*.

The body thus brought to the roſtra, the next of kin *laudabat defunctum pro roſtris*, made a funeral oration in his praiſe, and that of his anceſtors.

This done, the body was carried to the *pyra*, or funeral pile, and there burnt: his friends firſt cutting off a finger, to be buried with a ſecond ſolemnity.

The body conſumed, the aſhes were gathered: and the prieſt ſprinkling the company thrice with clean water, the eldeſt of the *præficæ* crying aloud, *ilicet*, diſmiſſed the people, who took their leave of the deceaſed in this form, "Vale, vale, vale: nos te ordine quo natura premiſerit, ſequemur."

The aſhes, incloſed in an urn, were laid in the ſepulchre, or tomb. The firſt Romans did not burn their dead, but interred them as we do. Pliny, lib. vii. cap. 54. aſſures us, that the cuſtom of burning was not introduced till after they had learnt that their enemies dug up, and expoſed, the bodies of their ſoldiers buried in remote countries. And yet Plutarch, in his life of Numa, obſerves that Numa was buried; as having expreſsly forbade them, by his teſtament, to burn: this ſhews that the Romans had practiſed burning before his time.

This cuſtom of burning the dead, ſo religiouſly obſerved by the Greeks and Romans, was held in abhorrence by ſeveral other nations.

Herodotus relates, that the Perſians deteſted it, as holding fire to be a god. The Egyptians declined to burn their dead, as taking fire for an inanimate beaſt, and judging it impiety to commit the bodies of the deceaſed to be devoured by beaſts. The cuſtom of burning among the Romans ceaſed under the empire of the Antonines. See BURNING and MOURNING.

In the Romiſh church, when a perſon is dead, they waſh the body, and put a crucifix in its hand. At its feet ſtands a veſſel of holy water, that they who come in may ſprinkle both themſelves and the deceaſed. In the mean time ſome prieſt ſtands by the corpſe, and prays for the deceaſed till it is laid in the earth. In the funeral proceſſion the exorciſt walks firſt, carrying the holy water, next the croſs-bearer, afterwards the reſt of the clergy, and laſt of all the officiating prieſt. They ſing the *miſerere*, and ſome of the Pſalms; and at the end of each Pſalm, a *requiem*. We learn from Alet's ritual, that the faces of deceaſed laymen muſt be turned towards the altar when they are placed in the church; and thoſe of the clergy towards the people. The corpſe is placed in the church, ſurrounded with lighted tapers; after the office for the dead maſs is ſaid; then the officiating prieſt ſprinkles the corpſe thrice with holy water, and as often throws incenſe on it. The body being laid in the grave, the friends and relations ſprinkle the grave with holy water.

FUNERAL *Charges* are not allowable againſt a creditor, except for the coffin, ringing the bell, parſon, clerk, and bearers fees, but not for the pall and ornaments. See DEBT and EXECUTOR.

FUNERAL *Column*. See *Funeral* COLUMN.

FUNERAL *Games*, *ludi funebres*, were a part of the ceremony of the ancient funerals.

They conſiſted chiefly in proceſſions, and ſometimes in mortal combats of gladiators around the funeral pile.

The cuſtom was very ancient, though it had not always been the ſame. At firſt they cut the throats of a number of captives before the pyra, as victims to appeaſe the manes of the deceaſed. This Achilles does in Homer, Iliad ϕ, at the funeral of Patroclus; and Æneas, in Virgil, lib. ix. at that of Pallas, ſon of Evander. Cæſar, in his Commentaries, lib. viii. relates, that the Gauls alſo did the like.

But at length it appeared barbarous thus to butcher man; and therefore to ſave the horror of the ſpectacle, yet without the dead's loſing any thing thereby, they made the poor captives fight and kill one another, only ſaving ſome few of ſuch as came off victors.

This cuſtom was borrowed from the Greeks by the Romans; among whom the cruel diverſion was called *munus*.

The firſt who introduced it at Rome was Junius Brutus, at the obſequies of his father; or, according to others, Ap. Claudius, and M. Fulvius, during their conſulate.

The like horrible combats were alſo occaſionally exhibited by the magiſtrates; and ſometimes they were added to the theatrical pieces.

The emperor Claudius decreed, that whereas theſe accurſed games were till then frequent and arbitrary; it ſhould be the practice, for the future, only to perform them regularly every year at the expence of the ſtate; and that the ædiles ſhould have the care and direction thereof. But he conceived a horror for them himſelf, and ſoon after aboliſhed them; though it was ſtill allowed particular perſons to have them, provided they were worth forty thouſand ſeſterces per annum. They were not finally aboliſhed before the time of Theodoric king of the Goths, at the end of the fifth century.

FUNERAL *Honours*. See HONOURS.

FUNERAL, *Military*, is uſually attended with many ſolemnities, ſuch as cannot fail to prove deeply impreſſive on the minds of the ſpectators, and to evince the reſpect in which the deceaſed was held. The funeral of an officer high in rank generally forms an extenſive proceſſion of horſe and foot;

ſoot; on ſuch occaſions the garriſons, or detachments they commanded, parade, and a portion, deſignated the "funeral party," precede the corpſe in open order, with their arms reverſed, the drums muffled, and the band playing the dead march, or ſome ſolemn airs, ſuited to the occaſion. The officers, in lieu of leading, follow their ſeveral diviſions; all wearing crapes both on the left arm and on their ſwords: the ſenior corps and the ſenior officers being reſpectively neareſt the corpſe. The pall is ſupported by officers of equal, or of ſuperior rank to the deceaſed, whoſe ſword and ſaſh are laid on the lid of the coffin. In many inſtances the union colours of the regiment are borne as a pall, being previouſly diſengaged from the ſtaff. The chief mourners, among whom are commonly the officer on whom the command devolves, together with the ſtaff of the deceaſed, and of the ſtation, &c. follow the corpſe, and the whole uſually paſs through a lane formed by the ſeveral regiments wearing their ſide arms, which, as ſoon as they have proceeded, cloſe and follow in order. On arriving near the place of interment, the lane is again formed, and the funeral party open to the right and left, reſting on their arms reverſed in a ſorrowful poſition. The corpſe and mourners having moved beyond them, they again form and follow to the grave, near which, during the ſervice, they remain at ordered, or reverſed, arms, and conclude the ceremony by firing three vollies over the corpſe, as the earth is filling over it. During the whole time the colours of the fortreſs are lowered to half-maſt high, and minute guns are fired, correſponding in number with the years of the deceaſed.

To officers of inferior rank proportionate honours are paid; thoſe who commanded regiments being fired over by their flank companies, and attended by the reſidue as mourners. Captains are uſually attended by their own companies as funeral parties, and by a proportion of others as mourners: ſubalterns by ſmall parties to fire over, and the reſidue of the company as mourners. Even a private ſoldier has a funeral party of a ſerjeant, a corporal, and twelve men; and if his conduct while living gave ſatisfaction, moſt of the company will be ſeen to attend. On ſome occaſions, non-commiſſioned officers and privates have been ſo highly eſteemed as occaſion their mournful followers to be very numerous.

Naval funerals depend much on circumſtances: where they take place in any friendly port, the corpſe is generally ſent aſhore to be interred according to the forms above deſcribed, the marines furniſhing the funeral party, and a ſuitable number of officers attending to bear the pall, together with ſeamen to bear the coffin, and to follow as mourners. When an officer of high rank is to be interred, the enſign of the ſhip, and the flag of the deceaſed, are lowered half way down their reſpective ſtaves; the barge conveying the corpſe is hung with black, and the rowers wear crapes, &c. The band, which in theſe, as well as in military funerals, has its inſtruments furniſhed with black ribbon, the drums being muffled and covered with black crape, perform ſolemn muſic. All the ſhips in port lower their colours to half maſt, and the ſhip from which the corpſe proceeds to the ſhore, in particular, fires minute guns.

At ſea, and in an enemy's harbour, ſuch a mode of interment cannot take place, therefore the body, if not preſerved for the purpoſe of being buried aſhore, muſt be ſewed up in a hammock, which may again be caſed either in black woollen, &c. or in a wooden ſhell; being duly laden with ſhot, or any ponderous ſubſtance, it is laid upon a grating taken from one of the hatchways, and laid upon the lee-gunnel. There the uſual ſervice is performed by the chaplain, or, for want of one, by ſome officer, and the corpſe is launched into the deep. It is ſometimes the practice to fit out the ſhip's barge, or her long-boat, &c. on ſuch occaſions, and to cauſe the body to be rowed from ſhip to ſhip, receiving from each ſome token of reſpect, ſuch as manning the rigging in ſilence, lowering the colours to half maſt, performing ſolemn muſic, and occaſionally by firing a certain number of guns. The ſervice is concluded in the boat bearing the corpſe, which is then conſigned to the deep.

It is not eaſy to deſcribe the decorum which prevails on theſe occaſions, nor to give an adequate idea of the impreſſion made on a very large portion of any crew loſing an agreeable companion. His conſignment to "Davy Jones's Locker," as it is technically called, produces much affliction among thoſe who were his immediate meſſmates, who eye his ſpoon, which often becomes a ſacred relic, as it remains unuſed in the common bracket, with far more emotion than, from a ſuperficial acquaintance with the naval character, one ſhould expect to witneſs. The abſence of a fellow-ſeaman, who, according to the common phraſe, has "ſtuck up his ſpoon," cannot be unnoticed; every thing calls the loſt aſſociate back to the memory, in which his good qualities are ſure to be indelibly recorded!

FUNERAL *Oration*, or *Sermon*, a diſcourſe pronounced in praiſe of a perſon deceaſed, at the ceremony of his funeral.

The cuſtom of making funeral orations is very ancient. The Romans had it of a long ſtanding; and it was always one of the neareſt relations that made the harangue. Auguſtus did the office to his grandmother Julia, when only twelve years of age. Suet. Aug. cap. 8. And we have divers parallel inſtances.

The cuſtom ſeems to have begun with the republic; at leaſt, the firſt funeral oration we read of was that of Brutus, who expelled the kings, and was the firſt conſul; who having been killed in a battle againſt the Etrurians, *laudabatur pro roſtris*, was praiſed in the forum by Valerius Publicola his colleague.

Indeed, ſome authors will have the practice more ancient. They maintain it to have been in uſe among the Greeks; and that Solon, who, according to Aulus Gellius, gave laws to the Athenians, in the time when the elder Tarquin reigned in Rome, was the firſt author thereof; ſomething like which, it ſeems, the orator Anaximenes has left in writing. See Polydore Virgil De Invent. Rer. lib. iii. cap. 10. See DEMONSTRATIVE.

FUNES, in *Geography*, a town of South America, in the province of Popayan; 15 miles S. of Paſto.

FUNFKIRCEN, or *Five Churches*, a town of Hungary, ſituated in a fertile ſoil between the Drave and the Danube, the ſee of a biſhop. An univerſity was founded in this place by Louis I., and it had at one time 2000 ſtudents; but when the Turks obtained poſſeſſion of the town, the univerſity declined, and it has never ſince recovered. The number of its inhabitants is about 12,000; 110 miles W. of Belgrade. N. lat. 46° 6′. E. long. 18 9′.

FUNGENO, or FUNGANDO, a kingdom of Africa, ſituated between the Zaire and the Coanza, ſubject to Anziko.

FUNGI, in *Botany*, a Natural Order of Plants, the fourth of the claſs *Cryptogamia*, as originally eſtabliſhed by Linnæus, is reckoned among the *Acotyledones* by Juſſieu. This order includes all thoſe productions commonly known by the name of Muſhrooms, as well as a numerous tribe of ſimilar vegetable bodies, differing in firmneſs from a watery pulp of very ſhort duration, to a leathery or even woody texture, often very permanent. They cannot properly be ſaid to have any herbage, much leſs any thing like leaves or flowers in appearance, however their different parts may perform

perform functions analogous to what are proper to ſuch organs. Acharius, like many of his predeceſſors, reckons them deſtitute of ſexual organs, or any thing analogous to *ſtamina* and *piſtilla*; but this opinion is altogether theoretical, like the aſſertion of Juſſieu, which denies them cotyledons. Neither has been proved, nor is either of any practical uſe, for the purpoſes of ſyſtematical arrangement. Some have thought *Fungi* to be of an animal nature, becauſe of their fœtid ſcent in decay, and becauſe they are occaſionally the habitations of inſects, which were ſuppoſed to form them as polypes do corals, an idea ſcarce worthy of refutation. The ſuppoſition maintained by ſome, of their originating from the tranſmuted ſap of corrupted wood, is equally futile. They are in fact as diſtinct in genus and ſpecies as any other vegetables, and propagate themſelves as regularly, though, like other plants, ſubject to varieties.

Dryander, Schæffer, and Hedwig, have aſſerted their vegetable nature, and in many inſtances demonſtrated their ſeeds; in ſome caſes their organs of impregnation have been, with great probability, pointed out.

The chief writers on *Fungi* are Schæffer, Batarra, Bulliard, Sowerby, Schrader, Tode, and Perſoon, the latter being the beſt ſyſtematic author in this department. He divides them into two principal ſections. 1. *Angiocarpi*, bearing their ſeeds internally, like the *Lycoperdon*, or Puffball; and 2. *Gymnocarpi*, whoſe ſeeds are imbedded in an appropriate, dilated, expoſed membrane, called *hymenium*, of which the common eatable muſhroom, *Agaricus pratenſis*, is an example. In this genus, *Agaricus*, the *hymenium* conſiſts of parallel plates, termed gills.

Fungi *eſculenti*. See Phallus.

FUNGIFER Lapis, the *muſhroom-bearing ſtone*, a name given by authors to a coarſe ſtone found in Italy, and many other places, lying near the ſurface of the earth, which they ſay will at any time produce muſhrooms, on being moiſtened with warm water.

FUNGITÆ, in *Natural Hiſtory*, a name given by authors to a ſpecies of ſea-coral, often found adhering to ſea-ſhells, or to the larger corals in its recent ſtate, and very often found alſo foſſile, or buried at great depths in the earth; they are uſually immerged in ſtone, and ſometimes in clay. The more frequent of theſe are of a conic ſhape; ſometimes they are flatted and diſcoid, and uſually ſtriated longitudinally; they ſometimes are found in their foſſil ſtate adhering to ſhells or corals, but more uſually ſeparate. To this, and ſome other bodies of this kind, Mr. Lloyd has given the name *columella*; to one of them, that of *branchiale*, from its reſembling the gills of a fiſh; and to another, that of *undulago*, from its undulated figure. Mr. William Martin, (Outlines, &c. p. 83.) a late writer, who ſeems to have ſtudied the ſubject of extraneous foſſils or reliquia, as he calls them, with the beſt effect, conſiders the exiſtence of petrified fungi as extremely doubtful, and refers ſuch ſpecimens as he has examined to the claſs of coralline bodies, to which they ſeem evidently to belong.

FUNGITES, a ſpecies of *Madrepora*; which ſee.

FUNGOIDASTER. See Hevella.

FUNGOIDES. See Agaricus, Clavaria, Helvella, and Peziza.

FUNGOUS Flesh, is a ſpongeous excreſcence, or (as we popularly call it) *proud fleſh*, frequently growing on the lips of wounds, ulcers, &c. See Fungus.

Fungous *Tumours*. See Tumours.

FUNGUS, in *Mineralogy*, a name given by Dr. Liſter to a blackiſh bituminous ſubſtance, found in ſome of the mines of Derbyſhire. It adheres to the ſides of the fiſſures of rocks, and lies in ſeams of the ſtrata. It is of a blackiſh colour, and fatty ſubſtance, which never dries in the air, but always remains as moiſt as when taken out of the mine. Some maſſes of it are ſoft and like a jelly, others are hard and firm, and in theſe there are ſeveral lumps of pure bitumen in many parts. This is inflammable like reſin. It is light, but breaks finer, and ſhines like good aloes when freſh broken, but that it is a little darker coloured, and has ſome tinge of purple in it. In ſome pieces the purple is wanting, and there is a green in the place of it. On being diſtilled, it yields firſt a limpid and inſipid water, then a whitiſh water of a ſharp taſte, and finally a yellow and clear oil, much reſembling oil of amber, but the proceſs affords no volatile ſalt in the neck of the receiver, in which it differs from amber when treated in the ſame manner. Phil. Tranſ. N° 6.

Fungus, in *Natural Hiſtory*. See Fungi, Madrepora, and Mushroom.

Fungus, in *Surgery*, ſignifies a ſpongy excreſcence, which is generally compoſed of large, high, flabby, ſometimes firm, granulations, and is apt to bleed from ſlight cauſes, being attended with various degrees of pain in different caſes and under different circumſtances. As the diſeaſe conſiſts of an organized, vaſcular ſubſtance, it is commonly its nature to continue to become larger and larger, unleſs its growth be ſtopped by ſome deciſive method of treatment on the part of the ſurgeon. It is almoſt impoſſible for us to give the reader an adequate idea of the miſery and dreadful ſufferings which certain fungous diſeaſes bring upon mankind. Some of theſe excreſcences, it is true, are only attended with ſlight inconvenience and occaſional pain; but many others, beſides being at all times horridly painful, reduce the unhappy patient to the extreme ſtate of debility, partly by producing repeated hemorrhages, and partly by occaſioning loſs of reſt, fever, &c. Some fungous diſeaſes aſſume a malignant character, becoming cancerous, or, (if poſſible) worſe than a cancer, ſo that ſhould they be too extenſive for extirpation, the conſequences muſt be fatal.

In the article Dura Mater, *Tumours of*, we have deſcribed one ſpecies of fungus which grows from the dura mater, makes its way outward by producing an abſorption of the tables of the ſkull, lifts up the ſcalp, and, at length, ulcerates the ſkin ſo as to protrude at ſome part of the head, quite free from every kind of covering. Such ſwellings have ſometimes been ſucceſsfully deſtroyed; but, too frequently, they affect the brain underneath and prove fatal. The reader, however, is referred for an account of this ſubject to the above-mentioned article.

A milder and leſs alarming form of fungus is ſeen in ſuch excreſcences as the ficus, condyloma, &c. which frequently occur about the anus, perinæum, and pudenda. The manner of curing theſe diſeaſes we have deſcribed under the head of Excrescence.

Fungous excreſcences are not confined to any particular parts or ſtructures; they may originate in almoſt any ſituation in the body. However, there are certain circumſtances which are particularly often attended with the appearance of a fungus. When a ſurgeon, in removing an encyſted tumour, leaves a portion of the cyſt behind, a fungus is very apt to grow from the ſurface of this latter part, and prove a great deal more troubleſome than the previous ſwelling. After the operation of removing a cancerous eye, a malignant fungus often ariſes from the bottom of the orbit, increaſes notwithſtanding the moſt able interference of the ſurgeon, affects the brain, and deſtroys the patient. After cutting out a circular piece of the ſkull with a trephine, and expoſing the dura mater, it ſometimes

happens

happens that a dangerous fungus ſhoots up from the outer ſurface of the latter membrane. Whenever there is a diſeaſed or exfoliating portion of bone under any ſore, fungous granulations are particularly prone to appear, and, in this inſtance, the cure depends on the ſeparation of the morbid part underneath. When a ſurgeon ventures to cut away any tumour, which is growing cloſely connected with a tendinous expanſion, he ſhould be on his guard againſt the production of a fungus. This remark ſhould be remembered, after taking away ganglions with a cutting inſtrument. After operations for cancerous diſeaſes, the appearance of a fungus is the principal uneaſineſs of every well-informed practitioner, who, in beholding the high, luxuriant, ſpongy granulations, recognizes the recurrence of the fatal diſtemper.

Before entering into the conſideration of ſeveral important fungous diſeaſes, which form the chief ſubject of the preſent article, we have to remark, that the treatment of a fungus, whatever be the ſpecies, generally conſiſts in attempting to extirpate it. For the moſt part, the ſooner ſuch endeavour is made, the more likely it is to ſucceed, and the leſs formidable is the operation. The extirpation is effected ſometimes with a cutting inſtrument, ſometimes with cauſtic, ſometimes with a ligature. In former times, the actual cautery was much employed for this purpoſe, and it appears to be not altogether abandoned in France even in our own times; but, by the general conſent of all reſpectable practitioners, hot irons have long been diſuſed in the practice of ſurgery in England.

Fungus of the Antrum.—Anatomy teaches us, that the antrum is a conſiderable cavity, ſituated in the upper jaw-bone, between the lower part of the orbit and the roof of the mouth, having an aperture, by which it communicates with the inſide of the noſe, and being lined with a production of the Schneiderian membrane.

Fungous diſeaſes of the antrum are amongſt the moſt terrible to which human nature is ſubject. The dreadful ſufferings and extenſive miſchief which a tumour of this deſcription may induce, have been excellently depicted in the following narrative. M. T. David, fifty years of age, experienced for two years a degree of violent pain, which he referred to the two large molar teeth of the right ſide of the upper jaw. Theſe teeth were extracted in the month of September, 1790, without any relief being obtained. Towards the end of February, 1791, the cheek of the ſame ſide was affected with ſwelling and pain. A ſhort time afterwards, a ſoft ſmall eminence appeared above the tuberoſity of the cheek-bone, and, as it increaſed rapidly, the patient was determined to try to get into the Hôtel-Dieu on the 30th of the following April. At this period the whole cheek was ſwelled, red, and painful; the tumour on the cheek-bone was about two inches in diameter, and, by projecting into the orbit, had puſhed the globe of the eye upwards and backwards. A portion of the fungus filled up the right noſtril, puſhed the ſeptum naſi to one ſide, and protruded to the extent of half an inch from the anterior opening. That part of the alveolar proceſs, from which the teeth had been extracted, being depreſſed below the level of the remaining teeth, rendered maſtication extremely difficult. From the weakneſs and advanced age of the patient little hope of a cure was entertained. With a view of palliating the pain in the cheek, compreſſes, moiſtened with the lotio aquæ lithargyri acetati, were applied.

During the firſt fortnight, the ſwelling over the cheek-bone only underwent a trivial augmentation; but the fungus increaſed with great rapidity. It extended towards the back part of the noſtrils, depreſſed the arch of the palate, and deformed the noſe ſo much, that it could ſcarcely be diſtinguiſhed from the cheek. The pains became more and more aggravated, and, at laſt, deprived the patient of her ſleep. Toward the end of the firſt month, that portion of the fungus which had paſſed out of the right noſtril returned into the noſe. The tumour alſo, which projected into the mouth, partly diſappeared; but the ſwelling on the tuberoſity of the cheek-bone conſiderably increaſed. The eye-ball ſoon became entirely concealed in the orbit; the ſkin of the cheek became gradually thin, and, at length, burſt by a ſmall opening ſituated under the great angle of the orbit. From this orifice a great quantity of reddiſh ſanies was diſcharged. A fortnight afterwards, an ulceration took place at the top of this tumour, and gave vent to a putrid and very irritating ſanies. The pains now extended towards the ear, from which flowed a quantity of fœtid, blackiſh pus. The ulcer produced a deep excavation in the cheek, which, in leſs than ten days, was entirely deſtroyed. A colliquative diarrhœa now came on, and the patient died in a ſtate of maraſmus on the 4th of July, ten weeks after her admiſſion, and three years from the commencement of her complaint. On diſſection, the muſcles of the right ſide of her face were found reduced to a thick yellow cellular maſs. The pterygoid, maſſeter, and temporal muſcles were in part deſtroyed, as it is ſaid, by the corroſive action of the ſanious diſcharge, which even made an impreſſion on the finger. The ligaments which connected the lower jaw to the temporal bone were deſtroyed, and the pus paſſed through an opening from this articulation into the meatus auditorius externus. The right portion of the palatine arch, and three-fourths of the poſterior alveolar proceſs, were of the conſiſtence of cartilage. The external part of the orbit was deſtroyed by the fungus. The apophyſis of the maxillary bone was diſlocated, and, in part, deſtroyed. The articulation of the cheek-bone with the temporal bone was ſo nearly annihilated, that there only remained a connection by means of a thin lamina, in which were ſeveral openings. The right partition of the naſal foſſa was deſtroyed, and the antrum formed with the noſe one large cavity. See Deſault's Pariſian Chirurgical Journal, vol. ii.

Such is the dreadful progreſs of fungous tumours of the antrum, when left to themſelves, and unreſiſted by the ſalutary and timely interference of ſurgery. One ſingle example, indeed, is inſufficient for conveying a full idea of the ravages which may be occaſioned by the increaſe of the fungus and its preſſure on the ſurrounding parts. In ſome caſes, the ſwelling prevents the tears from paſſing down into the noſe, raiſes the lower part of the orbit, cauſes a protruſion of the eye, occaſions an irremediable loſs of ſight, makes the grinding teeth fall out, obliterates the neighbouring noſtril, and produces an expanſion and a partial abſorption of the bony parietes of the antrum itſelf. The ſufferings of a patient afflicted in this manner baffle deſcription. His headaches are terrible and inceſſant; he breathes with difficulty; he is deprived of his ſleep and appetite; he lingers in a miſerable ſtate of weakneſs, loathſomeneſs, deformity and pain, and dies at once an object of pity and diſguſt.

Fungi of the antrum are not diſeaſes with which we can tamper or play with impunity. They are not caſes which hold forth any chance of ſpontaneous amendment or cure. On the contrary, it is their nature to grow continually worſe, and to bring on the fatal termination which happened in the inſtance above related. Knowing theſe things, every ſurgeon who values his own profeſſional reputation, or the life

life of his patient, will immediately make up his mind to act with promptitude and deciſion. In the early period of the diſeaſe the tumour itſelf is the only thing which requires removal; but after the ſwelling has brought on the train of ravages which we have above enumerated, a cure cannot be accompliſhed in ſo eaſy a manner. We may, indeed, take away the fungus, and put a ſtop to the increaſing miſchief; yet many of the changes which have been occaſioned muſt take a long time to be rectified, and ſome of the effects, ſuch as the deſtruction of the ſight, may have become totally incurable.

The longer the diſtemper has exiſted, the more extenſive will generally be the ſurrounding miſchief, and the more likely will the fungus be to grow again. Even when this reproduction of the excreſcence does not happen, many months and years will often be required for the completion of the cure, the ſeparation of the exfoliations, the healing of ulcers and ſinuſes, and the re-eſtabliſhment of the health.

After ſtating theſe circumſtances, it becomes almoſt ſuperfluous to enjoin ſurgeons to endeavour to diſcover the diſeaſe in its infancy, and to attack it in this ſtate with powerful and effectual means.

Fungi of the antrum appear frequently to originate from the irritation of carious teeth in the upper jaw. From this cauſe, from bad colds in particular habits, from blows, or on ſome other inexplicable account, we conceive that the Schneiderian membrane which lines the cavity is inflamed, throws out coagulating lymph, and emits the deſtructive fungous excreſcence.

Now, by reaſon of the concealed ſituation of ſuch a tumour, it muſt be ſomewhat difficult to make out the nature of the affection before it has made a certain progreſs, eſpecially as the complaints are uſually regarded at firſt as common tooth-achs, or mere rheumatic pains of the face.

Hence, whenever a practitioner is conſulted for theſe caſes, he ſhould at leaſt take the trouble to aſk a few prudent queſtions; for notwithſtanding the inviſible ſituation of a fungus in the antrum, it is well known among all well-informed ſurgeons that ſuch a diſtemper ſeldom exiſts without being attended with ſome affections of the adjacent parts. It is by conſidering theſe latter complaints that we are led to ſuſpect a tumour in the antrum, and that we are ſometimes enabled to aſcertain its preſence before it has become ſo large as to occaſion much diſfigurement of the face, or any alarming degree of ſurrounding miſchief. The ſurgeon ſhould enquire whether any of the teeth have become looſe, or have ſpontaneouſly fallen out; whether the alveolar proceſs is ſound; whether there are any fungous granulations making their appearance at the ſockets of ſuch teeth as may have dropped out of, or been extracted from the upper jaw; whether there is any diſcharge of ſanies, or matter from the noſe, &c. Whenever ſuch ſymptoms prevail, there is great reaſon to ſuſpect that a fungus exiſts in the antrum, and the ſurgeon ſhould not remain inactive, till the bones of the face begin to ſwell, fungi protrude through the ſkin of the cheek, the eye is diſplaced, the ductus naſalis obſtructed, and the ſurrounding miſchief has become alarmingly extenſive.

If the patient, with any of the preceding grounds of ſuſpicion, ſhould labour under violent and long-continued pain in the ſituation of the upper jaw-bone, after having had bad teeth, a ſevere cold, or a blow on the face, the practitioner is called upon to make an opening into the antrum, for the purpoſe of being able to get at the very root of the tumour.

There are two ſituations in which the ſurgeon may effect this object. One is to make a perforation with a gimblet, or ſome ſuch inſtrument, through the ſocket of any diſeaſed grinding tooth which may happen to be ſituated under the antrum, and which of courſe muſt be in the firſt inſtance extracted. We need not dwell upon the propriety of taking out a carious tooth in theſe caſes inſtead of a ſound one. When none of the teeth are bad, which will very ſeldom happen with a fungus in the antrum, and when the ſurgeon is determined to make an opening by drawing one of the teeth, and perforating the bottom of the ſocket, his beſt plan is to extract the third or fourth grinder, reckoning from before backward.

We will not poſitively condemn the plan of making an opening into the antrum in the foregoing way. It may be right in the firſt inſtance, before the ſurgeon is certain whether the diſeaſe is a tumour or an abſceſs in that cavity; becauſe, in the latter event, the method will be likely to anſwer every purpoſe; and ſhould there be a fungus preſent, the removal of a bad tooth, and perforation of the ſocket, cannot do any harm. Indeed we may adviſe, as a general practice, that in every inſtance in which a patient ſuffers violent pain in the face, and has any carious teeth, theſe ſhould always be taken out without the leaſt delay.

Although we have not ventured to diſſuade practitioners altogether from taking this mode of making an opening into the antrum, we have no heſitation in declaring, that, in the event of there being a fungus in that cavity, ſuch an opening will not be ample enough to enable the ſurgeon to put in execution the beſt meaſures for the effectual extirpation of the tumour; he may, indeed, by means of the perforation, give vent to ſome ſanies, aſcertain that the caſe is not an abſceſs, diſturb the excreſcence with his probe, &c.; but he will not be able to attack the diſeaſe at its root, and unleſs this be done, he had better remain quiet. The only reaſons, therefore, in favour of making, in the firſt inſtance, a perforation through the alveolar proceſs, are, that the ſurgeon may learn with certainty that the caſe is not an abſceſs, and that the patient, at all events, thus gets rid of a carious tooth, which may be looked upon as a ſource of irritation and pain.

As ſoon as the ſurgeon is convinced of the exiſtence of a fungus in the antrum, he ſhould immediately decide to make ſuch a free expoſure of the excreſcence as will enable him to put in practice its effectual extirpation. Let him at once determine to imitate the immortal Deſault in deciſion and boldneſs in theſe urgent caſes, to tamper and play with which is even far more culpable and abſurd than leaving the unhappy patient to his own fate.

Deſault had a patient with a fungus, which had grown in the antrum, diſtended the parietes of that cavity, hindered the tears from paſſing down into the noſe, raiſed the lower part of the orbit, cauſed a protruſion of the eye, made two of the grinding teeth fall out, and cauſed in the anterior part of the antrum a cavity, from which a portion of the excreſcence projected. The following was the plan of treatment, which was ſucceſsfully adopted. The cheek was firſt detached from the os maxillare, by dividing the internal membrane of the mouth, at the place where it is reflected over this bone. Thus, the outer ſurface of the bone was denuded of all the ſoft parts. A ſharp, perforating inſtrument was applied to the middle of this ſurface, and an opening made more forward than the one already exiſting. The plate of bone, ſituated between the two apertures, was removed with a little falciform knife, which, being directed from behind forward, made the diviſion without difficulty. The opening, thus obtained, being inſufficient, Deſault endeavoured to enlarge it below, by ſacri-

ſcing the alveolary proceſs. This he endeavoured to accompliſh with the ſame inſtrument, but finding the reſiſtance too great, he had recourſe to a gouge and mallet. A conſiderable piece of the alveolary arch was thus detached, without any previous extraction of the correſponding teeth, three of which were removed by the ſame ſtroke. In this manner an opening was procured in the external and inferior part of the antrum, large enough to admit a walnut. Through this aperture a conſiderable part of the tumour was cut away with a knife, curved ſideways and fixed in its handle. A moſt profuſe hemorrhage took place, but Deſault, unalarmed, held a compreſs in the antrum for a ſhort time; this being removed, the actual cautery was applied repeatedly to the reſt of the fungus. The cavity was dreſſed with lint, dipped in powdered colophony.

On the eighteenth day the ſwelling was evidently diminiſhed, the eye leſs prominent, and the epiphora leſs viſible. But at this period a portion of fungus made its appearance again. This was almoſt entirely deſtroyed by applying the actual cautery twice. It appeared again, however, on the twenty-fifth day, and required a third and laſt recourſe to the cautery. From this time the progreſs of the cure went on rapidly. Inſtead of fungous excreſcences, healthy granulations were now formed in the bottom of the ſinus. The parietes of the antrum gradually approaching each other, the large opening made in the operation was obliterated, and reduced to a ſmall aperture, hardly large enough to admit a probe. Even this little opening was cloſed in the fourth month, at which time no veſtiges of the diſeaſe remained, except the loſs of teeth, and a very obvious depreſſion juſt where they were ſituated. (Œuvres Chirurgicales de Deſault, par Bichat, tom. 2.)

Some readers may deem ſome of the foregoing meaſures rude and violent. The ſtriking out of three of the teeth with a portion of the alveolar proceſs, and the employment of the actual cautery, are undoubtedly very rough proceedings, and cannot be expected to receive the approbation of many ſurgeons in this country. Nor will we abſolutely declare in favour of theſe methods, much as we are convinced of the neceſſity of having recourſe to powerful means, and greatly as we admire the boldneſs and deciſion which guided the hand of Deſault. We conſider the uſe of the perforator and falciform knife, however, deſerving of recommendation. In ſome inſtances a ſmall trephine might be uſed for making an opening into the antrum. Even the removal of a part of the alveolar arch muſt be effected if the root of the excreſcence cannot otherwiſe be reached. Perhaps one of the ſaws, deſcribed and engraved in Mr. Hey's Practical Obſervations in Surgery, might be the beſt inſtrument for accompliſhing this object; but rather than that the purpoſe ſhould not be fulfilled, if a ſufficient expoſure of the fungus cannot otherwiſe be obtained, we conſider even Deſault's plan indiſpenſably proper, on account of the terrible and fatal miſchief which muſt inevitably follow the continuance of the diſeaſe. With regard to the employment of the actual cautery, ſurgeons may eaſily avoid the diſagreeable duty of applying hot irons, by uſing, inſtead of ſuch barbarous implements, the kali purum, with or without the calx viva. After cutting away as much of the fungus as poſſible, the ſurface from which its root aroſe ſhould be freely rubbed with the cauſtic, ſo as to obviate the danger of the excreſcence growing again. If, however, any fungous granulations ſhould re-appear, the ſurgeon muſt take care to extirpate them immediately with the knife and cauſtic. In all probability ſuch ſteps will kill a portion of the bone; but who would not rather ſubmit to the tedioufneſs of an exfoliation than to the re-production of a terrible diſeaſe, which is equally loathſome, deforming, and painful, holds forth no chance of ſpontaneous amendment, and tends to a ſhocking ſpecies of death?

Fungus Cerebri, or Hernia of the Brain.—This is a totally different diſeaſe from the excreſcences which ſometimes grow from the dura mater, and make their way outward by producing an abſorption of the ſuperincumbent part of the ſkull, and an ulceration of the integuments of the head. Such fungi, for the moſt part, begin while the cranium is entire, and the deſtruction of the bone is a conſequence of the increaſe of the ſubjacent ſwelling. On the other hand, the fungus, or hernia cerebri, follows a removal or deſtruction of a piece of the ſkull, and conſequently, when the diſeaſe occurs, it is almoſt always after the operation of trepanning, though, if Mr. Charles Bell's account be accurate, the ſame kind of tumour may alſo be a conſequence of a venereal caries of the cranium.

Mr. Abernethy has publiſhed an intereſting caſe, and offered the following theory of the formation of the diſeaſe: "In conſequence of the brain being injured to ſome depth beneath the ſurface, diſeaſe of the veſſels, and conſequent effuſion of blood had enſued. The effuſion was, for a time, reſtrained by the ſuperincumbent brain and its membranes; but theſe gradually yielding to the expanſive force exerted from within, and at laſt giving way altogether, the fluid blood oozed out, and congealed upon the ſurface of the tumour." Hence Mr. Abernethy appears to ſuppoſe that the excreſcence is compoſed of a mere maſs of congealed blood, and the rapidity with which the ſwelling aroſe in the caſe which he diſſected made him think that there was not time enough for any organized vaſcular ſubſtance to be formed.

However, we cannot help ſuſpecting that the fungus cerebri is vaſcular, like other tumours, and when Mr. Abernethy mentions, in the relation of the example which he diſſected, the irregularly *granulated* ſurface of the ſwelling, we cannot conceive how ſuch a ſtructure could be an accidental conſequence of a mere exudation of blood.

Mr. Charles Bell, in his Operative Surgery, vol. i. expreſſes his opinion that the deficiency of the ſkull, and the ulceration of the dura mater, always precede the growth of the fungus, that after large openings made in the cranium with the trepan, or the elevation of extenſive depreſſed pieces of the ſkull, the pulſation of the brain forces the dura mater againſt the ſharp edge of the bone, and makes that membrane ulcerate; and that then a fungus rapidly ſprouts up from the ſubſtance of the brain, which has a tendency to ulceration.

In proof of the vaſcularity of the fungus, ſeveral circumſtances are mentioned by the foregoing writer. The tumour bleeds when torn or cut. It ſhrinks and collapſes when the patient dies. Mr. Charles Bell has a preparation of the diſeaſe, where an ulcer paſſes from its baſe into the lateral ventricle, and where the ulcer has an external opening, yet no blood, nor coagulum, was found upon the ſurface of the brain, or in the cavities. The ſwelling is not formed of concentric laminæ, like the coagulum of an aneuriſm. The blood never burſts from its ſurface as it would do even from a venous tumour, which could in the firſt inſtance make its way through the membranes of the brain. It is affected, like ſpongy granulations, by cauſtic. A degree of compreſſion, ſuch as would ſtop bleeding from a conſiderable artery, will not ſubdue the diſeaſe when it has made ſome progreſs. The ſwelling has a fibrous ſtructure, and when diſſolved after death, hangs in ſhreds, not like a coagulum.

In a caſe of fungus cerebri, which fell under Mr. Charles Bell's obſervation, and aroſe after a venereal exfoliation of

the ſkull, the following ſymptoms occurred: At the beginning, while ſenſibility laſted, the patient uſed to have cold ſhiverings and pain in the head. His countenance was of a pale, dirty, cadaverous yellow. As the tumour increaſed, he had frequent ſickneſs, was ſubject to giddineſs, and reeled like a drunken man; the pulſe became ſlow and weak; he betook himſelf entirely to his bed, could no longer ſit up, became incoherent, lay oppreſſed, and had a pulſe which was a mere tremulous motion of the artery. The diſeaſe ran its courſe in about eight days.

With regard to the treatment of the fungus cerebri, Mr. Abernethy is of opinion, that when no bad ſymptoms precede the appearance of the tumour, or when they go away upon the ſwelling being freed from the confinement of the dura mater, it may perhaps be moſt prudent not to interfere with the diſeaſe. The tumour may of itſelf drop off in pieces, and be no more renewed. In the Edinburgh Medical Commentaries, vol. i. p. 98, may be found a caſe, in which the tumour continued to increaſe for fourteen days, and had become as large as a gooſe's egg, when it dropped off in largiſh pieces. Another inſtance of the ſame kind is alſo recorded in the Medical Muſeum, vol. iv. p. 463. See likewiſe Fabricius Hildanus.

While the tumour is unattended with any urgent ſymptoms, it only ſeems neceſſary to cover the ſwelling and ſore with ſome mild dreſſing, carefully avoiding all preſſure, which both reaſon and experience ſhew is likely to be attended with bad conſequences.

However, if the fungus ſhould continue to increaſe very much, ſo as to make it almoſt impoſſible to avoid making preſſure upon it, the plan, which experience appears to approve the moſt, is occaſionally to pare off the tumour with a knife.

That ſuch ſwellings may be ſucceſsfully removed has been proved both by accidents and by practice. Du Queſnay, in the Mémoires de l'Academie de Chirurgie, relates the following caſe: A young man received, on the right parietal bone, a blow which cauſed a fracture. A part of the bone was taken away, and a hernia cerebri enſued, which was ſeveral times pared down with a knife. On the thirty-fifth day from the accident, the patient, in a ſtate of intoxication, put his hand under the dreſſings, and tore the protruding portion of the tumour violently away. The next day the ſurgeon found that almoſt the whole of what he conſidered as corrupted brain was removed, ſo deep a cavity being left, that the corpus calloſum could almoſt be ſeen. The place healed up completely; but a palſy of the left ſide of the body, which had come on the day after the accident, ſtill continued.

Several examples are recorded by Mr. Hill of fungi of the brain being ſucceſsfully pared down with a knife. (See Caſes in Surgery).

When a fungus cerebri, in conſequence of being confined by the ſmallneſs of the aperture in the bone, occaſions irritation and preſſure on the brain, it may be adviſable to enlarge the opening in the cranium. In this way, the ſurgeon may alſo ſucceed in giving vent to fluid collected and confined under the ſkull.

There are ſome caſes to be met with, in ſurgical books, greatly againſt the employment of compreſſion. One is noticed by Scultetus, in his Armamentarium Chirurgicum, obſ. 19; and another in the London Medical Journal, vol. x. p. 277. In theſe inſtances compreſſion was tried, for the purpoſe of ſtopping the growth of the tumour; but both the patients died. Upon diſſection, a large cavity was found in each brain, filled with an accumulation of fluid, which had been prevented from eſcaping, by reaſon of the opening in the bone being cloſed by the fungus.

Were a caſe to preſent itſelf, in which the degree of hemorrhage from a fungus cerebri was dangerous, Mr. Abernethy has propoſed the plan of removing the ſubſtance of the ſwelling, and expoſing the bleeding veſſels, in order to ſee whether this expoſure would put a ſtop to the bleeding. This gentleman conſiders the experiment juſtified by analogy; for bleeding in other ſituations will often continue notwithſtanding the preſſure of the dreſſings and large coagula; but will immediately ceaſe on the bleeding ſurface being expoſed.

We ſhall conclude with cautioning ſurgeons againſt the danger of ever applying ſtyptics and cauſtics to any diſeaſes ariſing from the ſurface, or ſubſtance of the brain, and with adviſing them not to let the fungus draw away their attention from every other circumſtance. Frequently, inflammation of the pia mater will be co-exiſtent with the latter diſeaſe, and require at leaſt as much vigilance, deciſion, and judgment on the part of the ſurgeon.

Fungus Teſtis.—Until lately, the particular diſeaſe of which we are about to ſpeak ſeems to have eſcaped the notice of ſurgical writers, and in conſequence of the affection not being underſtood, when met with in practice, the ſevere proceeding of caſtration has too often been very unneceſſarily adopted.

An exceedingly able deſcription of the fungus teſtis was publiſhed by Mr. Lawrence in the fourth volume of the Edinburgh Medical and Surgical Journal. The ſubject is there illuſtrated with the particulars of nine caſes, which fell under the author's obſervation.

It is ſtated by this gentleman, that the patient commonly aſſigns ſome blow, or other injury, as the cauſe of the complaint. In ſome inſtances, the diſeaſe originates in the hernia humoralis from gonorrhœa; in others it comes on without any apparent cauſe. The diſorder begins with an extremely hard painful ſwelling of the teſticle. After a certain ſpace of time the ſcrotum ulcerates; but the opening which is thus formed, inſtead of diſcharging matter, gives iſſue to a firm and generally inſenſible fungus. The ſurrounding integuments and cellular ſubſtance are thickened and indurated by the complaint, ſo that there appears altogether a conſiderable maſs of diſeaſe. As ſoon as the ſcrotum has burſt, a conſiderable diminution of the pain and ſwelling takes place. In this ſtate the diſorder appears very indolent; but if the fungus be deſtroyed by any means, the integuments come together, and a cicatrix enſues, which is inſeparably connected with the teſticle.

Mr. Lawrence next informs us, that an examination of the part, while the fungus exiſts, diſcloſes the fact, that this growth has its origin in the glandular ſubſtance of the teſtis itſelf; that the coats of the part are deſtroyed to a certain extent; and that a protruſion of the tubuli ſeminiferi takes place through the opening, which is thus formed. "I have often (ſays this gentleman) aſcertained the continuity of the excreſcences with the pulpy ſubſtance of the teſtis, of which we ſhall find more or leſs remaining, according to the difference in the period of the diſorder. It appears to me that the glandular part of the teſtis experiences an inflammatory affection in the firſt inſtance, in conſequence of the violence inflicted on it; and that the confinement of the ſwollen ſubſtance, by the denſe and unyielding tunica albuginea, ſufficiently explains the peculiar hardneſs of the tumour, and the pain which is always attendant on this ſtage of the diſorder. The abſorption of the coats of the teſtis and of the ſcrotum obviates the tenſion of the parts, and thereby reſtores eaſe to the patient, at the ſame time that the fungus makes its appear-

appearance externally. I think it not improbale, that if the complaint were left entirely to itſelf, the ſwelling would ſubſide, the fungus ſhrink, and a complete cure enſue, without any profeſſional aſſiſtance; but the diſorder is ſo indolent in this ſtage, that a ſpontaneous cure would not be effected until after a very long time. The excreſcence may, however, be removed by the knife, or, if the nature of its attachment permit, by ligature; or it may be freely treated with eſcharotic applications. The removal of the protuberance to a level with the ſcrotum, by means of the knife, is the ſhorteſt and moſt effectual mode of treatment. I can ſee no ground whatever for propoſing caſtration in this malady, ſince in no part of its progreſs, nor in any of its poſſible conſequences or effects, can it expoſe the patient to the ſlighteſt riſk. Some may be diſpoſed to defend the removal of the part, becauſe it would bring the caſe to a more ſpeedy termination, and if a patient, after being informed of all the circumſtances, ſhould deſire the operation on this ground, the ſurgeon would be juſtified in performing it. But I think he never could be warranted in propoſing ſo painful and dangerous a remedy as caſtration, for a diſorder attended with neither pain nor danger, and admitting of cure by a perfectly ſafe and mild kind of treatment.

"Funguſes of a different character and progreſs may, no doubt, occur in the teſtis; but the deſcription already given will ſerve to diſcriminate that particular ſpecies, to which alone the preſent obſervations are deſigned to apply. In a caſe, in which my friend Mr. Macartney performed the operation of caſtration, the teſtis itſelf was found, and the fungus, which was a firm and denſe ſubſtance, grew from the tunica albuginea."

Mr. Lawrence proceeds to mention, that ſome authors have recorded caſes which bear a ſlight analogy to the fungus teſtis, of which we have been ſpeaking. Petit and Swediaur are ſtated to have deſcribed the diſcharge of ſmall portions of the ſubſtance of the teſticle from an abſceſs of the part. (See Mem. ſur la Suppuration de la Membrane propre de Teſticule in Mem. de l'Acad. de Chirurgie, tom. 4. and Obſervations on Venereal Complaints.) Bertrandi deſcribes the ſame occurrence, and the ſubſidence of a protruded part under the uſe of ſtimulant powders. (See Mem. de l'Acad. de Chirurgie, tom. 5. p. 677.) Sabatier mentions the ſwelling and burſting of the teſticle, and eſcape of a part of its ſubſtance, as occaſionally occurring in the radical cure of the hydrocele. (Mem. de l'Acad. de Chirurgie, tom. 3.)

The caſes of the fungus teſtis, publiſhed by Mr. Lawrence, are well deſerving of attention, as they afford a very ſatisfactory explanation of the nature of the diſeaſe. The performance of caſtration for the cure of this malady ought, in our opinion, never to be thought of. Even when the patient himſelf has had the nature of the caſe explained to him, and wiſhes to ſubmit to the operation with a view of getting ſpeedily well, we conſider that the removal of the teſtis is not at all neceſſary in the cure, and that were this ſevere method adopted, it would not be the moſt expeditious means of relief. Cutting away the prominent part of the fungus, and freely rubbing the deeper portion of it with cauſtic, will certainly deſtroy the diſtemper, and, after this practice, we ſhall have no extenſive wound of the ſcrotum to heal up, as would be the caſe were caſtration performed. Hence it appears to us, that the removal of the teſticle is warranted by no conſiderations whatever, not even by the earneſt intreaties of the patient. Such a wiſh can only ariſe from not knowing that the diſeaſe may be got rid of, with at leaſt equal quickneſs, by a much milder plan of treatment. We ſhall take our leave of this ſubject with referring our readers to the caſes recorded by Mr. Lawrence. (See Edinburgh Medical and Surgical Journal, vol. iv. p. 257.)

Fungus Hæmatodes.—This is one of the moſt intractable diſeaſes to which the human frame is liable. Terrible as the diſtemper is, however, it was not conſidered as a caſe of a diſtinct and peculiar nature, until Mr. Burns, of Glaſgow, gave ſome account of the ſubject in the ſecond volume of his work on inflammation. The diſorder is there deſcribed under the name of *ſpongoid inflammation*, and, at preſent, it is known by ſome other appellations, ſuch as the *ſoft cancer*; *medullary ſarcoma*, and *carcinome ſanglante*.

Before Mr. Burns publiſhed the above-mentioned book, the fungus hæmatodes was always miſtaken for cancer, and we may indeed ſtate, that the ſame error generally continued to prevail, until Mr. Hey's "Practical Obſervations in Surgery" iſſued from the preſs in the year 1803. How different the two diſeaſes are, will be clearly ſhewn in the ſequel of the preſent article.

The fungus hæmatodes has moſt frequently been obſerved to make its attack on the eye-ball, the upper and lower extremities, the teſticle, and the mamma. Mr. Wardrop ſtates, that the uterus, ovary, liver, ſpleen, lungs, and thyroid gland, have alſo been the ſeats of the diſeaſe, and Mr. Burns has recorded one example, in which the hip-joint was the part affected. The joint of the ſhoulder likewiſe appears to be ſubject to the malady, as is proved by ſome drawings in the collection of the Ecole de Médecine, ſhewing ſpecimens of what the French have named the "carcinome ſanglante", which is plainly the ſame affection as the fungus hæmatodes.

A diſtemper, which makes its attack on ſo many different parts and organs, cannot always preſent itſelf exactly in the ſame form. Hence, it ſeems expedient to offer a conciſe account of the manner in which the malady occurs in various ſituations, more particularly the eye, extremities, female breaſt, and teſticle.

According to Mr. Wardrop, the firſt appearances of the fungus hæmatodes, when it attacks the eye, are in the poſterior chamber. The pupil becomes dilated and immoveable, and, inſtead of having its natural deep black colour, it has a dark amber, and, in ſome caſes, a greeniſh hue, giving to the eye much of that appearance which exiſts in the ſound eye of a ſheep or cat. As the diſeaſe advances, the colour becomes more remarkable, and, at length, is diſcovered to be occaſioned by a ſolid ſubſtance, proceeding from the bottom of the eye towards the cornea. The ſurface of this ſubſtance is generally rugged and unequal, and, in ſome caſes, red veſſels may be ſeen running acroſs it. Theſe are ramifications of the central artery of the retina, ſituated in front of the opaque body. In proportion as the diſeaſe makes progreſs, the new-formed ſubſtance gradually fills up the whole of the poſterior chamber, and its ſurface advances as far forward as the iris. In this ſtate, the diſeaſe has the appearance of an amber, or a brown maſs, and, in two inſtances, which Mr. Wardrop was acquainted with, the exiſtence of cataracts was ſuſpected, and couching in one example actually undertaken by an experienced ſurgeon.

The diſeaſe continuing to increaſe, an alteration next takes place in the ſhape of the eye-ball, which acquires an irregular knobbed appearance. At the ſame time the ſclerotic coat loſes its natural pearly-white colour, and becomes of a dark blue, or livid hue. The tumour now occupies the whole anterior chamber, and, in ſome caſes, a quantity of purulent matter collects between the diſeaſed maſs and

the cornea. At laſt, the cornea ulcerates, and a fungous tumour ſhoots out. In certain inſtances, the ſwelling makes its way through the ſclerotic coat.

Mr. Wardrop notices, that the fungus to which we have juſt now adverted is very rapid in its growth, and often acquires a conſiderable bulk. When ſmall, it bears a near reſemblance to a ſoft polypus. It is generally of a dark red, or purple colour. Its ſurface is irregular and often covered with coagulated blood. Its ſubſtance is eaſily torn, and on being broken, or ſlightly ſcratched, a profuſe hemorrhage takes place. In particular caſes, the fungus is of a firmer texture. When the ſwelling happens to protrude through the ſclerotic coat, it receives a covering from the tunica conjunctiva. When the fungus has attained a large ſize, the moſt prominent parts ſlough away, attended with a very fœtid ſmell, and a diſcharge of acrid ſanies.

In the courſe of the diſeaſe the lymphatic glands become affected, particularly thoſe which lie about the parotid gland, and under the lower jaw.

When an eye, affected with the fungus hæmatodes, in an advanced ſtate, is diſſected, a diſeaſed maſs is found extending forwards from the entrance of the optic nerve in ſuch a manner as to have produced an abſorption of the vitreous, cryſtalline, and aqueous humours. The retina is, as it were, annihilated, while the choroid coat is propelled forward, and ſometimes quite deſtroyed.

The ſubſtance of the excreſcence itſelf has the appearance of medullary matter, being chiefly compoſed of an opaque, whitiſh, homogeneous matter, having the ſame pulpy ſoftneſs and tenacity which characterize brain. It varies, however, both in conſiſtence and colour in different caſes, and ſometimes contains bony particles.

The optic nerve is thicker and harder than natural, of a browniſh aſh-colour, and deſtitute of the tubular appearance which it ought to have. In other caſes, the nerve, beſides being altered in its ſtructure, is ſplit into one or more pieces, the morbid growth filling up the interſpaces, ſurrounding the different portions of the nerve, and forming one connected maſs with the contents of the eye-ball. Other changes have been remarked in the nerve; but they muſt be learnt by a reference to Mr. Wardrop's publication.

The brain and its membranes have alſo been obſerved to ſhare the diſeaſe. Dark red ſpots have been noticed on the dura mater, and, in other examples, white ſpots were found between the tunica arachnoides and pia mater, which were ſcattered almoſt all over the ſurface of the brain, and proved to be ſmall bags, containing a fluid like cream.

When the abſorbent glands are enlarged, they are found converted into the ſame kind of medullary matter, which compoſes the diſeaſed maſs in the eye-ball. Should the ſkin burſt, a ſloughy ulcer is produced; but, according to Mr. Wardrop, no fungus ſhoots out, unleſs when the affection of a lymphatic gland is itſelf a primary one.

In conſidering the fungus hæmatodes of the eye, every reader muſt be ſtruck with the very early period of life at which the diſeaſe generally commences. Of twenty-four caſes with which Mr. Wardrop has been acquainted, twenty were under twelve years of age, and it is ſtated, in "Les Œuvres Chirurgicales de Deſault, par Bichat," tom. 2, that two-thirds of the patients, on whom Deſault operated for carcinoma of the eye, at the Hotel-Dieu, were under twelve years of age. Now as cancer is always moſt diſpoſed to attack perſons advanced in life, we may conclude, that Deſault's patients, for the moſt part, laboured under the fungus hæmatodes, from which, indeed, cancer has not been diſcriminated by moſt of the beſt ſurgical writers.

The ſight of young ſubjects is generally deſtroyed before the attention of parents is excited to the diſtemper. In many caſes, however, the eye firſt receives a blow, which brings on inflammation, and after the ophthalmy has laſted a certain time, the coloured ſubſtance becomes perceptible at the bottom of the eye. When no external violence has occurred, the firſt ſymptom is a trivial fulneſs of the veſſels of the conjunctiva, the iris becoming, at the ſame time, extremely vaſcular, and altered in colour, and the pupil dilated and immoveable. There is ſeldom much complaint made of pain; but the child is ſometimes obſerved to be languid and feveriſh.

In adults, the fungus hæmatodes of the eye generally comes on without any apparent cauſe, though ſometimes in conſequence of a blow. At firſt, the tunica conjunctiva is ſlightly reddened, and viſion is indiſtinct. The redneſs and obſcurity of ſight increaſe ſlowly, and an aching pain is experienced in the head. The latter ſymptom is deſcribed as being moſt agonizing, particularly during the night, and never becoming diminiſhed, until the eye burſts and the humours are diſcharged. Only one eye is in general affected.

With regard to the cure of the fungus hæmatodes of the eye, the only chance of effecting this deſirable object depends upon the early extirpation of the diſeaſed organ. It muſt be acknowledged, however, that moſt of the operations, in which the morbid eye has been removed, have hitherto proved unſucceſsful, owing to a recurrence of the diſeaſe. The reaſon of this circumſtance may be imputed to the optic nerve being almoſt always in a morbid ſtate, before any attempt is made to remove the eye. Mr. Wardrop remarks, that paſt experience proves the impropriety of attempting any operation, when the diſeaſe has advanced ſo far that the poſterior chamber is filled with the diſeaſed growth. Since no internal medicines, nor external applications, ſeem to afford the leaſt hope of checking any form of the fungus hæmatodes, it is obvious, that when the diſeaſe of the eye has exceeded certain bounds, the miſerable patient is placed beyond the reach of any effectual aid from ſurgery.

We ſhall conclude our remarks on fungus hæmatodes of the eye, with referring the reader to a late valuable publication, entitled "Obſervations on Fungus Hæmatodes," by James Wardrop, 1809. In this book many caſes, and numerous particulars, relative to the morbid anatomy of the diſeaſe, are ably deſcribed.

When fungus hæmatodes affects any part of the limbs, the diſeaſe generally commences with a ſmall colourleſs tumour, which, if there be no thick covering over it, ſuch as the faſcia of a muſcle, or the aponeuroſis of the foot, is ſoft and elaſtic, but in other caſes tenſe. It is at firſt free from uneaſineſs; but by degrees a ſharp acute pain darts occaſionally through it, more and more frequently, until the ſuffering is inceſſant. For a conſiderable time the tumour is ſmooth and even; but afterwards it projects irregularly in one or more points, and the ſkin at this place becomes of a livid red colour, and feels thinner than elſewhere. It here readily yields to preſſure, but inſtantly bounds up again. Small openings now form in theſe projections, and diſcharge a thin bloody matter. Almoſt immediately after theſe tumours burſt, a ſmall fungus protrudes, like a papilla, rapidly increaſes both in breadth and height, aſſumes the appearance of a carcinomatous fungus, and often bleeds in a very profuſe manner. The matter is thin, and exceedingly fœtid, and the pain is ſaid to be of the ſmarting kind. The

integuments

integuments are red and tender for ſome extent round the ulcers. After ulceration has taken place, the neighbouring glands ſwell, and put on exactly the ſpongy qualities of the primary tumour. If the patient ſtill ſurvive this advanced ſtate of the diſtemper, ſimilar tumours form in other parts of the body, and the patient dies hectic. (Diſſertations on Inflammation, vol. ii. p. 303.)

According to a late practical writer, when the diſeaſe is limited to the adipoſe, or cellular membrane, which covers the muſcles, the tumour is not uſually painful in the beginning, nor does it impede the motion of the muſcles on which it is ſeated. But when the diſorder occupies a deeper ſituation in the limbs, pain and weakneſs of the affected parts are felt. The fungus, alſo, as it increaſes in bulk, does not render the integuments uniformly thin, as in the caſe of an abſceſs. In one part the tumour, when preſſed with the hands, will afford the ſenſation of a deep-ſeated fluid, while another part will feel hard and uneven. Mr. Hey differs a little from Mr. Burns, in ſtating that the ſkin does not become uniformly thin and of a red colour, as when purulent matter is making its way to the ſurface of the body; but, on the contrary, that the integuments continue to feel as thick as uſual round the fungus, which protrudes through them. (Practical Obſervations in Surgery, p. 283, 284).

Fungus hæmatodes is ſeen on the extremities in ſubjects of every age, although, as we have already explained, the ſame affection of the eye-ball is commonly met with in children under the age of twelve.

Sometimes the tumour has ſucceeded ſome external violence, and conſequently, at firſt, has not been diſtinguiſhable from the common ſwelling of the injured parts.

It is the nature of the tumour to grow in the commencement by ſlow degrees; but as ſoon as an opening is made, the fungus generally ſhoots up with aſtoniſhing quickneſs.

The tumour, before ulceration occurs, often preſents ſo deceitful a ſenſe of fluctuation as to induce very experienced ſurgeons to believe that the caſe is a collection of fluid, and, of courſe, to make a puncture with a lancet. This proceeding ſhould always be carefully avoided, ſince it never fails to aggravate the diſeaſe, and accelerate the patient's diſſolution.

The fungus which ariſes on the extremities is generally of a round form, has an unequal rugged ſurface, and clotted blood is frequently ſeen adhering to it. It is of a dark red colour, is eaſily torn, and bleeds on being touched even in a gentle way. Its neck is commonly very narrow, while the upper portion ſpreads out very much, ſo as completely to cover the edge of the ulcerated ſkin.

When the fungus has attained a large ſize, the moſt prominent portions ſlough away, attended with an exceedingly fœtid diſcharge, and conſiderable hemorrhage.

Sometimes the abſorbent glands become contaminated with the diſeaſe, while the ſwelling is yet ſmall, in other caſes not till it ulcerates. The glands between the tumour and the thoracic duct are thoſe which are liable to be affected, ſo that, when the fungus hæmatodes is on the lower extremity, the glands in the groin, and all thoſe in the courſe of the iliac veſſels and aorta, are apt to be diſeaſed.

When a fungus hæmatodes, ſituated on one of the limbs, is examined after death or amputation, the tumour itſelf is found to conſiſt of a ſoft ſubſtance, ſomewhat like the brain, of a greyiſh colour and greaſy appearance, with thin membranous-looking diviſions running through it, and cells or abſceſſes in different places, containing a thin bloody matter, occaſionally in very conſiderable quantity. There does not ſeem uniformly to be an entire cyſt ſurrounding the tumour; for the ſwelling very frequently dives down betwixt the muſcles, or down to the bone, to which it often appears to adhere. The neighbouring muſcles are of a pale colour, and loſe their fibrous appearance, becoming more like liver than muſcle. The bones in the vicinity of the tumour are always carious. (See Burns on Inflammation, vol. ii. p. 305.)

When the parts containing the fungus are divided, they are found to be in a morbid ſtate. The adipoſe membrane forms a great number of pouches, filled with the fungus, upon the removal of which the pouches, if the patient be alive, bleed profuſely from every part of their internal ſurface. (Hey's Practical Obſervations in Surgery, p. 284.)

We have remarked, that in fungus hæmatodes of the eye other parts of the body were often affected with the diſeaſe before the patient's death. So when the extremities are the ſeat of the diſtemper, the lymphatic glands in the courſe of abſorption are apt to become diſeaſed, and not only theſe parts are ſometimes found in a morbid ſtate, but even the brain, the kidney, the liver, the breaſt, and other viſcera, as ſeveral well-authenticated caſes have now indiſputably proved. The reader may, if he pleaſe, be convinced of this important fact by referring to ſome of the examples which are detailed in Mr. Wardrop's late publication.

We have ſtated, that Mr. Burns of Glaſgow firſt wrote upon the fungus hæmatodes, as a diſtinct and peculiar diſeaſe, under the name of "ſpongoid inflammation." There are, however, numerous caſes of the diſeaſe recorded in ſurgical books by authors who were unacquainted with the general character of the complaint. See "An account of an anomalous tumour of the leg unſucceſsfully treated," publiſhed in Monro's works. Likewiſe the deſcription, which Mr. Pott has given, of a peculiar ſwelling of the calf of the leg, in his remarks on amputation.

On the ſubject of the treatment of fungus hæmatodes, ſituated on the extremities, we need not long detain the reader. When he hears that no internal medicine, nor external application, ſeems to have the leaſt power of checking this malignant diſeaſe, he will naturally turn his mind to the plan of extirpation with the knife. Mr. Hey informs us, that the growth of the fungus cannot always be repreſſed by the ſtrongeſt eſcharotics. Neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted vitriolic acid, has been ſufficient for this purpoſe, and ſurgeons may always be certain, that when they irritate any malignant diſeaſe by plans which fail in accompliſhing its extirpation, they inevitably accelerate the expanſion of the morbid ravages, and haſten the patient's death.

The fungus hæmatodes is one of thoſe terrible maladies with which no wiſe ſurgeon will dare to tamper. As ſoon as the nature of the caſe is aſcertained, the whole of the diſeaſed ſubſtance, and parts in its vicinity, ſhould be carefully cut away. We are of opinion, that if this plan be ſtrictly executed, the patient will have as much chance of recovery, as if the limb were amputated. It is our duty, however, to ſtate, that in all the caſes in which the tumour alone was extirpated by Monro, Burns, and Hey, the diſeaſe recurred. Hence, Mr. Wardrop thinks, that we are warranted in urging the removal of the whole limb, as ſoon as the true nature of the caſe is manifeſt. When therefore any tumour is ſuſpected of being a fungus hæmatodes, the latter gentleman ſuggeſts the plan of making an opening into the ſwelling, for the purpoſe of ſeeing its ſtructure, and thus forming a deciſive judgment. If the caſe prove to be fungus hæmatodes, the limb might be immediately

mediately removed; if not, the ſurgeon might be content with putting in practice whatever meaſures the particular nature of the caſe ſhould require.

There are a few circumſtances which are quite manifeſt after the foregoing account. Firſt, that if an attempt be made to cut away the tumour, and ſave the limb, the ſurgeon muſt take care to remove at the ſame time a conſiderable quantity of the ſoft parts in the circumference of the ſwelling. Secondly, that after the tumour is taken out, a careful examination of the ſurface of the wound ſhould be made, and every ſuſpicious part or fibre cut away. Thirdly, that ſhould the diſeaſe, notwithſtanding ſuch caution recur, amputation ſhould be performed without delay. Fourthly, that cauſtics ſhould never be employed in theſe caſes. Laſtly, that as other inviſible parts and viſcera are often diſeaſed at the time when the operation is done, the ſurgeon ſhould always be upon his guard, and not raiſe the hopes of the patient's friends too high. Were he to act otherwiſe, reproach and loſs of reputation would be the frequent conſequences of his conduct.

The teſticle is liable to the fungus hæmatodes, and the affection was firſt deſcribed by Dr. Baillie, in his Morbid Anatomy, under the name of the *pulpy teſticle*. Mr. Abernethy, in his publication on tumours, has given an account of what he terms *medullary ſarcoma*, and of a remarkable inſtance, in which the foregoing part was attacked. It is ſuppoſed, that the medullary ſarcoma of Mr. Abernethy is, in reality, the ſame as the fungus hæmatodes of Hey, Wardrop, and other writers. The caſe to which we have alluded being very illuſtrative of the nature of this diſeaſe in the teſticle, we conceive that the reader will not regret its inſertion in the preſent article.

"A tall, thin, healthy-looking man, of about forty years of age, had, about fifteen years before, a ſwelled teſticle from a gonorrhœa; the epididymis remained indurated. Six years afterwards it became enlarged, and a hydrocele at the ſame time formed. Half a pint of water was diſcharged by a puncture, but inflammation ſucceeded the operation, and this teſtis became very large. An abſceſs formed, and burſt in the front of the ſcrotum, and the teſtis ſubſided in ſome degree. Mercury was employed to reduce it, but without effect. The part, however, was indolent, and gave the patient no trouble but from its bulk.

"About a year afterwards, a gland enlarged in the left groin (the ſame ſide as the teſtis): another then became ſwoln in the right groin, and, in the courſe of two years, ſeveral glands in each groin had obtained a very conſiderable magnitude. At this period, he was admitted into St. Bartholomew's Hoſpital under the care of Mr. Long. The teſtis was, at this time, between four or five inches in length, and about three in breadth; it reſembled its natural form, and was indolent in its diſpoſition. The ſpermatic chord was thickened, but not much indurated. Four or five glands were enlarged in the groin on both ſides; each of which was of the ſize of a very large orange; and, when obſerved together, they formed a tumour of very uncommon ſhape and magnitude.

"They gradually increaſed in ſize for ſeveral months, till at laſt the ſkin appeared as if unable to contain them any longer. It became thin, inflamed, and ulcerated, firſt in the left groin, and thus expoſed one of the moſt prominent tumours. The expoſed tumour inflamed and ſloughed progreſſively, till it entirely came away. As the ſloughing expoſed its veſſels, which were large, they bled profuſely, inſomuch that the ſtudents endeavoured, but in vain, to ſecure them by ligatures; for the ſubſtance of the tumour was cut through, and torn away in the attempt. Preſſure by the finger, continued for ſome time, was the only effectual mode of reſtraining this hemorrhage.

"The loſs of one gland relieved the diſtended ſkin, which had only ulcerated on the moſt prominent part of the tumour, and had not become diſeaſed. It now loſt its inflamed aſpect: granulations formed, and a cicatrix took place. In the oppoſite groin a ſimilar occurrence happened. One gland, expoſed by the ulceration of the ſkin, ſloughed out, being attended by the circumſtances juſt recited. However, before the ſkin was cicatrized, ulceration had again taken place in the right groin, in conſequence of the great diſtenſion of the ſkin from the growth of the tumour; and ſloughing had begun in the tumour, when the patient, whoſe vital powers had long been greatly exhauſted, died." See Surgical Obſervations, &c. 1804, by J. Abernethy, F. R. S. &c.)

In this example, the diſeaſe extended to many parts beſides the teſtis. The tumour, formed by the inguinal glands on each ſide, was as large as a man's head, and ſimilar in ſtructure to the diſeaſed teſticle. The pelvis was almoſt filled with ſimilarly diſeaſed glands, and the vertebræ were hidden by others as high up as the diaphragm. Some of them, upon being cut into, diſcharged a thick fluid reſembling cream.

Fungus hæmatodes of the teſticle is ſaid to begin, ſometimes in the body of that organ, ſometimes in the epididymis. The progreſs of the diſeaſe is ſlow, and the pain attending it is, in general, not great enough to excite alarm. Nor is there, at firſt, any inequality or hardneſs in the gland, nor change in the ſcrotum. When the teſticle has become exceedingly large, it feels remarkably ſoft and elaſtic, and as if it contained a fluid. Hence, the caſe has often been miſtaken for a hydrocele, and a puncture made with a trocar. Sometimes the tumour, when large, is in ſome places hard; in others ſoft. The hydrocele may be known by the water beginning to collect at the bottom of the ſcrotum, and then aſcending towards the ſpermatic cord, and by the ſwelling being circumſcribed towards the abdominal ring; whereas, in the fungus hæmatodes, the diſeaſe begins with a gradual enlargement of the teſticle itſelf, followed by a fullneſs, which extends up the ſpermatic cord. See Wardrop, p. 127.

It appears that the fungus hæmatodes in the teſticle does not claim this appellation, ſince, how large ſoever the tumour may be, it emits no fungous growth. Abſceſſes form, and the integuments of the ſcrotum burſt; but no fungus ſhoots out.

The teſtis is ſaid to be more frequently affected with the malady in young, than old perſons.

On diſſection, the ſubſtance of the diſeaſed teſticle is found to preſent a medullary, or pulpy appearance, generally of a pale browniſh colour, but ſometimes of a red. The conſiſtence is ſometimes uniform; ſometimes variegated, and interſected by thin membranes. When immerſed in water, a good deal of the medullary matter mixes with the fluid. In moſt caſes, the tunica albuginea and tunica vaginalis are adherent together: ſometimes there is a fluid between them. See Wardrop, 131—133.

With regard to the treatment, we have nothing to recommend, except caſtration, which, unleſs performed at an early period, before the diſeaſe extends up the cord, and to the lymphatic glands, muſt be unavailing. We fear, alſo, that the little alarm excited at firſt, and the difficulty of aſcertaining the early exiſtence of the diſeaſe, will always be ſtrong reaſons why few patients will ever be adviſed, or willing, to ſubmit to a timely operation. Its

reſult,

reſult, likewiſe, even when done early, muſt always be very uncertain, ſince moſt of the attempts to extirpate fungus hæmatodes in other ſituations have for the moſt part proved unſucceſsful, in conſequence of the diſeaſe recurring in a more malignant and fatal form.

Mr. Hey, in his "Practical Obſervations in Surgery," has related ſeveral caſes in which the female breaſt is ſtated to have been the ſeat of the fungus hæmatodes. Mr. Wardrop has expreſſed doubts about the reality of the diſtemper in the inſtances adduced by the foregoing writer. However, we are inclined to think, that the diſeaſe was fungus hæmatodes, ſomewhat diverſified from the common character of the complaint, by reaſon of the difference of ſtructure in which it was ſituated. Thus, in the teſticle, the diſtemper has its peculiarities, ſince, in this organ, when the integuments burſt, no fungus ſhoots out; and yet Mr. Wardrop does not heſitate to admit ſuch diſeaſe to be the formidable diſorder of which we have now been treating.

The following are ſome of the moſt remarkable circumſtances which occurred in one example recorded by Mr. Hey. In making an exertion, a maiden lady, aged 54, felt ſomething crack in her breaſt. A few days afterwards, a ſmall tumour, about the ſize of a hazel-nut, took place in the part. The ſwelling got gradually larger, was hard, and moveable. At length, it extended nearly to the axilla on one ſide, and the ſternum on the other. Its ſurface was uneven, and the integuments were in ſome places thick. At other parts they were thin, and felt as if a fluid were under them. When the harder parts were handled, Mr. Hey had a ſenſation as if he had broken ſome fibrous ſubſtance. Shooting pains had been felt in the tumour from its commencement.

The ſkin at laſt gave way; a dark-coloured ſubſtance aroſe in the fiſſure; and blood began to ooze out of the opening. This aperture afterwards became ſo large, that much bleeding uſed to take place from it, whenever the hemorrhage was not ſtopped by a coagulum.

Mr. Hey removed a large oval piece of the diſeaſed integuments, chiefly with a view of ſuppreſſing the bleeding, with ſtyptics.

The fungous ſubſtance, making the greater part of the tumour, bore a reſemblance to that of a fungus hæmatodes of the thigh, recorded by the ſame writer, p. 233. The maſs, upon being broken, bled. It adhered ſtrongly to the remaining part of the integuments, which formed a great number of irregular cells. Indeed, the whole internal ſurface of the ſac containing the fungus was compoſed of theſe cells, except the bottom, which was formed by the pectoral muſcle, and was more even. In the operation, a diſeaſed portion of this muſcle, about two inches ſquare, was left uncovered. It ſeemed as if it had been expoſed to the air, and had begun to form granulations. The muſcular fibres were ſcarcely diſtinguiſhable. The whole internal ſurface of the ſac bled, as if the blood had been ſqueezed from a ſponge. Ruſpini's ſtyptic was applied with lint to the muſcle, and hot oil of turpentine to the reſt of the cavity. The applications were kept on with a circular bandage.

The patient only lived till the morning of the day which followed the operation. It ſeems, that before ſhe died a good deal of blood had been loſt. See Practical Obſervations in Surgery, p. 254.

We need only add our own belief, that this caſe ſeems to merit the name of fungus hæmatodes, and that the only chance which the patient had of life depended upon the earlier attempt to cut away every particle of the diſeaſe. When this opportunity had paſſed away, perhaps it might have been moſt prudent not to have employed the knife at all, particularly as the only end of doing ſo ſeems to have been that of applying very irritating ſtyptic applications.

The reader is already appriſed, that the fungus hæmatodes has generally been confounded with carcinomatous affections. Hence, it ſeems proper, before taking our leave of this ſubject, to notice the principal differences between cancer and fungus hæmatodes. This taſk ſeems yet neceſſary; for, notwithſtanding the two caſes may be eaſily diſcriminated by certain peculiarities, it is acknowledged, that in ſome circumſtances there exiſts an analogy. Thus the progreſs of the two diſeaſes, eſpecially in the early ſtage, is generally ſlow. When ulceration happens, a thin fœtid ichor is diſcharged, inſtead of purulent matter, and, occaſionally, both maladies are attended with profuſe hemorrhages. Both diſeaſes often emit a fungus; both contaminate the lymphatic glands in the direction of the abſorption; and both are apt to involve in the morbid ravages every kind of ſtructure which may happen to be near. Laſtly, both diſeaſes frequently affect at once ſeveral parts of the body. All theſe circumſtances have been noticed by Mr. Wardrop.

The ſame gentleman has explained, that a ſchirrous tumour is, from its commencement, hard, firm, and incompreſſible, and is compoſed of two ſubſtances; one hardened and fibrous; the other ſoft and inorganic. The fibrous mattter is the moſt abundant, conſiſting of ſepta, which are paler than the ſoft ſubſtance between them. The ſoft matter is ſometimes ſemi-tranſparent, and of a blueiſh colour, differing ſomewhat, however, in its appearances in different caſes.

A ſchirrous tumour, ſituated in the gland, is not capable of being ſeparated from the latter part, ſo much are the two ſtructures blended. A ſcirrhus in another ſituation ſometimes condenſes the ſurrounding cellular ſubſtance, ſo as to form a kind of capſule, and aſſume a circumſcribed appearance.

When a ſcirrhous ſwelling ulcerates, a thin ichor is diſcharged, and a good deal of the hard fibrous ſubſtance is deſtroyed by the ulceration, and the tumour is leſſened. The diſeaſe continues to ſpread by ulceration, other parts become affected, and the patient dies from the increaſed quantity of morbid ravages and the irritation on the conſtitution.

Sometimes, though not always, after a ſcirrhus has ulcerated, it emits a fungus of a very hard texture. Such excreſcence, however, is itſelf at laſt deſtroyed by the ulceration. It is curious alſo, that cancerous ſores often put on, for a ſhort time, at a particular part, an appearance of cicatrization.

On the other hand, as Mr. Wardrop has remarked, the fungus hæmatodes, while of moderate ſize, is a ſoft, elaſtic ſwelling, with an equal ſurface, and a falſe feel of a fluctuation. It is in general quite circumſcribed, being contained in a perfect capſule. The ſubſtance of the tumour, inſtead of being for the moſt part hard, conſiſts of a ſoft, pulpy, medullary matter, which readily mixes with water. When ulceration occurs, the tumour is not leſſened by this proceſs, as in ſcirrhus, but a fungus is emitted, and the whole ſwelling ſeems to grow with increaſed rapidity.

Finally, we ſhall obſerve, that cancerous diſeaſes are moſt frequently met with in perſons who are conſiderably advanced in life; that fungus hæmatodes generally afflicts young ſubjects; and that the latter diſtemper has been obſerved in the liver, ſpleen, kidney, and lungs, parts in which true cancer has never yet been remarked. Such readers as deſire to be particularly acquainted with the ſubject of fungus hæmatodes, may learn all that is yet known con-

concerning this formidable diſeaſe, by referring to the ſecond volume of ſome "Diſſertations on Inflammation," by John Burns, (ſee page 302, on Spongoid Inflammation); and conſulting Hey's "Practical Obſervations in Surgery," p. 233; Abernethy's "Surgical Obſervations," publiſhed 1804, p. 51; and, in particular, "Obſervations on Fungus Hæmatodes," by James Wardrop, printed 1809.

FUNGUS *Oculi*, in *Veterinary Science*, a name given by ſome of the writers on the diſeaſes of horſes to a diſtemper of the eye, to which that animal alone is ſubject. The firſt author who has communicated an obſervation of this diſorder to the world is Dr. Lower, in the Philoſophical Tranſactions. He obſerves, that horſes alone are ſubject to it, and calls it a ſpungy excreſcence of the uvea; it is commonly of a dark muſk-colour, and grows out of the edge of the uvea, and though of little conſequence in its firſt ſtages, yet if it grows very large, or if the number of the funguſes increaſe, it weakens and obſtructs the creature's ſight, and ſometimes wholly takes it away. The uvea is a muſcular part, and its chief uſe is to dilate or contract itſelf in a proper manner for the admiſſion of objects with as much light as the eye can bear, ſo that the brighter the light is to which the eye is expoſed, the more this membrane is contracted into a narrow compaſs, and the more dark the place is, the more the opening is dilated. This ſudden change, and the office of this part, may be more conveniently ſeen in the eye of a cat, than in that of any other animal, but it is the ſame in all, in a greater or leſs degree. If the edge of this coat be loaded with a very large excreſcence of this kind, or if ſeveral, though ſmaller, grow all round it, it muſt neceſſarily happen, that the pupil, or ſight, is very much if not totally obſtructed, and the animal ſees very little, or not at all. The horſes of this kind are very ill furniſhed for ſeeing in the ſunſhine, but do very well in dark days, or in the duſk of the morning or evening, when the diſeaſe is not too violent. It is obſervable, that when theſe funguſes grow in the eyes of young horſes, they become much ſmaller when they are taken to dry meat in the ſtable, and increaſe again when they are turned out to graſs. Whether this be owing to the difference of dry and moiſt food is not eaſy to determine, but it is moſt probably owing to the difference of paſture; the horſe at graſs, being obliged to carry its head much lower than thoſe which feed in the ſtable. Thoſe funguſes that are fixed on the upper part of the uvea are apt to grow the largeſt, and to hinder the ſight moſt; and thoſe which grow in the middle of the uvea hinder the ſight more by diſtracting the object than thoſe which grow in either corner or angle of it. The cure is not eaſy; all that can be attempted muſt be by dry diet, and attenuating medicines; and a palliative remedy may be the hanging ſomething over to ſhade the eye, and keeping it from being expoſed nakedly to the ſun, the conſequence of which will be, that the pupil will not be ſo cloſely contracted, and conſequently the light not ſo much obſtructed. Phil. Tranſ. N° 32.

FUNIKEDY, in *Geography*, a town of Africa, in Kaarta; 36 miles N. of Kemmoo.

FUNIS, or FUNICULUS, *Umbilicalis*, in *Anatomy*, the umbilical chord, which conſiſts of two arteries and a vein, named umbilical, which have the office of keeping up the communication between the circulating organs of the fœtus and the placenta; convoluted on each other, and ſurrounded by a quantity of gelatinous ſubſtance. See EMBRYO.

FUNIS *Umbilicalis, Preſentation of*, in *Midwifery*, is when in labour the navel ſtring deſcends into the vagina, before the preſenting part of the child. It ſometimes happens, that on the burſting of the membranes in the courſe of a labour, and the ruſhing forth of the waters, the funis umbilicalis, or navel-ſtring, comes down, with or before the preſenting part of the fœtus. This rarely happens in a natural labour, or when the breech of the fœtus lies over the os uteri, as the head or breech, by their ſize and adaptation to the ſhape of the brim of the pelvis, generally prevent any other body from entering the paſſage with them. When, however, the funis is of an extraordinary length, it will ſometimes enter the pelvis before the head or breech of the child, and conſequently precede them. If this caſe be neglected, and the labour ſuffered to go on, the funis will be gradually thruſt down by the pains, until it frees the external orifice of the vagina, and becoming cold, the blood in the veſſels will be congealed, the circulation ſtopped, and the life of the child extinguiſhed. To prevent this accident, authors have recommended carrying the funis up into the uterus with the hand, beyond the preſenting part, and detaining it there, until ſome part of the child enters, and fills up the brim of the pelvis. To do this the more effectually, we are told to incloſe the pendent part of the funis in a linen rag, or in a bag made of ſoft leather. But theſe methods, Dr. Denman rightly obſerves, have rarely been found to ſucceed, (ſee his Introduction to the Practice of Midwifery, 4to. p. 559,) the funis generally following the hand, when it is withdrawn, or coming down with the following pains. If we are called in late, and the funis has been down ſo long that the life of the child is deſtroyed, or if the child was dead before the commencement of labour, (and in either caſe we may know that to have happened, from the total want of pulſation in the funis,) the labour may then be conducted in the ſame manner as if the funis had not preſented, as it will not occaſion any impediment to the birth. That is, if the head, feet, or breech prove either of them to be the part preſenting, the woman is to be encouraged, and the child ſuffered to come into the world in the way it offers, giving only the aſſiſtance directed under the articles *Natural* LABOUR, BREECH, or FEET *preſentations*, which ſee. We ſhould be particularly careful, in this caſe, to conceal from the mother the death of the child, the knowledge of which, by diſpiriting her, might damp, or even put a total ſtop to the pains, and thence materially retard the labour, or in delicate habits, occaſion flooding, or convulſions. On the other hand, if from perceiving a pulſation in the funis we are ſatisfied the child is alive, inſtead of making futile and unavailing attempts to return the funis, if the os uteri is ſufficiently dilated, or is ſo ſoft and yielding as to admit it, we muſt paſs a hand leiſurely and ſlowly into the uterus, whatever may be the preſenting part, and turn the child, and bring it by the feet. For the manner of doing this, ſee LABOUR, *Preternatural*. But if the head of the child be too far advanced in the pelvis, before we are called, to make this practicable, or ſafe, we muſt content ourſelves with keeping the funis in the vagina, to prevent its contracting cold, and as far out of the way of preſſure as we can, and leave the excluſion of the child to the pains; or if the pains ſhould be ſlow and feeble, and the head of the child, after deſcending ſo low as to preſs upon the external orifice, ſhould remain there, little moved by the pains, we may aſſiſt them, and accelerate the birth by uſing the lever, or the forceps. The lever, perhaps, will, generally ſpeaking, be moſt adviſeable in this caſe, as leſs likely to preſs or injure the funis, more eaſy in its application, and more ſpeedy in producing the deſired effect.

FUNIS *Crepitans*. See CISSUS.

——*Muræna rum*. See MELASTOMA.

——*Muſarius*. See UVARIA.

——*Quadrangularis*. See MENISPERMUM.

FUNIS *Urens*. See TRAGIA.

FUNK ISLAND, in *Geography*, a ſmall iſland in the Atlantic, near the N.E. coaſt of Newfoundland. N. lat. 50°. W. long. 52° 15'.

FUNKAKUN, a town of Perſia, in the province of Mazanderan; 15 miles W. of Fehrabat.

FUNKS TOWN. See JERUSALEM.

FUNNEL *of a Chimney*, the ſhaft or ſmalleſt part of the chimney from the waiſt upwards. Palladio orders, that the funnel be raiſed three, four, or five feet at leaſt, above the roof, that it may carry the ſmoke clear from the houſe into the air.

Care, too, is to be taken as to the width; becauſe, if it be too wide, the wind will drive back the ſmoke into the room: and if too narrow, the ſmoke will not be able to make its way. Chamber chimneys, therefore, are not to be made narrower than ten or eleven inches; nor broader than fifteen. See CHIMNEY and FLUE.

FUNNEL, in *Engineery*, ſignifies the ſame with culvert, or drain.

FUNNEL, in *Chemiſtry*, &c. a well known inſtrument uſed in decanting and filtering liquors, and made either of glaſs or pewter or tin, or tinned iron, or earthen ware. Some are *ribbed*, in order to ſupport large paper filters; and the funnel, called *ſeparatory*, is intended for the ſeparation of liquids of different ſpecific gravity, by allowing the heavieſt only to drop out of the narrow part of the inſtrument.

FUNNEL *Polype*. See POLYPE.

FUNNEL-*ſhaped Hollows*, in *Geology*, is a phenomenon which Mr. Jameſon has obſerved, (Geognoſy, p. 34. 172.) in gypſeous diſtricts; and we have obſerved ſimilar dimples, or depreſſions, in the chalk ſtrata about Fakenham in Norfolk, and other places, ſeemingly occaſioned by the gradual breaking in of the ſuperficial ſtrata, into cavities in thoſe beneath; as we judge from the ſimilarity of theſe funnel-ſhaped hollows to old ſhafts which have in the miners' phraſe *run-in*.

FUORTI, in *Geography*, a town of Naples, in Abruzzo Citra; 21 miles S.S.E. of Salmona.

FU-RAN. See EPIDENDRUM.

FUR. See DARFUR.

FUR, in *Commerce*, is a general term, comprifing the ſkins of different kinds of wild animals, that are found in high northern latitudes, particularly thoſe forming part of the American continent; ſuch as the beaver, bear, mooſe-deer, marten, mink, woolverin, wolf, &c. &c. &c. When theſe ſkins are in an unimproved ſtate, as they come from the hands of the Indian hunters, they properly claſs under the denomination of *peltry*; but when they have had the inner ſide converted into leather, by an aluminous proceſs, they then aſſume the appellation of furs; and the art of thus manufacturing them is called *furriery*.

FURS, or *Furrs*, is a term, in its confined ſenſe, applied to the ſkins of different hairy quadrupeds, when they have undergone an aluminous proceſs, by which the inſide integuments are converted into a kind of coriaceous ſubſtance. In this view *furs* differ from *peltries*, which are the ſame ſkins in the ſtate they are taken from the animals, and ſimply dried, or in a ſtricter meaning of the word, the latter only compriſes ſkins covered with ſhorthair, as the deer, elk, buffaloe, &c., principally manufactured into leather. But in a general ſenſe, the term fur includes all kinds of ſkins which are uſed in furriery, *viz.* bear, beaver, mink, marten, otter, fox, ermine, ſable, ſquirrel, cat, hare, rabbit, &c. Reſpecting the relative eſtimation of the various kinds much appears to depend upon the ſeveral uſes to which they are generally applied; and their intrinſic value upon the climate, whence they are brought, the age or health of the animals, and the ſeaſon of the year when caught and killed. It has been frequently remarked by natural hiſtorians, that the colder the country, the larger and warmer is the fur of each animal; it being wiſely provided in the economy of nature, that the clothing of the inhabitant ſhould be adapted to the rigours of his ſituation. Thus the fox and wolf, which in temperate climates have but comparatively ſhort hair, in the frozen regions near the pole are covered with a fine long and thick fur. The beaver and the ermine, which are found in the greateſt plenty in high northern latitudes, are remarkable for the warmth and delicacy of their furs. It is not an eaſy taſk to account for this remarkable warmth of furs in northern quadrupeds. Some have ſuppoſed it originates in ſpare and ſcanty diet, with the difficulty of obtaining food, to which animals in ſuch climates are ſubjected. Others, with more probability, have aſcribed it to the ſeverity of the cold, contracting the pores of the ſkin, ſo that the hair conſequently takes the ſhape or ſize of the orifice through which it grows; as wires are made ſmaller and longer by being drawn through narrower apertures. From whatever cauſe it may ariſe, ſuch is the fact; and farther, all the animals of the arctic climates may be ſaid to have their winter and ſummer garments, except very far to the north, where the cold is ſo continually intenſe, that, according to Crantz, no change of colour is perceivable either in the fox or bear. Hence it is, that the furs of high northern latitudes are better in quality than thoſe of more temperate climes; the produce of Siberia ſuperior to thoſe of Ruſſia; and the imports from Canada preferable to thoſe from the United States. This fact alſo accounts for the difference of value in ſimilar articles brought from the ſame country; for during winter the furs of moſt animals improve both in quality and colour. Indeed ſome kinds, as thoſe of the iſatis or croſs fox, unleſs killed at that ſeaſon, are in no eſtimation.

Of the leaſt valuable among the kinds of furs, thoſe of the rabbit and hare may be claſſed, although they are more generally known from the circumſtance of their forming a conſiderable article in the hat manufacture; for which purpoſe vaſt quantities are imported from thoſe countries bordering on the polar regions, where they are found as white as the ſnow they traverſe, and in ſuch plenty, that they are ſold on the ſpot, or rather bartered for the value of five ſhillings per hundred. It is not eaſy to aſcertain the exact time when furs were firſt uſed in the hat trade. The ſtipulations for the preſervation of rabbits in different treaties reſpecting Calais, ſigned between the Engliſh and French, previouſly to the year 1440, have induced ſome writers to ſuppoſe the improvement was adopted about the beginning of the fifteenth century. But even in the time of Elizabeth the wearing of hats was reſtricted by act of parliament to the upper claſſes in ſociety; the middling and lower being confined, under forfeiture of a penalty, to the uſe of knit caps. This act, however, was ſoon after repealed, and the uſe of felt hats, and others manufactured from fur, came into general wear. In 1638, king Charles having incorporated the makers of theſe hats and caps into a privileged company, he affixed regulations for the trade, prohibited the importation of beaver hats, and reſtricted the hatters to the uſe of that article, allowing the admixture of other ſubſtances, only in hats and caps, called *demi-caſtors*, intended for importation. From this period may be dated the increaſe in the value of the beaver fur, which now ſupplies that manufacture with its moſt valuable commodity. Of beavers, the

ſkins of the middle-aged or the young, called cub-beaver, is the moſt valuable, the wool being the fineſt, moſt gloſſy, and ſuſceptible of the moſt permanent dye.

Fox ſkins furniſh a conſiderable variety of furs. In the cold countries animals of this ſpecies are of all colours, white, grey, blue, iron-grey, ſilver-grey, variegated and black. Of theſe, the laſt is the moſt valuable, and the firſt the leaſt. The hair of the white fox is very liable to fall off; the blue are ſought for with avidity, owing to their ſcarcity; and the black fetch a high price, from their juſtly acknowledged beauty. The generality of this kind of ſkins, like thoſe of the wolf and bear, are manufactured into muffs, tippets, cloaks, and other defenſative articles of winter dreſs.

The different ſpecies of animals which conſtitute the weaſel genus furniſh many of the fineſt and moſt generally eſteemed furs. The fur of the wild-cat is ſoft and warm, but from an offenſive ſmell, which it tenaciouſly retains, the value falls below that of others of a very inferior kind. The marten affords a ſkin of various colours, but the part of it held in the higheſt eſtimation is that browner than the reſt, extending along the ſpine. The ſkin of the ſable is highly coveted, which is in colour a browniſh black, and the darker the more deſirable it becomes. The fur of this animal is finer, ſofter, and more gloſſy than that of any other quadruped, except its equally eſtimable congener the ermine, which is the moſt valuable of any hitherto known. In ſummer the ermine is brown, and called the ſtoat. It is in winter only that this little animal has its fur of the proper colour and conſiſtence. At the approach of the inclement ſeaſon the hair, from being coarſe and ſhort, lengthens and grows finer, while numerous ſmaller hairs riſe up between the longer, thicken the coat, and give it all the warmth and ſoftneſs which is ſo much admired in the furs of northern animals, and ſets ſo high a price upon their ſkins. The ſnowy whiteneſs which the ermine's fur aſſumes at that time of the year confers on it alſo an additional value.

Many other animals afford furs of various qualities, which, according to their uſes, differ as to the degree of eſtimation in which they are held; as the woolverin, raccoon, muſquaſh, genet, and ſloth, the fur of which laſt poſſeſſes ſuch a beautiful luſtre as to give it the preference to that of all other animals, except the ermine, ſable, and Siberian fox. Another fur-bearing animal of the American continent, and lately diſcovered, muſt not paſs unnoticed, becauſe it is likely, at no diſtant period, greatly to enhance the importance of the trade in articles of this deſcription, the ſea-otter. This inhabitant of the New World furniſhes a complete rival to any in the Old; its fur being, in the opinion of experienced judges, the fineſt and moſt deſirable for many purpoſes of any yet produced in all parts of the globe. Captain Clarke, who ſucceeded captain Cook, collected a quantity in the vicinity of Nootka Sound, and carried them to China, where they ſold as high as one hundred dollars per ſkin. The account of this induced other adventurers to open a trade to Canton; but the Chineſe emperor, jealous of European communication, quickly prohibited this branch of commerce. The Columbia, Miſſouri, and other rivers, which riſing in the north-weſt parts of America, fall into the great Pacific ocean, are known to abound with ſea-otters; and theſe will probably ſoon furniſh a new ſource of profitable ſpeculation.

Fur *Trade*. The uſe of furs and peltry is nearly coeval with the hiſtory of man. From the primeval pair having been clad in veſtments of ſkins, the cuſtom of adopting ſuch a kind of dreſs was obviouſly deduced, and the multiplication, and ſubſequent diſperſion of mankind, for peopling the earth, would extend and perpetuate the uſage during the firſt ſtages of civilization.

"——————————Cum frigida parvas
Præberet ſpelunca domos, ignemque Laremque,
Et pecus & dominos communi clauderet umbra:
Silveſtrem montana torum cum ſterneret uxor
Frondibus, & culmo vicinarumque ferarum
Pellibus."

Juvenal Sat. l. vi.

Accordingly, hiſtorians and poets deſcribe people in the ruder ages of the world, when hunting and fighting appear to have been their principal employment, as uſually clothed in this manner: and the cuſtom would prevail till art had taught the ſuperior advantages of wool, and invention afforded her aſſiſtance in its multifarious fabrication. Thus Virgil, when he deſcribes Æneas about to take his departure from Troy, repreſents him as having his outer veſt formed of a lion's ſkin.

"Hæc fatus, lateros humeros ſubjectaque colla
Veſte ſuper fulvique inſternor *pelle* leonis."

Æneid, lib. ii.

In book the fifth, he depicts Aceſtes as formidably clad in the ſkin of a Libyan bear.

In the various iſlands and countries lately brought to our knowledge by numerous voyages of diſcovery, and where the arts appear in a ſtate of infancy, the uſage of wearing furs and ſkins is ſtill prevalent among the natives; from the northern point of Kamtſchatka to the moſt ſoutherly iſlands in the Pacific ocean, from the ſeats of the Nathana and Quarrelling Indians to the great wall which ſeparates China from the Siberian deſarts. As tribes multiplied, cultivation increaſed, and conſequently woods diminiſhed, the haunts of undomeſticated animals would become more diſtant from the habitations of man; hunting and killing them would thus become more toilſome, which muſt neceſſarily enhance the value of ſkins, and what originally were conſidered as cheap and common neceſſaries, would at length be claſſed among the more valuable and coſtly commodities. In the ſacred book of Exodus, among the offerings made towards erecting the tabernacle for Jehovah, are enumerated purple, ſcarlet, and fine linen, with goat-ſkins, red ſkins of rams, and badger ſkins. The ſacred book of Numbers, which contains precepts for purification, provides that every thing made of ſkins, and all goods manufactured from goats' hair, were in a particular manner to be purged; becauſe they were calculated to retain longer the principles of contagion. From which paſſages it appears, that ſkins were not only uſed for furniſhing ſome portions of dreſs; but were alſo conſidered of great value long ſubſequent to the time when the arts of weaving and dyeing were diſcovered.

At what period, or among what people, furs became an article of luxury, is a ſubject on which little can be collected for elucidation. They do not appear to have conſtituted any part of dreſs worn by the patrician orders in the enlightened nations of Greece and Rome. Their uſe was probably confined to the northern parts of Aſia and Europe; and the cuſtom afterwards might have been extended to the middle and ſouthern parts of the latter continent, by thoſe immenſe hordes, which deſcended and deluged the Roman empire like a flood, the Goths and Vandals.

The hiſtory of various nations tends to ſhew that furs were anciently uſed to ornament the robes of princes, grandees, and perſons delegated with high authority. Veſtiges of their uſe in theſe reſpects are ſtill viſible in England, in the ſtate robes of the king, the nobility, judges, and other perſons

ſons of diſtinction, and in the public dreſſes of the chief magiſtrates, and officers in municipal corporate bodies. Their uſe is diſtinctly traceable in the bordering, impaling, quartering, and divers forms belonging to emblazonry in armorial bearings; where vair and ermine ſtill hold a conſpicuous rank. All which demonſtrate the prevalence of the cuſtom of furred garments in ages far remote from the preſent.

Of the fur trade at an early period, little has been recorded, though it certainly muſt have formed a conſiderable branch of commerce. There exiſted ſeveral reaſons why little has been detailed on this ſubject, as to the nature, extent, or mode in which the merchandize in furs and peltry was conducted. Previouſly to the diſcovery of the New World by Columbus, the furs, in general demand for Europe, were procured from the north and north-eaſtern parts of the Ruſſian empire. The diſcovery and annexation of the extenſive territory of Siberia in the ſixteenth century added greatly to the wealth and power of Ruſſia, by the numerous fiſheries, iron works, and particularly by the extenſive field it opened for the trade in furs. But previouſly to the direct communication with that empire by the Ruſſian company, formed under the auſpices of the celebrated Sebaſtian Cabot, and the diſcovery of the port of Archangel by captain Richard Chandler, the fur trade in the north-eaſt had been carried on through the ports of Livonia, lately poſſeſſed by the Teutonic knights of St. Mary of Jeruſalem, a republic, of which the Hanſeatic towns not along ago were the only remaining part; the Ruſſians, anterior to that period, not poſſeſſing any ſea-ports or ſhipping on the ſhores of the Ba'tic. Thus the articles, which conſtituted this department of commerce, found their way to a market by the interior of the north of Europe. In conſequence of this circuitous conveyance, the deſpotic nature of the Ruſſian monarchs, and the narrow policy adopted by that government, it was ſcarcely known for a long period from what particular places, or by what mode of intercourſe the furs and ſkins were procured. But the Livonian war having greatly injured the trade, the czar was induced to accede to the requeſt of the Engliſh merchants for permiſſion to trade directly to the Ruſſian coaſt.

The diſcovery and colonization of America, particularly the northern parts of it, bordering on the gulf of St. Lawrence and Hudſon's bay, gave a new turn to mercantile ſpeculations in furs and peltry.

Hudſon's bay was diſcovered by ſir Thomas Burton, and further ſurveyed in queſt of a north-weſt paſſage during the reign of Charles the Firſt, by captain Luke Fox. Afterwards prince Rupert, and ſeveral noble aſſociates, having ſent out captain Newland, on an exploratory voyage to the bay, and finding by the narrative of his proceedings that an advantageous commerce might be carried on with that part of the American continent, they determined to form an united company for the purpoſe of opening a new ſource of trade and wealth. In this purſuit they were encouraged by the return and ſucceſsful adventure of captain Gillam, who about the ſame period had been diſpatched on a trading voyage by ſome merchants of Briſtol. An application to the crown obtained for the aſſociation a charter for the excluſive right to attempt the diſcovery of a north-weſt paſſage, to proceed in that direction on mining inveſtigations, and to open with the natives of the Terra Incognita a trade in furs. By this charter, dated May 2, 1670, they were incorporated under the title of the governor and company of adventurers of England, trading to Hudſon's bay, with the ſole and excluſive privilege of navigating in all ſeas, bays, ſtraits, creeks, lakes, rivers, ſounds, &c. that lie within the entrance of the ſtraits, commonly called "Hudſon's ſtraits." This charter was a very ample one, and for a time had a moſt diſaſtrouſly excluſive effect upon the trade in furs. But ſuch charters, happily for commerce, were greatly abridged of their extenſive privileges, by one of thoſe eminent bulwarks of Engliſh liberty, which have at ſeveral important epochs diſtinguiſhed the conſtitution of Britain. By a ſtatute, enacted in the firſt year of king William and queen Mary, entitled "An act for declaring the rights and liberties of the ſubject, and ſettling the ſucceſſion of the crown," the privileges of the company, like every other not ſanctioned by an act of the legiſlature, were diſannulled, and though they ſtill pretend to poſſeſs prohibitory powers, every Britiſh ſubject has an equal right to participate in the trade to that quarter. Their firſt factory, fort, or eſtabliſhment on Nelſon river, was formed in the year 1682, and a Mr. John Bridgar was made governor. Soon after they ſet up others in different parts of the bay; but the French, who were jealous of the interference with the Indians, in the vicinity of their Canadian ſettlements, ſeized upon the forts, and diſpoſſeſſed the ſettlers. On application to the French court reſpecting this outrage, it was deemed a piratical act, and the king of France, as an indemnity, gave the company the French fort and factory on the river Hayes. Although the French in Canada did not at firſt pretend to a property in the countries about Hudſon's bay, yet in a few years after the company was eſtabliſhed, ſo early as 1674, their jealouſy of the Engliſh enterprize was very manifeſt. They became exceedingly troubleſome to the outpoſts, and erected a fort within eight days journey of the ſettlement on prince Rupert's river. They alſo endeavoured, by underſelling us in their barter with the Indians, to ruin our trade and intereſt with thoſe ſavages, which they were enabled effectually to do by their contiguity; the neareſt parts of Canada not being diſtant more than 150 miles from the above mentioned factory at fort Nelſon.

From this period, till the year 1714, the company's people were frequently annoyed and haraſſed by their litigious and ambitious neighbours; till, by the treaty of Utrecht, lines of demarcation were drawn between the two countries, and definitive articles agreed upon relative to the trade. After this they extended their concerns, and erected new ſettlements. In 1730 they poſſeſſed five, *viz.* on Albany river, Hayes's iſland, Rupert's river, Port Nelſon, and New Severn. The country about Hudſon's bay is very inhoſpitable and unfriendly to vegetable productions; for even in the ſouthern part, in the latitude of 51 degrees, it is exceſſively cold nine months in the year. In ſo wretched a country, therefore, there can be no plantations, properly ſo called, nor any towns and villages. The reſident traders therefore muſt be ſupplied with bread, beef, pork, flour, peas, and other neceſſaries from England, or ſome parts of America. With the poor ſavages of the country, commerce can be conducted by no other means than *barter;* and the beaver is made the medium, or agio, of exchange. Thus, for inſtance, the company for one beaver's ſkin, at one period, gave half a pound of gunpowder, four pound weight of lead ſhot, two hatchets, half a pound of glaſs-beads, one pound weight of tobacco, eight ſmall, or ſix large knives, one large and two ſmall powder horns. For 12 good winter-beaver ſkins, a gun of the beſt ſort; for eight do. the ſmalleſt ſized gun; for ſix do. a good laced coat; for five do. a plain red coat; for four do. a woman's coat; and ſo proportionably for kettles, looking-glaſſes, combs, &c. Arthur Dobbes, eſq. who publiſhed, in 1743, an account of Hudſon's bay, furniſhes this ratio of exchange between the company's agents and the Indians. A beaver ſkin, he ſays, as the medium of circulation, is the eſtabliſhed price of the

undermentioned articles, *viz.* a pound weight of braſs kettles, one and a half pound of gunpowder; five pounds of lead ſhot, ſix pounds of Brazil tobacco; one yard of bays, two combs; two yards of gartering, one pair of breeches, one piſtol, or two hatchets. Other kinds of goods procured from the ſavages are doubtleſs valued in a ſimilar manner, although he has not detailed the reſpective proportions. In the catalogue of Britiſh manufactures given in lieu of them, he enumerates the following; "glaſs-beads, black-lead, ſugar, thread, vermilion, brandy, broad cloth, blankets, duffels, flannel, awl-blades, buttons, fiſh-hooks, fire-ſteels, files, guns, flints, yarn, mittens, handkerchiefs, hats, hawk-bells, knives, ice-chiſſels, looking-glaſſes, needles, net-lines, rings, runlets, ſword-blades, ſpoons, ſhirts, ſhoes, ſtockings, ſaſhes, worſted, thimbles, tobacco-boxes, tongs, trunks, wine, &c. &c."

This year, 1730, the company imported 11,040 coat and parchment beaver ſkins; 4404 do. cubs; 3330 damaged and ſtage-parchment; 990 do. cubs; 1648 martens, 3130 damaged do.; 380 otter ſkins; 890 cat ſkins; 260 fox ſkins; 540 woolverins; 400 black bear ſkins; 190 wolves ſkins; and 30 wood-ſhocks. In 1737, the company exported to the value of 4124*l.* 18*s.* 2*d.* The year following, 3879*l.* The ſame author gives the following ſtatement of one of the company's ſales in the year 1740, *viz.* "17,780 beaver ſkins, and 49,600 ſkins of all kinds, 2360 pound weight of bed feathers, 160 of caſtoreum, 610 whale fins, and 120 gallons of whale oil." He further obſerves, "that as there are two ſales every year, and the company reſerves three-fifths of their beaver ſkins for their ſecond ſale, but no other ſkins; then the ſecond ſale muſt have had 26,670 beaver ſkins, and both the ſales muſt have furniſhed 44,450 beaver ſkins." He has alſo given the company's entire ſale for the year 1743, with the prices affixed, *viz.*

		£.	s.	d.
26,750	Beaver-ſkins, ſold for	9780	4	0
12,370	Martens ſkins, do.	4242	7	0
2,360	Damaged do. do.	442	10	0
590	Otter ſkins, do.	413	0	0
850	Cat ſkins, do.	413	0	0
260	Damaged do. do.	52	0	0
320	Foxes	200	0	0
600	Woolverins	205	0	0
170	Do. damaged	27	12	0
320	Black bears	368	0	0
1580	Wolves	1580	0	0
270	Do. damaged and ſtags	123	15	0
40	Woodſhock ſkins	22	6	0
10	Mink ſkins	1	10	0
5	Raccoon ſkins	0	16	0
120	Squirrel ſkins	2	0	0
		17,874	0	0

The following articles he adds without enumerating their prices, *viz.* 130 elk ſkins, 440 deer ſkins, 3170 pound of bed-feathers, and 220 pound in a tick, 140 caſtoreum, 470 whale-fins, 23 caſks of whale oil, and 8 pound of weſaguipaka.

	£.	s.	d.
And in their March ſale, 40,125 beavers, worth	14,670	0	0
Unvalued goods, about	400	0	0
Total amount of the trade in 1743	33,396	0	0

A literary controverſy, between Mr. Dobbes and Capt. Middleton, concerning the paſſage through Hudſon's bay weſtward to China, and the nature of the company's trade with the ſavages, has brought to light more particulars for the illuſtration of this ſubject, than either the company would have been inclined, or the public could have expected them to communicate. Upon the allegations, in theſe and other pamphlets, reſpecting a north-weſt paſſage to the ſea of Japan, that the Hudſon's bay company had not hitherto encouraged any attempts for the diſcovery of ſuch a paſſage, and that a more extenſive and beneficial commerce might be carried on with the countries bordering on the bay, if the trade were laid open; the houſe of commons appointed a committee to inquire into the truth of ſuch ſtatements. By the papers and books produced on that occaſion, it appears the original fund of the company was 10,500*l.* This, in the year 1690, was trebled, making 31,500*l.*; which was again trebled in 1720, amounting to 94,500*l.*; and by a partial payment of 10*l.* per cent. on a new ſcheme of enlargement, the capital was augmented to 103,500*l.* Mr. Robſon, who had ſome years been ſurveyor for the company, and on this occaſion ſeemed rather a diſguſted evidence againſt them, informs us the company's four ſmall factories contained only 130 ſervants, and two ſmall houſes, with eight men in each; the value of their annual exports was about 4000*l.*; and that in time of peace they employed three ſhips of 150 to 200 tons burthen, with two or three ſmall ſloops, conſtantly ſtationed in the bay. The company, he obſerved, have always been extremely averſe either to make diſcoveries, or permit others to attempt ſuch undertakings, apprehenſive, whenever the improvable value of the colony and trade ſhould be known, government might be inclined to take the one under its own protection, and to lay open the other to the nation at large. They, therefore, have contented themſelves with dividing among only a hundred perſons a large profit upon a ſmall capital. This profit, according to his ſtatement from the documents laid before the parliament, is enormous. Taking the beaver ſkin as the ſtandard, he thus proceeds, "for a quart of Engliſh ſpirits, which the company export at ſix-pence, and before they ſell it to the natives, mix it with one-third water, which reduces it to four-pence; they take a beaver ſkin, which has been ſold at the company's ſale, at a medium of ten years, for ſix ſhillings three farthings the pound, and a beaver-ſkin generally weighs a pound and a half; ſo that they get nine ſhillings and one penny for four-pence, which is 2700*l.* per cent. profit. Upon other articles not ſo material, they do not gain above 500*l.* or 600*l.* per cent.; but in exchange for martens the profit is double of that upon beaver; for they value three martens only as one beaver, and thoſe, at a medium of ten years, have ſold for ſix ſhillings a ſkin. It appears alſo from the ſtandard that one-third more is charged upon many articles at Nelſon and Churchill factories, than at Mooſe and Albany; thoſe factories being farther from the French, who till within theſe few years had not intercepted the trade there; and not content even with this extravagant profit, the factors are allowed to ſell their goods conſiderably above the ſtandard, which is called the profit upon the *overplus* trade; yet with all this advance upon their goods the company is reduced by the expence of management, ſhipping, factories, officers, and ſervants, to a little more than 200*l.* per cent. For by a medium of ten years trade, their ſales amount annually to 27,354*l.* 5*s.* 5¼*d.* and their expences to 19,417*l.* 8*s.* 6*d.*; their net profit, therefore, at the ſame medium, amounts to 7,936*l.* 16*s.* 11¾*d.* which upon 3,674*l.* 3*s.* 1¾*d.*, their annual export at the ſame medium, is about 216*l.* per cent. profit upon the annual ſtock in trade, and near 7⅔*l.* upon the

the nominal capital of 103,95*l.*"—But from this ſtatement, compared with Mr. Dobbes's, the profits of the concern are by no means ſo enviable as might at the firſt glance be imagined. For upon viewing the proceeds of the company's ſales, it may be obſerved, that if their capital ſtock be about 100,000*l.* that thereon they had not for many years divided more than 10*l.* per cent, and if the ſale in 1743 be any rule to determine for other years; the reſt being abſorbed in the company's annual expences for ſhipping, forts, garriſons, ſalaries, and home charges, which may amount to about 20,000*l.* So that although Mr. Dobbes has evidently ſpared no exertions to become maſter of his ſubject, yet, after all, conſidering the riſks to which the company are conſtantly liable, their gains, as captain Middleton obſerves, "are little to be envied. Indeed their recent dividends of eight per cent. form no very alluring object for mercantile ſpeculation. The laſt mentioned author, in his pamphlet, printed in 1743, ſtates, "that until a little above twenty years before, the voyage to Hudſon's bay was ſeldom made without wintering there." This ſhews the company have by that alteration made a conſiderable improvement, and great ſaving muſt accrue from ſuch an economical meaſure. But the exiſting neceſſary expences might be materially diminiſhed, except in the article of freight, if the trade were laid open, the country ſettled, and the poſſeſſions thus ſecured without charge; whilſt the exports and imports would be greatly increaſed, perhaps as ſome have calculated, to one hundred times their preſent value, for there is a ſufficient ſcope; and an extent of country, which by proper cultivation, and due encouragement to the natives, to ſupport the computation. Indeed this latter meaſure, the civilization of the Indians, is highly deſirable; for by inſtructing them in the knowledge of uſeful arts, and inducing them to attain habits of induſtry, by allowing a fair and equitable trade, a ſolid foundation might thus be laid for their converſion to Chriſtianity.

Reſpecting the future progreſs of the trade, and the nature of its concerns, little more can be collected than what is furniſhed by the invoices of the cargoes, imported in the company's ſhips; and the reports of their public ſales. For ſubſequent to the parliamentary inveſtigation they have been unuſually jealous of inquiry, and peculiarly tenacious of information. A few notices, extracted from theſe, will ſerve to elucidate ſimilar kinds of ſtatements; which will be found in the ſubſequent account of the Canadian branch of this commerce. From the time of Mr. Dobbes's ſtatement, the concern for ſome years was evidently on the decline; but after the American war had terminated in eſtabliſhing the independence of the United States, this, among other kinds of traffic, was more vigorouſly purſued with thoſe parts of America ſtill ſubject to the crown of Great Britain. The importation of the year 1789 affords the following reſult, *viz.*

"Coat beaver ſkins 4,900; parchment ditto 26,750; cub ditto 14,900; marten 25,900; otter 2,650; cat 1,530; fox 3,790; woolverin 240; bear 400; wolf 2,420; fiſher 160; mink 460; raccoon 480; muſquaſh 5,200; elk 26; deer in the hair 2,980; rabbit 5,000." In the year 1791 the company made an alteration in the mode of ſale. Inſtead of allotting the different ſkins and furs according to their kind, they arranged each kind in ſix different claſſes, according to their reſpective goodneſs and value; but more eſpecially with the view to the various uſes to which they might be applied. By the adoption of this plan, the company became wholeſale furriers, as well as importing merchants; and by dividing of qualities, and deſignating uſes, united the double profits of two very beneficial concerns.

The following is the ſtatement, in the report of the ſale for 1791.

	AR	MR	EM	YF	SR	CR
Coat beaver	1100	50	34	1957	104	1133
Parchment do.	7387	2899	3047	18,493	4047	4738
Cub do.	2227	651	550	1848	880	350
Marten	6499	2641	3614	1947	3773	2471
Otter	4524	506	485	441	600	149
Cat	477	228	43	748	86	21
Fox	227	281	2142	2811	143	221
Woolverin	11	2	6	138	7	38
Black bear	205	100	77	36	26	3
White do.	—	—	6	6	—	—
Wolf	5	—	19	3174	14	19
Fiſher	72	46	27	37	—	—
Mink	204	159	44	119	—	50
Raccoon	203	180	183	38	—	—
Muſquaſh	2197	5960	580	180	51	36
Deer	39	—	324	1218	1313	142
Rabbit	2745	1530	3233	1286	496	—
Squirrel	—	—	152	144	—	20

The greateſt importation the company appears to have made, was in the year 1794, which amounted, as per invoice of cargoes, to 37,777 parchment beaver ſkins; coat do. 4024; cub do. 14,740; and the various kind of ſkins nearly in an equal proportion. From this period the decline of imports is evident from almoſt every annual ſale report. That for 1807 and 1808 will exhibit very nearly the preſent ſtate of the company's trade.

	AR	MR	EM	YF	SR	CR
Beaver coat lbs.	125	36	—	433	90	327
Do. parchment whole ſkins	4869	2619	553	3304	781	1279
Do. cub	2732	1604	302	1593	404	692
Marten	10,965	5613	3291	9270	6131	4912
Otter	988	382	339	953	611	174
Cat	125	360	116	273	17	161
Fox, about 2500 white	3439	338	1960	6986	335	226
Woolverin	34	—	19	174	14	72
Black bear	165	43	76	146	5	79
White do.	11	—	4	4	30	3
Wolf	1669	2	14	2475	2	98
Fiſher	284	37	—	95	—	1
Mink	395	405	76	831	63	110
Raccoon	794	120	241	295	—	50
Muſquaſh	1552	4683	1795	11,698	600	718
Deer	292	—	51	3453	—	645
Rabbit	2886	2910	6865	18,185	3900	—
Swan	—	—	—	396	—	—

The following is the amount of the quantity imported by the Hudſon's bay company in the year 1808, as appears from the ſale report for 1809, *viz.* beaver coat 1684 lbs.; ditto whole parchment ſkins 20,821; ditto cub ditto 12,063; muſquaſh 33,706; otter 5077; cat 2788; fox 1370; ditto kitt 2371; woolverin 163; bear, black, 971; ditto, white, 89; wolf 3704; fiſher 71 mink 3185; raccoon

coon 5339; deer 5339; ſwan 1067; ſquirrel 905; rabbit, 25,914. The higheſt price of coat beaver was nineteen ſhillings and ſixpence per pound, the average fifteen and ſixpence; parchment ditto twenty-three ſhillings and ninepence, average ditto, twenty-one ſhillings and fourpence; cub ditto, twenty-three ſhillings, average ditto, twenty-one ſhillings and eight-pence. In this ſtatement, it is proper to obſerve, that theſe prices were obtained for the prime and fair articles; what are called damaged and *ſtaged* ſkins, of which there is a very conſiderable portion in every annual importation, are ſold at very inferior ſums.

Canada, the grand entrepot, or market of communication for the trade in furs and peltry, was firſt colonized by the French, who viſited America for the purpoſe in 1540; when M. Cartier and baron Roberval, with about 200 men and women, as ſettlers, ſailed from St. Maloes with five ſhips, and proceeded up the river St. Lawrence, four leagues above the haven of St. Croix; where, having landed, they conſtructed a fort for the protection of the infant colony. Emigration and population proceeded ſo rapidly, that the country, near the north bank of the river St. Lawrence, ſoon became well peopled, ſo that from the account given of it by governor Lahontan, about the end of the ſixteenth century, the number of inhabitants amounted to 180,000. In the year 1603, the French went higher up the river, and began to ſettle in the country now called Canada, or New France, on the north ſide of the river, and erected houſes at the point of Trois Rivieres; but they did not extend ſo high as Quebec till the year 1608. They continued to erect habitations and forts in the ſame direction, between Quebec and Montreal till 1629, when the country was taken by an Engliſh force under the command of ſir David Kirk, but was ſhortly reſtored again to France. For a ſeries of years this valuable territory was much neglected by the mother country. During a long time the further colonization was left to private individuals, who fitted out expeditions of adventure at their own expence. Theſe were uſually men of rank and fortune, who obtained from the government an excluſive right to trade with the native Indians for divers kinds of furs and peltries, then the principal articles of Canadian commerce. But experience quickly demonſtrated that theſe expeditions were upon too ſmall a ſcale to inſure either the ſucceſs or the ſafety of the ſettlers, who were conſequently ſubject to be haraſſed by continual incurſions of the Indians for the ſake of plunder. From the year 1535, when it is ſaid Quebec was firſt diſcovered, to the year 1664, the government and trade of Canada were entruſted to private merchants, holding under patents, granted by the king of France. In the year 1664, the two departments were ſeparated, and changed poſſeſſors; the crown aſſuming the government, while the trade was put excluſively in poſſeſſion of the company des Indes Occidentales. But even after the French government had taken the colony under its own more immediate care, greater attention appears to have been paid to the ſpreading of the Roman catholic religion, by numerous miſſionaries exploring the interior, and cultivating friendſhip with the various Indian tribes, for the furtherance of the fur trade; than to the internal improvement of the country, by agriculture and arts. Indeed, from the firſt ſettlement of Canada, the fur trade was conſidered of the greateſt importance to the colony. Soon in the vicinity of the trading ſettlements, the ſkins of ſuch animals as were deemed precious in a commercial view, became ſcarce and daily more valuable. To procure the neceſſary ſupplies, the Indians were conſtrained to penetrate farther, and explore the diſtant woods for hunting purſuits, in which they were often accompanied by native Canadians. Theſe in time, by means of the intercourſe they thus obtained with perſons belonging to the remoter tribes, induced the latter to bring to the ſettlements belonging to the trade the kind of ſkins which were moſt in demaud. Such Canadians, who thus conſorted with the Indians in theſe hunting excurſions, were denominated "Coureurs des bois," and becoming a kind of pedlars or middle men, proved extremely uſeful to merchants engaged in the trade; who found it their intereſt to grant the neceſſary credit, to enable them to undertake their commercial ſpeculations. Three or four of theſe pedlars would put their property, as a joint ſtock, into a canoe conſtructed of birch-bark, which they would navigate up the rivers and lakes, and either aſcend to the places where the natives were accuſtomed to hunt, or to ſuch as they were uſed to frequent, for the purpoſes of trade. At length, to ſuch an extent did they proceed, that theſe voyages would take up from twelve to fifteen months, when the adventurers would return freighted with rich cargoes of furs, attended by numerous canoes, containing ſtill more, belonging to the Indians. The diſſolute lives of theſe men, however, tending to obſtruct the work of the miſſionaries, and leſſen the Canadians in the eyes of the natives, the ſuppreſſion of ſuch a claſs of men was attempted by an edict prohibiting any perſon from going up the country without a licence from government. But theſe licences being transferable, many of them came into the hands of the merchants, who, as they formerly did, had recourſe to the agency of the coureurs des bois, which cauſed a renewal of the former complaints; in conſequence of which, military poſts were eſtabliſhed at the confluence of the different large lakes of Canada; a meaſure which tended in a great degree to check the evil conſequences ariſing from the improper conduct of the foreſters. The trade alſo flowed in more numerous and profitable channels. Many reſpectable men, retired from the army, proſecuted the concern in perſon with great regularity, under their reſpective licences; and by perſevering induſtry extended it to ſuch a diſtance, as in that period was conſidered an aſtoniſhing effort of commercial enterprize. Theſe traders, and their miſſionaries, having combined their views, and agreed to act with concert, in the courſe of time ſecured the reſpect of the natives, and the obedience of the people neceſſarily employed in the laborious departments of the concern. Theſe religious men were of extenſive ſervice to the *commanders*, as the licenced traders were denominated, engaged in thoſe diſtant expeditions to the remote ſettlements, and enabled them to carry the fur trade as far as the banks of the river Saſkatchiwine, in latitude 53° north, and longitude 102° weſt. Thus expanded was it, notwithſtanding the reſtrictions by which commerce was oppreſſed under the French government; and thus did it ſurmount many of the moſt diſcouraging obſtacles; while at the ſame time no exertions were made from the people of Hudſon's bay to obtain the ſmalleſt ſhare in the trade of a country, which, according to the charter of that company, formed part of their own poſſeſſions; and, from its proximity, is acceſſible with ſo little comparative difficulty to the mercantile adventurer.

What the quantity of furs and ſkins was, on an annual average, that France imported from Canada, previouſly to the ceſſion of the province to the Engliſh, it is not eaſy accurately to aſcertain. Mr. Dobbes has given an enumeration of the peltry imported in the year 1743 by the port of Rochelle, the principal import place, *viz.* beaver ſkins 172,080; bear do. 16,512; raccoon do. 110,000; marten do. 30,325, otter and fiſher do. 12,428; mink do. 1700; fine cat do. 1220; wolve do. 1267; woolverins 92; grey fox,

fox, and cat do. 10,280; red fox do. 451: total 311,355 ſkins, worth about 120,000 *l.* ſterling.

On the 8th of September, 1760, the town of Montreal, together with the reſt of Canada, was ſurrendered to the Britiſh forces, under the command of general Amherſt, by the French general M. Vaudreulle; and in the treaty of peace, concluded in 1763, the whole province, and its dependencies, were ceded to Great Britain. From this invaluable acquiſition, not only did the country obtain a vaſt addition of territory; but, what is of very great importance, became poſſeſſed of the entire fur and peltry trade of the American continent. And though a portion of it was again alienated by the act, which declared the independence of the United States, yet while we retain the country on the banks of the great river St. Lawrence, the key to the lakes, and the land of furs, it muſt ever be carried on by this kingdom to the moſt conſiderable extent. Canada now become a Britiſh province, the lords of plantation addreſſed the king, that the trade might be put under the ſame regulations with that of the other colonies, except ſuch caſes as might be otherwiſe provided for by the articles of capitulation and ceſſion. Large orders for furs were now forwarded to this country from Flanders and other places on the continent, and even from Ruſſia, which, though conſidered a fur country, does not produce a ſufficient quantity for the ſupply of its own wants. But though the demands in the market were great, yet for ſome time after the conqueſt this trade appeared almoſt ſuſpended; owing to an ignorance of the country in the conquerors, their want of commercial confidence in the conquered, and the numerous diſcouragements ariſing from the hoſtile diſpoſitions of the Indian tribes, who had been in alliance with the French. Hence it was, that ſo late as the year 1766, the trade from Michilemakinac only commenced. In the undermentioned years, Mr. Macpherſon gives the number of ſkins, or furs, exported from the province of Canada, according to the returns from the offices at Quebec; where the ſpecies of furs are not diſtinguiſhed, but ſimply entered under one head of, "peltries, ſkins,"

1764, 106,035 ſkins, beſides 58 caſks, 207 bales, and 1 trunk, whereof the contents are not aſcertained.
1765, 275,206.
1766, 346,749.

Some of the adventurers now proceeded beyond Grande Portage, ſituated on a bay in latitude 48° north, and 90° weſt longitude, which has ſince that period become the principal north-weſtern entrepot of the trade. Subſequent to this an adventurer, by the name of Mr. Thomas Curry, having penetrated to the furtheſt limits of the French diſcoveries in the fur country, and returned with a ſucceſsful cargo; numerous perſons were encouraged to embark their capital, and engage in the concern, and they, or their agents, began to ſpread over every part of the country, particularly where the French ſettlements had previouſly been eſtabliſhed. The trade was now purſued with ſuch avidity and irregularity, that in a few years it became the reverſe of what it ought to have been, for the benefit of the perſons concerned. An animated competition prevailed, and the contending parties carried the trade beyond the line of domarcation laid down by the French, though with little advantage to themſelves, and to the ſerious injury of their neighbours, the Hudſon's bay company, who, in the year 1774, and not till then, thought proper to move their depot and factory to the eaſt bank of Sturgeon lake, in latitude 53° 56 north, and longitude 102° 15' weſt. Rouſed from torpidity, they now evinced more jealouſy towards their fellow ſubjects, and perhaps with greater reaſon than they had ever done towards thoſe of France. This competition, and many other incidental circumſtances, for ſome conſiderable time, injured the Canadian trade; and which, by the irregular mode it was conducted, yearly grew worſe and worſe. About this time that direful malady, the ſmall-pox, raged with uncommon virulence among the Indian tribes, and as Mr. Mackenzie deſcribes it, "the fatal infection ſpread around with a baneful rapidity which no flight could eſcape, and with a fatal effect that nothing could reſiſt, ſpreading its deſtructive and deſolating power as the fire conſumes the parched graſs." Theſe combined circumſtances reduced the fur trade of Canada to a forlorn condition. During the winter of 1783—4, the Canadian merchants engaged in this concern formed a junction of intereſts, under the name of the North-weſt Company; who divided their firm, for capital they had none, into ſixteen ſhares; each partner furniſhing a proportionate quota of ſuch articles as were neceſſary for carrying on the Indian intercourſe. The traders in the country, forgetting their former animoſities, and with the expectation of having their labours adequately rewarded, entered into a co-partnerſhip with the merchants of Montreal, engaging with the utmoſt ſpirit and activity to further the general intereſt. The trade, thus conſolidated, was directed by able men, who, from the powers with which they were entruſted, were enabled to carry it on to the utmoſt capable extent. In the year 1787, this company was joined by a rival company, which had ſtarted ſoon after the firſt was formed, and in which Mr. Alexander Mackenzie, the author of "Voyages from Montreal, &c." bore a diſtinguiſhed part. This commercial eſtabliſhment was, by union of ability, and local knowledge, founded on a more ſolid baſis than hitherto had been known in the country; and it not only continued in full force, vigour, and proſperity, in defiance of all interference from Canada, but maintained at leaſt an equal ſhare of advantage with the Hudſon's bay company, notwithſtanding the decided ſuperiority of their local ſituation. This new, or combined North-weſt company, conſiſted of twenty ſharers; of theſe, ſome were called the company's agents, and managed the concerns in Canada. Two went annually to the Grande Portage to tranſact the buſineſs there; while others were obliged to winter among the Indians, and to conduct the intercourſe with the reſpective tribes. By ſuch wiſe commercial arrangements, and prudent minor regulations, did the ſelf-created company inſure its ſubſequent ſucceſs. In the year 1788, the groſs amount of the annual adventure did not exceed forty thouſand pounds, which might be conſidered at that time the *ſtock* of the company; but by the exertion and enterprize of the proprietors, it was brought in the ſpace of eleven years to upwards triple that amount; yielding proportionate profits, and ſurpaſſing every thing in this department of commerce ever before witneſſed in America. Such a proſperous ſtate of affairs induced others to embark in ſimilar undertakings. In 1798 the concern underwent a change, the ſhares were increaſed to forty-ſix. This produced the termination of the company, which was not renewed by all the parties previouſly concerned, the majority continuing to act under the old firm, and the reſt ſetting up another, under the name of the South-weſt company; a title the eſtabliſhment aſſumed from the circumſtance of the furs in which they trade being brought from the Indian ſettlements in the weſtern parts of America, in the vicinity of the rivers Ohio, Miſſouri, and Miſſiſſippi. This trade had been carried on individually by the perſons forming this company, who, by interfering in each other's concerns, did themſelves a deal of injury which is now avoided by their union. But it yet

remains

remains to be decided, whether two parties under the ſame regulations, and by ſimilar exertions, though unequal in number, will be able to continue carrying on the buſineſs to a ſucceſsful iſſue. The contrary opinion has been entertained by many, which, if verified, will make it the intereſt of the parties again to coaleſce; for neither appears deficient in capital, to ſupport their reſpective claims on a market, and it is not probable that either will relinquiſh them on any other terms, than perpetual participation.

Theſe two companies have nearly monopolized the fur-trade, for having ſcarcely any competitors, they have in a great meaſure the Indian market in their own power; but they are obliged to pay latterly an advanced price for their ſkins and furs; becauſe the Indians, ſo long accuſtomed to the trade, have long ſince learned, that a beaver ſkin is worth more than a two-penny knife, or a ſix-penny trinket.

By the printed documents of the annual importations from Canada, the quantity of furs and ſkins, which arrived in England in the year 1783, was as follows: "96,000 parchment beaver; 3000 coat ditto; 105,000 deer in the hair and ſhaved; 10,000 ditto Indian; half-dreſſed, 85,000; 10,500 bear; 17,700 otter; 3400 fiſher; 40,000 marten; 5600 wolf; 300 woolverin; 7300 cat; 6400 mink; 3900 fox; 3600 elk; 65,000 muſquaſh."

After the north-weſt company had been formed, how very conſiderably the trade was increaſed by their united exertions, will appear from the imports of 1784, *viz.* "116,000 parchment beaver; 4000 coat ditto; 130,000 raccoon; 40,000 marten; 19,000 otter; 11,000 bear; 7000 wolf; 8000 cat; 8000 mink; 6000 fox; 4000 fiſher; 300 woolverin; 6000 elk; 160,000 deer in the hair and ſhaved; 5000 Indian ditto half-dreſſed; 84,000 muſquaſh."

Subſequent to the junction of the two rival companies in 1788, the trade was ſtill further extended, and a much larger quantity of furs were brought into the Engliſh market. The invoices of the cargoes belonging to ſundry ſhips, which arrived from Canada in the year 1791, give the following reſult, and it forms the greateſt annual importation ever made from that country, *viz.* "168,000 parchment beaver ſkins; 5500 coat ditto; 178,000 raccoon; 37,000 marten; 22,500 otter; 15,600 bear; 9600 wolf; 9400 cat; 21,000 mink; 11,000 fox; 600 fiſher; 650 woolverin; 147 muſquaſh; 86,000 deer in the hair and ſhaved; 1000 ditto half-dreſſed; 2000 elk." The two enſuing years were nearly as productive; but after the diſſolution of the company, and the partial reformation of a ſimilar firm, the annual imports began to decline. Thus the import of 1799 gives the following ſtatement, *viz.* "113,000 parchment beaver ſkins; 1200 coat ditto; 126,000 raccoon; 34,500 marten; 16,000 otter; 21,000 bear; 5900 wolf; 12,500 cat; 8000 mink; 7800 fox; 5400 fiſher; 780 woolverin; 6000 muſquaſh; 160,000 deer in the hair and ſhaved; 1000 elk." From this period, though the quantity imported in one or two years exceeded that of 1799; yet the average arrivals have fallen ſhort of it. Thus the report of 1803 gives, "93,000 parchment beaver ſkins; 200 coat ditto; 150,000 raccoon; 32,000 marten; 17,000 otter; 25,000 bear; 5600 wolf; 14,000 cat; 12,000 mink; 10,000 fox and kitt; 57,000 fiſher; 1400 woolverin; 76,000 muſquaſh; 204,000 deer in the hair and ſhaved; 600 elk." The year following produced rather more, and the ſucceeding one much leſs. The reſult of 1803 will ſerve to give a general view of the preſent ſtate of the trade: "106,000 parchment beaver ſkins; 125,000 raccoon; 54,000 marten; 12,000 otter; 16,000 bear; 1000 wolf; 5,300 cat; 15,000 mink; 10,000 fox. N.B. 2300 white; 7000 fiſher; 200 woolverin; 15,500 muſquaſh; 216,000 deer in the hair and ſhaved; 800 elk."

What have been the cauſes of this gradual diminution in the quantity brought to market has been a ſubject of ſerious inquiry. By ſome it has been attributed to the interference of the Hudſon's bay company; and their agents, engroſſing a conſiderable portion of the intercourſe with the Knifteneaux, Chepewyan, and other tribes of Indians, who uſed excluſively to trade with the Canadian adventurers. But by reverting to the ſtate of the ſales belonging to that company, it will be evident this could not have been the cauſe, for the arrivals in the market through that channel alſo have been progreſſively growing leſs. Two reaſons may be aſſigned for the defalcation. Firſt, the diſtance the adventurers are obliged to go to meet with new Indian tribes for the purpoſe of profitable barter, and the expenſive range the hunters are neceſſitated to take, for ſucceſsful purſuit in procuring ſaleable ſkins. A ſecond reaſon may be found in the recent formation of a new company at New York for carrying on the fur-trade in the United States; who, though at preſent they do not much annoy the Canadian traders by their rivalſhip in the commerce of the extenſive lakes; yet by the quantity of furs they import from Canada, for the purpoſe of ſupplying the Chineſe, they occaſion a conſiderable drawback on the quantity of goods which otherwiſe would be expoſed in the Engliſh market. Theſe two co-operating cauſes have had a conſiderable influence, both upon the trade in Canada, and alſo at Hudſon's bay; and they furniſh two powerfully perſuaſive arguments, why the intercourſe ſhould be extended and improved with the countries bordering on the north-weſt coaſt of America.

The prices of this article have been progreſſively riſing, not merely, as ſtated by ſome, on account of the leſs quantity brought into the market; but from more powerful though leſs obvious cauſes. The competition, which has tended to enhance the value, has ariſen from a different quarter. Luxury ramifying and increaſing through all ranks and gradations of ſociety, has been the primary and continuative cauſe of the average advance in the price of furs. Other incidental cauſes may have occaſioned temporary fluctuations; but theſe ſoon ceaſing to operate, the trade reverted to its uſual level. The leading and grand cauſe is, that change that has taken place in the national manners of this country; which is technically couched under "the nature of the trade." To inſtance, reſpecting beaver, where ſome years ſince one perſon wore a hat fabricated from that ſpecies of fur, a thouſand probably do at preſent. Formerly muffs, tippets, and furred garments were only worn by people of quality, or diſtinguiſhed the upper claſſes of gentry. Now coſtly furs adorn the dreſs of females in that ſphere of life, in which perſons at no remote period were uſually clad in the plaineſt and moſt homely attire. To this may be added the expence of freight, inſurance, &c., owing to a protracted war. And the indirect influence of general taxation, as well as the effects of a direct impoſt, and an additional fifteen per cent. lately put upon the article, ſubjects the conſumer to an accumulated charge. It is not requiſite to enter into details minutely to inveſtigate the ſcale of gradation, or mark the different periods of advance; ſuffice it to obſerve, that by the ſale prices of the Hudſon's bay company, on an average of eleven years from 1722 to 1733 incluſive, the price of beaver, which to a certain extent regulates the reſt, ſold from three ſhillings and three-pence to ſeven ſhillings and ſix-pence per pound, forming a medium of five ſhillings and four-pence halfpenny. By the accounts laid before parliament in 1749, the average price, reckoning for ten years prior to that period, of a pound weight of beaver, was

ſix

ſix ſhillings and three halfpence. Since that time it has variouſly fluctuated, but ſtill kept progreſſively riſing; till at one time it had advanced to the enormous height of thirty ſhillings per pound. It then fell conſiderably, and at preſent maintains the average rate of *twenty-four*. Mr. Gray, who in his account of Canada frequently alludes to the fur trade, furniſhes a few remarks, calculated to illuſtrate this ſubject; for by contraſting the prices at the London ſales with thoſe of Canada, which he gives in his ſtatement, it will be ſeen, that not monopoly, but the increaſing demand in the market, and the difficulty of ſupplying it, have been the actual cauſes of the advance in price.

The following were the quantity, kinds, and prices of furs and peltry exported from Canada to Britain, on an average of three years ending 1805, *viz.*

				£.	s.	d.
Beaver ſkins	99,076	average weight each 1⅓lb. at 14*s.* per lb.		92,470	18	8
Marten	21,370	at 4*s.* each		4,634	0	0
Otter	17,649	— 17*s.* 6*d.*		33,091	17	6
Mink	11,687	— 2*s.* 6*d.*		1,460	17	6
Fiſher	5,657	— 8*s.* 6*d.*		2,404	4	6
Fox	8,636	— 12*s.*		5,181	12	0
Bear and cub	20,074	— 40*s.*		40,148	0	0
Deer	223,290	— 5*s.*		55,822	10	0
Raccoon	151,710	— 2*s.*		15,171	0	0
Muſkwaſh	79,650	— 1*s.* 2*d.*		4,646	5	0
Cat, caſed and open	12,221	— 7*s.* 6*d.*		4,582	7	6
Wolf	6,425	— 8*s.*		2,570	0	0
Elk	1,032	— 10*s.*		516	0	0
Woolverin	1,250	— 5*s.*		812	10	0
Hare, Rabbit, Ermine, Squirrel	3,062	— 8*d.*		76	11	0
			Total in value	£ 263,088	13	8

Excluſive of this part of the trade, a large quantity of furs of all deſcriptions are annually ſent by way of St. John's into the United States; not merely for ſupplying the demands of that country, but for exporting to China, for which market the fineſt furs and prime peltries are in requeſt. The amount of theſe articles ſold to the Americans in the year 1806, Mr. Gray ſtates at 62,009*l.* 15*s.* 2*d.* The reaſon of the furs being ſent by this channel, rather than through the London market, is the difficulty of getting home the produce obtained for the furs in China by the Eaſt India company's ſhips, together with the various reſtrictions laid by the directors, and the heavy duty payable on the exportation.

Mr. Gray's account of the exports of furs and peltries from Quebec in 1808, is as follows, *viz.*

				£	s.	d.
Beaver	126,927	at	18*s.* 9*d.*	118,994	1	3
Marten	9,530	—	3*s.* 4*d.*	1,588	6	8
Otters	7,230	—	20*s.*	7,230	0	0
Mink	9,108	—	2*s.*	910	16	0
Fiſhers	3,866	—	4*s.*	773	4	0
Foxes	1,038	—	5*s.*	259	10	0
Bears and cubs	1,298	—	25*s.*	1,622	10	0
Deers	103,875	—	3*s.* 4*d.*	17,312	10	0
Caſed and open cat	5,718	—	3*s.* 4*d.*	953	0	0
Raccoons	123,307	—	2*s.*	12,330	14	0
Muſk cats	6,513	—	1*s.* 6*d.*	488	9	6
Wolf	18	—	7*s.* 6*d.*	6	15	0
Elk	662	—	15*s.*	496	10	0
Woolverins	39	—	5*s.*	9	15	0
Seals	10	—	4*s.*	2	0	0
Buffalo	1	—	20*s.*	1	0	0
			Total value	162,979	1	5

By this ſtatement it will appear that the fur trade to Britain has recently declined; and that many of the articles have ſold at a reduced price, compared with the average amount and prices in 1805.

The Canadian imports, for the year 1808, conſiſted of 92,000 parchment beaver; 3000 coat ditto; 123,000 raccoon; 10,000 marten; 7000 otter; 1300 bear;——wolf; 5700 cat; 9000 mink; 1000 fox; 3900 fiſher;——woolverin; 5400 muſkwaſh; 103 deer, in the hair and ſhaved; 600 elk. The higheſt price obtained for parchment beaver was twenty-one ſhillings, the average twenty; cub ditto, twenty-five, average ditto twenty-three and ſix-pence; coat ditto, fourteen and five-pence, average ditto eleven and tenpence. By comparing this ſtatement with the one previouſly given from the ſale-report of the Hudſon's bay company, for the ſame year, it will appear, that notwithſtanding the gradual defalcation in the quantity of furs brought from Canada, yet the importation from that country is nearly treble the amount of that from Hudſon's bay; and that the price of coat-beaver from the former country is conſiderably lower than what is brought from the latter, while the cub and prime parchment beaver reaches a higher ſtandard. This difference can only ariſe from the quality of the reſpective articles, ſince the ſales are conducted on a ſimilar plan, *viz.* "by the candle at a public auction." To explain the general mode of carrying on the fur trade, and conducting the neceſſary interchange of commodities with the Indians, it will be neceſſary to have recourſe to the details given on this ſubject by that intelligent merchant and obſervant traveller, Alexander Mackenzie, whoſe voyages of diſcovery in the interior, indefatigable labours for the furtherance of this branch of commerce, and the proſperity of our northern ſtates in America, deſerve the higheſt encomium; and doubtleſs his fame, with his valuable works, will deſcend to the lateſt poſterity. The facts which thoſe afford will be interſperſed with others furniſhed by Hearne, Vancouver, Gray, &c. &c. with

with ſuch additional remarks as may tend to the elucidation of the ſubject.

The commercial relations with the Indians form purely a barter trade, as money is of little value in a country where every thing bought and ſold is, and muſt be, in kind. The articles neceſſary for the trade are, coarſe woollen cloths of various kinds, milled blankets of different ſizes; arms and ammunition; twiſt and carrot tobacco; divers ſorts of Mancheſter goods; linens and coarſe ſheetings; threads, line, and twine; common hardware; cutlery and ironmongery of ſeveral deſcriptions; braſs and copper kettles; ſheet iron; ſilk, and cotton handkerchiefs; hats, ſhoes, and hoſe; calicoes, printed cottons, &c. &c. Theſe are imported from England. Spirituous liquors, and divers articles of proviſion, are purchaſed for the concern in Canada. Theſe goods are previouſly made up, and properly prepared for the Indian market at Montreal. The expence of this, the tranſporting them to the Indian territory, and freighting back the goods obtained in exchange, including wages to clerks, interpreters, guides, and canoe men, conſtitute about half the annual amount againſt what is termed *the adventure*. Theſe are conveyed by bateaux, flat-bottomed boats, and canoes, which commence their voyage at La Chine, about nine miles above Montreal, the rapids in the river St. Lawrence preventing the working up loaded canoes between thoſe two places. Some proceed by way of lakes Ontario and Niagara, &c.: but the greater number by the river Altawa, or Outawais, and by other rivers and portages, to lake Nipiſſing, lake Huron, lake Superior, and thence by ſeveral chains of large and ſmall lakes and rivers to lake Winipey, Athabaſca, or Arathapeſcow lake, and the great Slave lake, which is within a few hundred miles of the weſtern coaſt of North America. In this range of their trade the company have at times from one to two thouſand people in their employment, as their agents and ſervants, at their numerous poſts, diſperſed over the country, who conduct the buſineſs and cultivate the friendſhip of the Indians, among whom ſome of them conſtantly reſide. At one particular period Mr. Mackenzie thus particularly ſtates the number of men employed in the concern by the North-weſt company. "Fifty clerks, ſeventy-one interpreters and clerks, one thouſand one hundred and twenty canoe men, and thirty-five guides. Of theſe, five clerks, eighteen guides, and three hundred and fifty canoe men were engaged for the ſummer ſeaſon in going from Montreal to the Grande Portage in canoes; part of whom proceeded from thence to Rainy lake. Theſe, which are called porkeaters, or goers and comers, and hired in Canada or Montreal, were abſent from the firſt of May till the latter end of September. For this trip the guides had from eight hundred to a thouſand livres, and a ſuitable equipment; the foreman and ſteerſman from four to ſix hundred livres; the middle men from two hundred and fifty to three hundred and fifty livres, with an equipment of one blanket, one ſhirt, and one pair of trowſers, and were maintained during the voyage at the expence of their employers. Independent of wages, they were allowed to traffic, and many of them earned to an equal amount. About one-third of theſe proceeded to winter, and had more than double the above allowance and equipment. All the reſt were hired by the year, and in ſome inſtances for three years. Of the clerks, many of them were apprentices, who were generally engaged for five or ſeven years, for which they had only one hundred pounds, with proviſion and clothing."

The neceſſary number of canoes having been purchaſed, at three hundred livres each, the goods formed into packages, of about eighty or ninety pounds weight, and the lakes, with their connecting rivers, free of ice, which generally happens by the beginning of May, the voyagers, with their veſſels and cargoes, are diſpatched from La Chine. Eight or ten men are appointed to each canoe, and their baggage, proviſions, ſtores, with other neceſſary articles, and ſixty-five packages of goods, are ſtowed into this ſmall veſſel. "An European, on ſeeing one of theſe ſlender veſſels, (ſays Mr. Mackenzie,) thus laden, heaped up, and ſunk with her gun-wale within ſix inches of the water, would think his fate inevitable in ſuch a boat, when he reflected on the nature of her voyage; but the Canadians are ſo expert, that few accidents happen." The canoe is conſtructed with much ingenuity, it is perfectly light, and by that means anſwers remarkably well the purpoſes for which it is intended. The length of thoſe canoes, which are uſed in the fur trade, is about thirty feet, the greateſt breadth ſix, gradually narrowing towards each end, till they terminate in a point; the bottom is rounded, and they have no keel. A frame is formed of ſlight pieces of light wood, over which is faſtened a ſheathing, compoſed of ſections of bark, taken from the birch tree; theſe are ſewed together with ſilaments from roots of the ſpruce fir tree called *watape*; and the calking, or making the ſeams water-tight, is effected by a ſpecies of gum which hardens and adheres more firmly in the water. "I had the pleaſure, (obſerves Mr. Gray,) of ſeeing both an arrival, and departure of canoes from, and to, the north-weſt territories. It certainly is a curious ſpectacle. The canoes, when they take their departure from La Chine, are loaded to within about ſix inches of the gun-wale, or edge of the canoe. Inſtead of oars, they uſe paddles, which they handle with great dexterity. They ſtrike off, ſinging a ſong peculiar to themſelves, called the "voyager's ſong;" one man takes the lead, and all the others join in a chorus. It is extremely pleaſing to ſee people, who are toiling hard, diſplay ſuch marks of good humour and contentment, although they know, that for a ſpace of more than two thouſand miles, their exertions muſt be unremitting, and their living very poor; for, in the little ſpace allowed in the canoe for proviſions, you find none of the luxuries, and a very ſcanty ſupply of the neceſſaries of life. The ſong is of great uſe; they keep time with their paddles to its meaſured cadence, and, by uniting their force, increaſe its effect conſiderably."

Leaving La Chine they proceed to St. Anne's, within two miles of the weſtern extremity, in the iſland of Montreal, on the lake of the two mountains, which is conſidered the commencement of the Utawas or Outawais river, and preſents itſelf to the voyagers; who, to paſs the rapids of St. Anne, are obliged to take out part, if not the whole, of their lading. From this ſpot they conſider their departure, becauſe near it ſtands the laſt church on the iſland, dedicated to their tutelar ſaint. The lake of the two mountains is about twenty miles long, and contracting its waters forms the river Utawas, whoſe navigation is interrupted, at intervals, by a variety of caſcades and rapids, that either render decharges, or portages neceſſary. By the former are meant places where the canoes muſt unload their cargoes, and the packages be carried over to points, where the river again deepens, and becomes fit for navigation; and by the latter, ſuch places where the obſtacles oblige the voyagers to carry over both canoes and cargoes. Thus they proceed to lake Nepiſingui, from which by French river, in latitude north 45° 53, they enter lake Huron. Hence paſſing the iſland of Michilimakinac, at the confluence of lakes Huron and Michigan, and paſſing along the north ſhore of the former, they portage over the falls of the river St. Mary, which

which extends to lake Superior; and having croſſed that immenſe body of water which forms the grand reſervoir of the river St. Lawrence, they arrive at the important entrepot denominated the Grande Portage. At this place they are met by the northmen, who generally come down about the beginning of July. At this period it becomes neceſſary to ſelect from the pork-eaters a number of men, among whom are alſo the recruits, or volunteer winterers, ſufficient to man the canoes neceſſary for carrying the goods and proviſions requiſite for the Athabaſca country, to the river of the Rainy lake. The northmen, who have arrived at Grande Portage, are regaled, have their accounts ſettled, and ſuch as chooſe to ſend any of their earnings to Canada receive draughts to remit the ſame to their relations. Such as have not previouſly entered into engagements during the winter, as is cuſtomary, now contract for returning up the country, to perform the annual voyage for one, two, or three years; and as ſoon as every thing can be got ready, which uſually requires a fortnight, they are again diſpatched to their reſpective departments. This done, the agents, aſſiſted by their clerks, prepare to return eaſtward, by getting the furs and ſkins acroſs the Portage, and re-packing them in bales of one hundred pounds each, to ſend them down to Montreal, where they commonly arrive about the month of September.

The trade from the Grand Portage to the interior is, in ſome particulars, carried on in a different manner from that between it and Montreal. The canoes employed in the tranſporting goods from the latter place are too large for carrying them beyond the former. Others therefore of about half the ſize, navigated by about four to ſix men, are here procured from the natives. Theſe boats carry, on the average, about thirty-five packages, in which twenty-three are for the purpoſes of trade, and the reſt are uſed for proviſions, ſtores, and baggage. A pilot, or conductor, is appointed to every four or ſix of theſe canoes, and thus loaded, the voyagers embark on the river Autort, on the north ſide of the Portage. Thence proceeding to lake Outard, they enter the Mountain lake, paſs by numerous portages to lakes Roſe, Saginaga, De la Pluie, and De Bois, which contracts into the river Winipic. The courſe is now through various ſmall lakes and rivers, with numerous intervening portages and decharges to the laſt, at the great waters of lake Winipic; between which, and Hudſon's bay, two communications are formed by means of the Severn and port Nelſon rivers. Several other rivers diſcharge their waters into this lake, *viz.* the Dauphin, Red-deer, and Saſkatchiwine: and the whole country, to the ſouth of the latter, abounds in beaver, mooſe-deer, fallow-deer, elks, bears, buffaloes, and numerous other animals, calculated to the trade in furs and peltry. On theſe waters are three principal forts, for the protection of thoſe conducting the concerns. Fort Dauphin, erected by the French, prior to the conqueſt; Red-deer, and Swan-river forts, with ſeveral ſmall detached outpoſts belonging to each. Up the Saſkatchiwine the flotilla of canoes proceeds to Cedar lake, from whence the abovementioned river is navigable to near its ſource. On this fine communication are five principal factories; *viz.* Nepawi-houſe, South-branch-houſe, Fort George-houſe, Fort Auguſtus-houſe, and Upper Eſtabliſhment. Leaving the Saſkatchiwine, the voyagers enter the river that communicates with the Sturgeon lake, on the eaſtern bank of which is ſituated another factory, Cumberland-houſe. Thence the rout lies through Pine-iſland lake, lake de Bouleau, Miron lake, lake de Bois, to the Miſſinipi, called alſo Churchill river. The inhabitants of this part of the country are the Kniſteneaux Indians, whoſe furs the traders for ſeveral years ſucceeded in obtaining till 1793; when the ſervants of the Hudſon's bay company thought proper to ſend their people amongſt them, for the purpoſe of ſecuring their credits, which the natives are apt to forget, and advancing towards the interior by a new line of commercial ſpeculation. Why they had not adopted ſuch a meaſure long previous to this period is not very obvious: for it muſt have been, as the fact has ſince proved, highly beneficial to their concerns. From the ſhort diſtance they had to come, the quantity of goods they were able readily to ſupply, the trade, as experience has evinced, muſt have reverted to them: the Canadian merchants being unable, from the remoteneſs of their ſituation, and other circumſtances, to meet the company's agents upon adequate terms.

The courſe of this river is interrupted by rapids and falls, and the flotilla has yet to paſs by ſeveral ſmall lakes and rivers to Otter lake; thence by lakes de l'Iſle d'Ours, lake des Souris, lake du Serpent, lake Croche, lake Shagoina, lake la Croiſe, lake de Bœuf, up the river la Loche, and thence by the Elk, which communicates with the lake of the Hills, in latitude 58° 36′ north. On the ſouthern ſide of this is ſituated what is termed the "Old Eſtabliſhment," which was the only one in this part prior to the year 1785. It was formed by a Mr. Pond in 1778—9, about forty miles diſtant; and transferred to this place in 1788, by the order of the north-weſt united company. This, called Fort Chepewyan, is in latitude 58° 38′ north, and longitude 110° 26′ weſt. This was the ſettlement where Mr. Mackenzie reſided eight years, conducting the concerns of the north-weſt company, whence he took his departure on both his expeditions of diſcovery; and the furtheſt to the north-weſt hitherto eſtabliſhed for carrying on the commerce in furs and peltry. The following is the ſtatement he gives of the mode adopted in tranſacting the buſineſs. "The flotilla of laden canoes, which leave lake de Pluie about the firſt of Auguſt, do not arrive here till the latter end of September, or the beginning of October, when a neceſſary proportion of the number is diſpatched up the Peace river, to trade with the Beaver and Rocky Mountain Indians. Others are ſent to the Slave river and lake, to traffic with the inhabitants of that country. A ſmall part of them, if not left at the fork of the Elk river, return thither for communicating with the Kniſteneaux; while the reſt of the people and merchandize remain here to trade with the Chepewyans. In the fall of the year, the natives meet the traders at the fort, where they barter the furs or proviſions which they have procured, then obtain freſh credit, proceed to hunt the beavers, and do not return till the beginning of the year; when they are again fitted out in the ſame manner, and come back the latter end of March, or the beginning of April. But they are now unwilling to repair to the beaver hunt until the waters are clear of ice, that they may kill them with fire-arms, which the Chepewyans are averſe to employ. The major part of the latter return to the barren grounds, and live during the ſummer with their relations and friends in the enjoyment of that plenty which is derived from numerous herds of deer. Yet perſons of that tribe who are moſt partial to thoſe deſarts cannot remain there in winter, and they are obliged, with the deer, to take ſhelter in the woods in that rigorous ſeaſon, during which they contrive to kill a few beavers, and ſend them by young men, to exchange for iron utenſils and ammunition. Till the year 1782 the people of Athabaſca ſent or carried their furs regularly to fort Churchill, Hudſon's bay, and ſome of them have ſince that time repaired thither, notwithſtanding they could have provided themſelves from the Canadians with all the neceſſaries which they required. The difference of the price ſet on

goods, here and at that factory, made it an object with the Chepewyans to undertake a journey of five or ſix months, in the courſe of which they were reduced to the moſt painful extremities, and often loſt their lives from hunger and fatigue. At preſent, however, this traffic is in a great meaſure diſcontinued, as they were obliged to expend, in the courſe of their journey, that very ammunition which formed its moſt alluring object." Such is the ſubſtance of the communications of the moſt intelligent writers upon this intereſting ſubject, ſeveral of whom were ably qualified to give it elucidation from having had ocular demonſtration of the facts they relate. But none of them attempt to detail the particular mode of intercourſe with the Indians, or the ratio of exchange or barter between them and the traders. This, which will be regretted by all who have read the very important information contained in their works, particularly in Mr. Mackenzie's voyages, may be accounted for thus: the writers were perſons intereſted in the trade, the lucrative returns of which formed a ſtrong inducement to give general information rather than narrate particular circumſtances, that, if developed, might have led to an injurious competition. Some idea, however, of the agio, or rate of exchange, as well as the manner of effecting it, has already been given in the account of the commercial relations between the Indians and the Hudſon's bay company. A further elucidation may be found in the following ſtatement, which, as a maximum fixed by government for the benefit of both parties, though occaſionally departed from, probably conſtitutes a general guidance or regulation for the trade.

In the year 1762 the governor of Nova Scotia, having conciliated the friendſhip of the neighbouring Indians, who had been converted to the religion and intereſts of the French, an act was paſſed by the provincial legiſlature to guard againſt the interruption of the provincial harmony, by fraudulent practices in perſons who trade with the Indians; and to oblige all ſuch to take out licences, and give ſecurity for their compliance with the regulations of the act. The ſtatute moreover eſtabliſhed a tariff of regulated prices, which were fixed as the ſtandard of the trading intercourſe between the white people and the Indians.

A pound of the beſt ſpring beaver, valued at 5*l.* was eſtabliſhed as the fixed ſtandard, by which all other goods were to be eſtimated, *viz.*

1¼ Of fall beaver 1 Otter ſkin 3 Sable or marten ſkins 6 Mink ſkins 15 Muſk rats, or muſquaſh ſkins 5lb. Of deer ſkins 10 Ermine ſkins	}	To be conſidered equivalent to 1lb. of ſpring beaver.
1 Large good bear ſkin	equal to	1⅗lb. of ſpring beaver
1 Red fox ſkin		½ ——
1 Black fox ſkin		2 ——
1 Silver fox ſkin		2½ ——
1 Large mooſe ſkin		1½ ——
1 Large cat ſkin, loup ſervie		2 ——
Seal ſkins, according to ſize, from 8*d.* to 3*s.* and 4*d.*		
6lb. Of feathers		1lb. of ſpring beaver.
1 Large blanket		2 ——
Rum, per gallon,		⅓ ——
Molaſſes, per gallon		⅖ ——
30lb. Of flour		1 ——
14lb. Of pork		1 ——
Stroud, per yard		1½ ——

And all other merchandize in proportion to theſe rates. From this, and preceding ſtatements, it will readily occur to the reader, that the profits of the fur trade are very large, and ſo they reaſonably ought to be, for the capital employed is great, and the returns peculiarly tardy. The agents are obliged to order neceſſary goods from England in the month of October, eighteen months before they can leave Montreal; that is, they are not ſhipped from London until the ſpring following, when they arrive in Canada during the ſummer. In the courſe of the following autumn they are made up into ſuch articles as are required for the Indians; they are then packed into parcels of eighty or ninety pounds each, but cannot be ſent from Montreal until the enſuing May; ſo that they do not get to market before the winter following, when they are exchanged for furs, which arrive at Montreal the next autumn, and from thence are ſhipped, to London chiefly, where they are not ſold, or at leaſt paid for, till the ſucceeding ſpring, or even as late as the month of June. Thus payment is made forty-two months from the time the goods were ordered in Canada; thirty-ſix after they had been ſhipped from England, and twenty-four ſubſequent to their having been forwarded from Montreal. So that from the time the goods have been bartered for furs, and theſe arrive in London, are ſold, and remittances made, full three years have elapſed. Conſequently, the merchant, allowing he has twelve months credit, does not receive his returns, to pay for thoſe goods, and anſwer the neceſſary attendant expences in procuring them, which are about equal to the value of the goods, till two years after they are conſidered as caſh, which renders this a very heavy buſineſs; the profits ought therefore to be at leaſt triple the profits of a trade where the capital is turned once a year.

The fur trade to the Canadians is nearly as valuable as their corn trade; it employs a great number of people, and a large capital. Beſides the expenditure it occaſions in Canada, the concern ultimately tends to the encouragement of Britiſh manufactures, for thoſe who are employed in the different branches of this buſineſs are enabled by their gains to purchaſe Britiſh articles, of which they otherwiſe muſt forego the uſe. The duty paid in England on furs and ſkins imported from Canada amounted, on an average of four years, ending 1806, to 22,053*l.* per annum. And further, we not only gain by thus being almoſt excluſively poſſeſſed of the commerce in furs and peltry, but alſo by the articles taken in exchange, which, it has been ſeen, are coarſe woollens, iron-ware, copper, and braſs utenſils, fire-arms, gun-powder, ſhot, and other manufactured articles. It has been pregnant with ſtill more general benefits, both to the important objects of ſcience and commerce; for the one has had new regions developed to its ken, by the reiterated exertions to extend the other. Thus what is generally conſidered, and in too many inſtances has been, congenial to the attainment of geographical information, in the preſent caſe has been productive of the moſt happy diſcoveries. Our Indian traders and wood rangers have explored ſeveral unknown countries, and found many nations and tribes to traffic with, far back in the interior of that vaſt continent, till at length they have penetrated to the great weſtern Pacific ocean, and opened a new way of intercourſe with Japan and China. It has developed more, for it has ſet at reſt for ever that long agitated, and juſtly deemed intereſting queſtion, reſpecting the exiſtence of a north-weſt paſſage, or communication by ſea, between the Atlantic and Pacific oceans. Mr. Hearne, a naval officer, but then in the ſervice of the Hudſon's bay company, in conſequence of ſome information received from the Indians, was ſent by the governor of Fort Prince-of-Wales on a journey of diſcovery in the year 1770. Having penetrated to the Frozen ocean at the mouth of the Copper-mine river, which by his ſtatement lies in nearly 72° north latitude, he

learned from converſation with the Indians, that the continent ſtretches aw from thence a prodigious way to the weſtward. By this journey it was aſcertained that any communication between the Atlantic and Pacific, if exiſting, muſt be beyond that high latitude. But ſince the conqueſt of Canada, more has been done in this way by a few ſpirited merchants, than had been effected for two centuries by the Hudſon's bay company, although their charter was principally, as it oſtenſibly ſtates, granted for that important purpoſe. The North-weſt company of Montreal, having been informed by one of their remoteſt agents, that the Indians had told him of a river flowing into a ſea, which was at no great diſtance to the northward; Mr. Mackenzie, one of the partners, left Montreal in the beginning of the ſummer of the year 1789, purpoſely to aſcertain the veracity of a communication ſo intereſting to ſcience and commerce. Attended by a few Indians, he traverſed partly in canoes, and partly by walking, the great extent of wilderneſs in which their poſts are eſtabliſhed, and proceeded beyond them down a conſiderable river, running north, till he actually arrived at the Frozen ocean, in which he ſaw ſome ſmall whales among fields of ice, and obſerved the riſe and fall of the tide. On an iſland, to which he gave the name of Whale-iſland, at the mouth of the river, to which alſo he affixed his own, he erected a poſt, near a few old deſerted huts, engraved on it his name, the number of perſons with him, the time they remained, and the latitude of the place, which was found by obſervation, 69° 14′ north. This voyage, or journey of diſcovery, and alſo that of Mr. Hearne's previouſly noticed, having developed the unfrequented regions of America, muſt be ſufficient to prove the utter impoſſibility of a navigable communication exiſting in any temperate part of that continent; and we might reaſonably expect to have no more conjectures or ſpeculations upon that ſubject, more eſpecially ſince the voyage of captain Vancouver in 1792, 3, and 4, who made a ſurvey of the whole north-weſtern coaſt of America, from latitude 39° 27′, north as far as the inlet, called Cook's river, and Prince William's ſound. Upon a very careful and minute inſpection of every creek and inlet of a coaſt, conſiſting entirely of creeks and channels, formed by an innumerable multitude of iſlands, he was enabled poſitively to aſcertain that there is no navigable paſſage between the Pacific and Atlantic oceans; unleſs there may be a poſſibility of ſailing through the generally frozen ſtrait between Aſia and America, and navigating the polar ocean, which bounds the unknown extremity of the latter continent. Mr. Mackenzie, in 1793, ſet out on another inland voyage of geographical and commercial diſcovery. In this ſecond expedition he directed his courſe to the weſtward, and after paſſing the higheſt land, and walking above 100 miles, he and his party re-embarked on a river running weſt, and plentifully ſtocked with excellent ſalmon, which conveyed them to an inlet of the Pacific ocean, where they ſaw porpuſes and ſea-otters, and obſerved a conſiderable riſe and fall of the tide. There, at a place previouſly denominated Caſcade Canal, by captain Vancouver, he painted upon a rock the words "Alexander Mackenzie from Canada by land, 22d July 1793." From theſe diſcoveries, and the fact having been aſcertained, that there exiſts no practicable north-weſt paſſage by ſea between Aſia and America, the practicability of a different kind of communication becomes an object of important conſideration. The Ruſſians, who firſt diſcovered, that along the coaſts of Aſia no uſeful and regular navigation exiſted, opened an interior intercourſe by rivers and lakes, through that long and widely extended continent to the ſtrait ſeparating Aſia from America, over which they paſſed to the territories of the latter. From this Mr. Mackenzie infers, that ſince the non-exiſtence of a practicable paſſage by ſea, and the exiſtence of one through the continent have been proved, the ſituation of our North American ſettlers has become nearly ſimilar to that of Ruſſia.

The trade in furs and peltry experience has proved, from its nature, cannot be advantageouſly carried on by individuals, for as a very large capital, credit, or both is neceſſary to conduct the concern with any proſpect of ſucceſs, it conſequently follows, as an eſſential point, that an aſſociation of men ſhould be formed, ſome of wealth to direct, and others of enterprize to execute, and ſo to act together in one common intereſt, and on ſuch principles, that the latter might ſucceed the former in continual gradation. The junction of ſuch a commercial aſſociation with the Hudſon's bay company, Mr. M. conceives would be a very important meaſure, which, if adopted, the trade might then be purſued with a very ſuperior degree of advantage, both in a private and public view, under the privilege of their charter, and would in fact prove the only method of completely fulfilling its ſtipulated conditions. He alſo obviates any objections to ſuch a plan, by conſidering it would be equal injuſtice to exclude either party from the option of ſuch an undertaking; conceiving, the right the one poſſeſſes by charter, as counterbalanced in the other caſe by prior poſſeſſion. And ſhould the company be adverſe to ſuch an union of intereſts, it would be a fair and reaſonable propoſal, upon a proper indemnification being offered, for government to oblige them to relinquiſh a right they refuſe to exerciſe, or to allow others the navigation of the bay to Nelſon's river; by which means the trade might be extended to the head of the Saſkatchiwine river, to the mutual advantage of Canada, and of Britain.

He further ſuggeſts, that by means of Port Nelſon river, which empties itſelf into Hudſon's bay, the Peach river, the Saſkatchiwine, that riſes in the rocky mountains, and the Columbia, which has its ſource on the weſtern ſide of the ſame; a communication by water might be formed nearly the whole length between the two great oceans, the Pacific and the Atlantic. By opening this intercourſe the Canadian merchants would be enabled to ſupply the natives of the interior with a larger quantity of uſeful articles, and at a reduced price. The enhanced value of which, and the difficulty of tranſporting them, will be eaſily comprehended, when the attendant circumſtances are taken into conſideration. The tract of tranſport occupies an extent of land from three to four thouſand miles, through upwards of ſixty large lakes, and numerous rivers, and the means of conveyance are ſlight bark canoes. And thoſe waters are interrupted by more than two hundred rapids, along which the articles of merchandize are chiefly carried on men's backs, and over a hundred and thirty carrying places, from twenty-five paces to thirteen miles in length, where the canoes proceed by the ſame toilſome and perilous operations. By the route propoſed moſt of theſe retarding circumſtances would be obviated, or greatly diminiſhed.

Since the diſcoveries on the north-weſt coaſt of America by captain Cook, one of the numerous advantages reſulting from the labours of that enterprizing circumnavigator was, the opening a new and extenſive ſource for procuring furs of the moſt valuable quality, and a new market for European commodities; the nature of which has been further elucidated by the exploratory voyages of captain Vancouver. By opening, therefore, the intercourſe recommended by Mr. Mackenzie, forming regular eſtabliſhments through the interior, and at both extremes, as well as along the coaſt; the entire command of the fur trade with North America might be

be obtained from 48 degrees of north latitude to the pole, except that portion of territory occupied by the Ruſſians. Such would be the ſpacious field for enterprizing exertion, and incalculable would be its advantages, if ſupported by the influence of credit and capital; means which Great Britain ſo pre-eminently poſſeſſes over other nations. Then would this country begin to receive ſome remuneration for the money it has expended in diſcovering and ſurveying the coaſts of the Pacific ocean, which at preſent are principally left to American adventurers, who, without regular ſyſtem, or adequate means to embark in the concern, and regardleſs of conciliating future confidence, look only to the intereſt of the preſent moment. Theſe having therefore collected all the ſkins they can obtain, and in whatever manner beſt ſuited to their means, proceed with them acroſs the Pacific to Canton, exchange them for the produce of China, and return with their wealth to their own country. Such adventurers, and many of them are very ſucceſsful in their concerns, would ſpeedily diſappear on the eſtabliſhment of a well-regulated trade; and nearly the whole traffic in furs muſt and would circulate through the channels of Britiſh commerce.

Some ſcheme or other, upon a grand ſcale, it is eſſential to adopt, if it be deſirable to preſerve the fur trade in the hands of the Hudſon's Bay and Canadian merchants. For ſince the ſetting up of the New York company, the diſcoveries on the north-weſt coaſt of America, and the finding what a profitable concern the ſale of fur was in the Chineſe and other eaſtern markets, the American merchants have made it an important ſubject of their ſpeculations. For the purpoſe of collecting information, and opening an intercourſe with various Indian tribes, an expedition was undertaken at the expence of the American government, by "a corps of diſcovery," as it was termed, under the command of captains Lewis and Clarke, belonging to the army of the United States. The voyagers, for it was performed greater part of the way in canoes, ſpent the years 1804, 1805, and 1806, in obtaining the object of their purſuit, which was, to find a paſſage by the Miſſouri and Columbia rivers to the Pacific ocean. The intention was fully anſwered by their aſcertaining the exiſtence of ſuch a practicable communication. By this means the people of the United States have obtained a fine clue to the north-weſt Indian tribes, and the river Columbia, with the adjacent bays and creeks, which abound with immenſe numbers of the ſea-otter, an animal that produces the fineſt and moſt valuable fur. Thus have they become poſſeſſed of the power of competition with the inhabitants of the northern ſtates ſubject to Britain; and are likely, if the Canadians ſtill continue to be circumſcribed by the tenacity of the Hudſon's Bay company, to outrival the Britiſh merchants in their own market.

See "Voyages from Montreal on the River St. Laurence, through the Continent of North America to the Frozen and Pacific Oceans, in the Years 1789 and 1793," by Alexander Mackenzie, eſq.; "Annals of Commerce, Manufactures, Fiſheries, and Navigation," by David Macpherſon; "An Account of ſix Years' Reſidence in Hudſon's Bay, from 1733 to 1736, and 1744 to 1747," by Joſeph Robſon; Vancouver's "Voyage round the World;" Gaſs's "Journal of a Voyage up the Miſſouri, &c.;" Umfreville's "State of Hudſon's Bay, and the Fur Trade;" "Letters from Canada, written during the Years 1806, 1807, and 1808," by Hugh Gray; Invoices of cargoes in the ſhips belonging to the Hudſon's Bay company; Invoices of cargoes of the ſhips employed in the fur trade from Canada; and reports of the reſpective ſales.

FUR, in *Heraldry*. See FURR.

FUR, in *Ornithology*, a name given by Bartholine to the LARUS *paraſiticus*.

FUR-*ſlice*, in *Agriculture*, a term employed in the northern parts of the iſland to ſignify the long narrow ſlice of earth turned up by the plough. See FURROW-*ſlice*.

FURA, in *Geography*, a ſmall iſland near the weſt coaſt of Scotland; five miles W. of Udrigill Head.—Alſo, a mountain of Africa, in Mocaranga, rich in gold; 30 miles from Maſſapa.

FURAJANNA Soo, a town of Africa, in Fooladoo. N. lat. 13° 16'. W. long. 7°.

FURANS, a river of France, which runs into the Iſere, near Romans.

FURBA, *Valley of*, one of the five diſtricts of the county of Bormio, in Switzerland. See BORMIO.

FURBISHER, a perſon who furniſhes or poliſhes arms, and gives them a brightneſs and luſtre.

In the general ſenſe of the word, it includes what we now call armourers and ſword-cutlers; in a more reſtrained ſenſe, it is appropriated to thoſe who clean and ſcour up old ſwords, guns, and halberds, and put them in order.

Among the officers of the Tower there is a furbiſher of ſmall arms, another of ſwords; and the like there is in moſt other armories of England.

FURBISHING, the act of cleaning, ſcouring, and poliſhing arms; as guns, piſtols, ſwords, &c.

The word is formed of the French *fourbiſſure*, which Hicks derives from *furben*, which, in the language of the ancient Franks, ſignified to clean and poliſh: though M. Huet chooſes rather to derive the French *foubir*, and *fourbiſſure*, from the Engliſh *furbiſh* and *furbiſhing*. Skinner obſerves, that ſome authors derive the Engliſh *furbiſh* from the Latin *furvus* and *fervor*; but for his part, he rather derives it from the German *farb*, colour; and *farben*, to dye, or give a colour.

Furbiſhing is principally performed with emery.

FURCA, FORK, in *Antiquity*, a kind of puniſhment, or rather an inſtrument of puniſhment, among the Romans. The form of the Roman furca is very obſcurely deſcribed by the ancients, and much controverted by the moderns. All we know for certain is, that it was of wood, and reſembled a fork; whence it is called, in writers, ξυλον διπλων διχερων διδυμον, that is, *lignum duplex, bicornutum, geminum*; a double forked, or horned, timber. Plutarch, treating of the furca, ſays, it is originally the piece of timber wherewith the beam of the waggon is upheld: he adds, that it is the ſame with what the Greeks call *apoſtates* and *ſterigma*; and the ſterigma is deſcribed, by Heſychius, as the forked piece of timber put under the yoke of the waggon.

From theſe accounts, Godwyn takes the furca to have been the beam of a waggon, to which the yokes are faſtened.

The puniſhment of the furca was of three kinds; the firſt only *ignominious*, was when a maſter forced his ſervant, for ſmall offences, to carry a furca, or fork, on his ſhoulders, about the city; confeſſing his fault, and warning others to beware of the like: whence ſuch ſervant come to be denominated *furcifer*.

The ſecond kind was *penal*; when the party, having the furca on his neck, was led about the circus, or other place, and whipped all the way.

The third was *capital*; the malefactor having his head faſtened to the furca, and ſo being whipped to death.

In after-times of the empire, when this ſort of puniſhment became interdicted, the form of the furca was changed, and made like our gibbets, or gallows. See CROSS.

FURCA, in *Geography*, a mountain of Switzerland, on the N.E. extremity of the Vallais, the aſcent of which is ſteep and difficult. A number of rugged and forked rocks, piled one above another, have occaſioned, it is ſaid, this chain to be called the "Furca." Near the ſummit, the height of which is eſtimated at 13,000 feet, between the Blaueberg and the Langnetz, a large body of ice ſupplies a torrent, which is probably one of the firſt ſources of the Rhone. The glacier of the Furca is an immenſe body of ice, extending at leaſt three miles in length, and near a mile in breadth between the Gleteherberg and the Satzberg, rocks more rugged, if poſſible, than any of the neighbouring mountains; it ſtretches from their foot, fills up the intervening chaſm, and reaches almoſt to their ſummits. The river Rhone is chiefly formed by this glacier: the ſmall torrent, already mentioned, being joined by ſeveral ſtreams, loſes itſelf under the vaſt arch of ice that forms the bottom of the glacier, iſſues conſiderably augmented, and is the great and principal ſource from whence the Rhone takes its riſe.

FURCA & *flagellum*, in our *Old Writers*, denotes the meaneſt of all ſervile tenures, when the bondman was at the diſpoſal of his lord for life and limb. "Ipſe tenet in villenagio ad furcam & flagellum de domino ſuo, &c."

FURCA, *and Foſſa*, in our *Ancient Cuſtoms*, *i. e.* gallows and pit, denoted a right or juriſdiction of puniſhing felons; *viz.* men with hanging, women with drowning.

FURCHE, in *Heraldry*, a croſs forked at the ends. See CROSS.

FURCONIUM, in *Ancient Geography*, a town of Italy, in Samnium, belonging to the Veſtini; at ſome diſtance S. of Amiternum: it was alſo called *Furconia*.

FURCULA, in *Anatomy*, the ſame with clavicula.

FURCULA, in *Geography*, a mountain of Switzerland; 13 miles W. of Chiavenna.

FURET, in *Zoology*, the *ferret* or MUSTELA *furo*.

FURFUR, in *Medicine*, ſignifying literally *bran*, in the Greek πίτυρον, has been applied to various excrementitious matters reſembling bran; more eſpecially to the little fragments of the cuticle which ſcale off under certain morbid ſtates of the ſkin, and are alſo called ſcurf, dandriff, &c. The term was alſo uſed by Hippocrates to denote a ſort of bran-like particles or ſediment in the urine; whence urina *furfurea*, *furfureum* ſedimentum, &c. From the ſame root we have

FURFURATIO, πιτυρίασις, a term uſed by Galen, and many ſubſequent writers, to denote certain ſcaly eruptions of the ſkin: it is uſed alſo to ſignify the falling off of ſcurfy ſcales in combing, &c. See PITYRIASIS.

FURHER, in *Geography*, a town of Hindooſtan, on the road from Agra to Oajein, in the pergunnah of Shajawulpour, which is divided from that of Schore by the river Parbutty.

FURIA, in *Zoology*, a Linnæan genus of the *Vermes*, poſſeſſing, according to that diſtinguiſhed naturaliſt, the following eſſential character: the body linear, equal, filiform, and ciliated each ſide with a ſingle row of reflected prickles preſſed cloſe to the body.

One ſpecies only of this genus is deſcribed, that bears the appellation of the infernal fury (*Furia infernalis*), a name very amply merited, ſhould the relations of its terrific powers, as delivered to us by Linnæus, be conſidered as ſufficiently correct.

This moſt extraordinary creature is deſcribed as an inhabitant of the vaſt marſhy plains of Bothnia and Finland, where it is reported to live among ſhrubs or ſedges, and crawling on thoſe plants, is occaſionally driven, or carried forward by the wind. Their progreſs, as may naturally be imagined, is ſometimes intercepted by man or animals, and when they happen to ſettle on any expoſed part which is not perpendicularly ſituated, they inſtantly penetrate the ſkin, and bury themſelves in the fleſh ſo deeply, as only to leave a black dot or point where they entered. This is ſoon ſucceeded by the moſt excruciating pains, inflammation, gangrene, ſwooning, and death; all which happens in the ſpace of a day or two; frequently within the courſe of a few hours, unleſs the animal be immediately extracted from the fleſh, and this muſt be effected with the utmoſt caution, by applying a poultice of curds, or cheeſe, or in more dangerous caſes, by carefully diſſecting between the muſcles where it had entered.

The above is the ſubſtance of that information which the writings of Linnæus affords us. This celebrated obſerver of nature was himſelf once attacked by this malady, and, as it appears, in imminent danger of his life, but, happily for the learned world, was reſcued through the hoſpitable ſervices of a prieſt. This occurred in one of his herborizations near the city of Lund in Sweden. The prieſt, perceiving at once the cauſe of his malady, undertook the arduous taſk of recovering him, and this he effected by lacerating the fleſh, and extracting a vermiform ſubſtance about half an inch in length, which he produced to Linnæus, aſſuring him at the ſame time that this was the true and ſole cauſe of his diſorder. Linnæus, notwithſtanding its injured appearance, conceived it to be a true vermes, and without doubt, yet feeble in body, and with his mind deeply impreſſed with a recollection of the agonies he had ſuffered, as well as the danger he had ſo narrowly eſcaped, very emphatically gave it the name of the infernal fury, as it ſeemed to poſſeſs in reality thoſe fatal powers which were attributed to the imaginary being ſo denominated by the ancients. At his return to Upſal, he made known this circumſtance in an academical theſis, and afterwards inſerted it in the "Syſtema Naturæ," under the name of Furia infernalis.

That the effects of this malady, from whatever cauſe it may ariſe, are truly diſtreſſing, and oftentimes attended with the utmoſt danger, can admit of no diſpute. All the inhabitants of Bothnia and Finland are aware of theſe effects; yet upon the whole we cannot ſuppreſs aſtoniſhment, if this diſorder be really occaſioned by ſuch an animal, that it ſhould be known only to Linnæus. Blumenbach and Muller are perſuaded no ſuch creature as that deſcribed does exiſt, and Boſc, who has very lately written on this ſubject, informs us, that it is generally concluded among the Swediſh naturaliſts that their illuſtrious countryman was in error: they admit that in the fenny parts of Sweden ſuch a diſorder is known to prevail in autumn, and it is acknowledged alſo that it excites the moſt excruciating torments, and often terminates in death, by occaſioning gangrene in the parts affected, unleſs an immediate remedy is applied. The apoſtume with which the wound or cavity is filled, they deſcribe as having a vermicular form, but deny that it is a worm, or any kind of animal; and the vulgar opinion is, that it owes its origin to a poiſonous matter injected into the fleſh by the ſting of an inſect, the family of which is not at preſent aſcertained. Others believe that Linnæus was in ſome manner impoſed upon, and conceive that the object preſented to him muſt be the larva of an inſect; or perhaps one of the Nereides, and which, from its dried and lacerated ſtate, deceived him. The latter idea we are hardly inclined to admit, ſince it is ſcarcely probable in our mind that this able naturaliſt could have been ſo far miſled, and, we might alſo add, ſo groſsly impoſed upon, though at the ſame time it muſt be admitted poſſible that ſuch an error might have ariſen from an accidental cauſe, and that without any deſign of impoſition on the part of his communicant.

In

In an academical tract, publiſhed by C. G. Hagen in the year 1790, under the title of "Diſſertatio de Furia infernali," its ingenious author has brought together the various obſervations that have been advanced by writers relative to the Furia infernalis, and this the curious reader will not conſult without advantage. We cannot forbear, however, in referring to this production, to caution the reader not to aſſume its concluſions with precipitation. In collecting together ſuch reports, the author acquits himſelf of a pleaſing, and indeed an uſeful labour, yet it ſhould be remembered that his views are evidently to eſtabliſh a fact acknowledged doubtful, namely, the actual exiſtence of this extraordinary creature, and that without, as it appears, being in any manner acquainted with it, except on the authority of others. The opinions of the many are againſt this concluſion, and we would ourſelves obſerve, without aſſenting to either opinion, that its non-exiſtence is more diſtinctly proved in the fruitleſs reſult of all the reſearches made ſince the time of Linnæus to diſcover a ſecond example of this worm, than its exiſtence can be demonſtrated by the ſubtility of argument. Every effort to obtain another ſpecimen has been, it appears, ineffectual, though it cannot admit of doubt that the ſubject itſelf has greatly intereſted the attention of the learned, and who, from the information they had previouſly obtained, and the frequency of this malady in the eaſtern parts of Sweden, would have been directed, we ſhould imagine, with certainty to the object in view.

When the very exiſtence of an animal is denied by a reſpectable authority, as is preciſely the fact with regard to the Furia infernalis, it deſerves our ſerious conſideration: for notwithſtanding the conſummate knowledge of Linnæus, its original deſcriber, he might, from ſome adventitious cauſe, be deceived; but it cannot be ſuppoſed an aſſertion, denying the exiſtence of ſuch an object, would be advanced without the moſt poſitive reaſons for that denial, or we ſhould at leaſt ſincerely hope not. At all events, we are perſuaded the fact is ſtill uncertain, and perhaps our judgment ought to be ſuſpended till the true cauſe of the malady it is ſuppoſed to occaſion be clearly determined to ariſe from ſome other cauſe, or that the diſcovery of another ſpecimen of the ſame worm ſhould remove all doubt reſpecting it.

FURIAN LAW, in *Roman Antiquity*, a teſtamentary law, ſo called from C. Furius, the tribune, by whoſe intereſt it was enacted. This law forbad any Roman citizen to leave by legacy above the value of one thouſand aſſes to any one perſon, and at the ſame time condemned the legatee to pay four times the ſum which was given him above what the law ſtipulated. See VOCONIAN *Law*.

FURIANA, in *Geography*, a river of Sicily, which runs into the ſea on the North coaſt. N. lat. 38° 11'. E. long. 12° 45'.

FURIES, *Eumenides*, *Diræ*, in the *Heathen Theology*, and *Poetry*, were infernal deities, ſuppoſed to be the diſpenſers of the divine vengeance, the puniſhers of wicked actions both here and hereafter, and the inflictors of terrors, wars, and peſtilence.

The furies were reputed the miniſters of Pluto, and the avengers of crimes. Strabo paints them clothed in long robes falling to their heels, but girt about the breaſt. They were three in number, TISIPHONE, MEGÆRA, and ALECTO. Theſe names, which import *rage*, *ſlaughter*, *envy*, &c. were perfectly applicable to them.

The poets ſpeak of great numbers of furies, ſome of whom were employed in tormenting criminals in Tartarus, or others wandering over the earth to tempt, or to puniſh the wicked here. Thus Virgil ſpeaks of the

"—agmina ſæva ſororum." Æn. vi. ver. 571.

But the three, above named, were ſuppoſed to exceed all the reſt in cruelty and malice, and the power of doing miſchief, and are called, by way of eminence, *the Furies*, and ſometimes the *Diræ*, a name peculiar to theſe three. They were three ſiſters, and born at one birth of the goddeſs of Night. Lycophron and Æſchylus ſay, they were the daughters of Night and Acheron. Others pretend that they owe their birth to Pluto and Proſerpine. Sophocles makes them ſpring from the Earth and Darkneſs; and Epimenides ſays, they were the ſiſters of Venus and the Parcæ, and the daughters of Saturn and Euonymus.

Patin, Spanheim, &c. will have it that we ſee theſe on the medal of the emperor Philip, ſtruck at Antioch, on whoſe reverſe are repreſented three women dreſſed as above mentioned, and armed with a key, and burning torches, poniards, and ſerpents.

Struvius, Antiq. Rom. Synt. cap. i. p. 182. adds, that the three furies may probably be no other than the triple Hecate, whom the ancients believed to purſue and torment the wicked in hell, on earth, and in heaven.

Some of the poets add a fourth fury called *Lyſſa*; a Greek word, ſignifying madneſs, or rage. Plutarch allows but of one fury, whom he calls *Adraſta*, the daughter of Jupiter and Neceſſity; who, according to him, was the ſole miniſter of the vengeance of the gods. Virgil ſeems to admit the Harpies into the number of the furies, and even calls them by that name. (Æn. l. iii. 252.)

The poets repreſent the furies as old, ſqualid, and meagre, with pale cheeks, having a kind of feveriſh fluſh on them, with eyes inflamed, their heads twiſted round with ſnakes, and furniſhed with whips and burning torches in their hands, to puniſh the guilty. Their attendants were terror, rage, paleneſs, and death. Thus ſeated round Pluto's throne, whoſe prime miniſters they were, they waited his orders with an impatience that marked out all the fury which they poſſeſſed.

The daffodil was ſacred to the furies, and ſuch as offered ſacrifices to them were crowned therewith. This we learn from Euſtathius, on the firſt book of the Iliad, p. 87.

Theſe furies were alſo called *Pœnæ*, Ποιναι, on account of the puniſhments they inflicted on criminals; as their denomination furies aroſe from the rage and madneſs which they threw into the conſcience. (Voſſ. de Idolol. lib. viii. cap. 18.) The Greeks called them *Erynnides*, *q. d.* ερις νε, contentio mentis, or becauſe, as Pauſanius remarks, ερινυειν ſignifies to fall into fury.

The Greeks called them *Eumenides*; the origin of which name is much controverted among the learned. The etymology that ſeems beſt authorized, derives it from ευμενης, *gentle*, *mild*; which was applied to them on occaſion of Oreſtes being abſolved of the murder committed by him on the perſon of his mother. Minerva, it ſeems, appeaſed and pacified the furies, ſo that they ceaſed to purſue him; upon which the Athenians ever after denominated them *Eumenides*.

But it muſt be obſerved, that, in truth, the Athenians called them by the ſame name long before Oreſtes time, as appears from the Œdipus of Sophocles. There was a temple in Athens, near the Areopagus, conſecrated to the Eumenides, whom the Athenians called *venerable goddeſſes*: Ariſtides, and the ſcholiaſt of Thucydides, ſpeak of this temple as erected in memory of the judgment of Oreſtes.

Goddeſſes ſo awful as the furies, we may naturally imagine, commanded particular homage. Accordingly they had temples in ſeveral places of Greece. But of all the temples dedicated to theſe divinities, there was not one of them, next to that built by Oreſtes in the Areopagus,

more

more noted than that which the ſame Oreſtes built in Arcadia. Theſe temples of the furies were a ſecure ſanctuary for thoſe who retired thither. Pauſanias ſays, that, after the death of Codrus, the Dorians, who were guilty of it, would all have been puniſhed with death by the judges of the Areopagus, if they had not avoided it by flying for refuge to the temple of theſe goddeſſes. Although the worſhip of the furies did not make ſo great a progreſs in Italy as in Greece, yet they were not neglected by the Romans. This we may conclude to be the caſe, if we admit the opinion of Cicero, that the goddeſs Furina was the ſame with the furies.

Beſides the Narciſſus, they uſed likewiſe in their ſacrifices branches of cedar, alder, hawthorn, ſaffron, and juniper; they ſacrificed to them ſheep and turtle-doves, as we learn from Œlian (de Animal. l. 10. c. 44.) and they uſed in their ſacrifices the ſame ceremonies with thoſe of other infernal deities. Pauſanias (in Arcad.) remarks, that in the earlier times the ſtatues of theſe goddeſſes had nothing different from thoſe of other divinities, and that the poet Æſchylus, in one of his tragedies, was the firſt who repreſented them with that hideous air, and choſe ſerpents that made them ſo dreadful, that the firſt repreſentation of his play proved fatal to many of the ſpectators. The deſcription given of the furies by this poet was followed, and it paſſed from the theatre to the temples. Henceforth they came to be repreſented as we have above deſcribed them.

FURIGELDUM, in our *Old Writers*, a mulct paid for theft.

FURINA, in *Geography*, a river of Cuba, which runs into the Spaniſh Main. N. lat. 20° 3'. W. long. 76° 10'.

FURINALIA, in *Mythology*, feaſts inſtituted in honour of Furina, the goddeſs of robbers among the Romans. They were celebrated on the ſixth day before the calends of September. The goddeſs Furina had a temple at Rome, and a prieſt called *flamen Furinalis*. Cicero repreſents this goddeſs as the ſame with the furies; and Turnebus, in his Adverſaria, defends this opinion, alleging that Plutarch, in ſpeaking of the wood conſecrated to Furina, where the younger Gracchus was killed, calls it the wood of the Erynnies, or of the furies.

FURLING Lines are ſmall lines made faſt to the top-ſails, top-gallant-ſails, and the mizen-yard-arms; ſerving to furl up thoſe ſails, *i. e.* to wrap and bind them up cloſe to the yard. The mizen has but one furling line, but all the reſt have two, one at each end. Thoſe that are uſed for the larger ſails are generally flat, and are known by the name of gaſkets.

FURLONG, an Engliſh long meaſure, containing the eighth part of a mile.

The Engliſh furlong is equal to 40 poles or perches, (the perch being 16½ feet) = 10 Gunter's chains = 1000 links = 110 Engliſh fathoms = 220 Engliſh yards = 440 cubits = 660 Engliſh feet = 7920 Engliſh inches = 132 paces = 176 Engliſh ells = 880 ſpans = 2640 palms, &c. In an old law-book, printed in Henry the VIIIth's time, we read, that ſix hundred feet, of five ſcore to the hundred, make a furlong.

In Scotland the furlong is equal to forty falls = 240 Scots ells = 1 $\frac{1}{7\frac{1}{5}}$ Engliſh furlong. In Ireland the furlong is = 1.2727 Engliſh furlongs.

Hercules is ſaid to have run a ſtadium, or furlong, at one breath.

Furlong is alſo uſed for the eighth part of an acre, or half a rood.

Furlong is ſometimes alſo uſed for a piece of land of more or leſs acres.

" Omnibus Chriſti fidel. Johannes Blunt de Eye, arm. —Dedit Thomæ Croft & Franciſco Lovel. arm. unum furlongum terræ arabilis continen. per æſtimationem quatuor acras, &c." Dat. 20. Jan. 3 Eliz. The furlong, as a ſuperficial meaſure, is generally 10 acres, according to the acre of different counties. The Engliſh ſquare furlong is = 10 Engliſh acres = 40 roods = 1600 ſquare poles = 100 ſquare Gunter's chains = 10,000 ſquare ſtaves = 1,000,000 ſquare links = 48,400 ſquare yards = 435,600 ſquare feet = 174,240 ſquare paces. See Measure.

FURLOUGH, in *Military Language*, a licence granted by an officer to a ſoldier to be abſent for ſome time from his duty. See Deserters.

FURMION, in *Geography*, a town of Iſtria; 18 miles E.S.E. of Umago.

FURNA, a ſmall iſland in the Grecian Archipelago. N. lat. 37° 42'. E. long. 26° 19'.

FURNACE, an utenſil, or veſſel, proper to contain fire, or to raiſe or maintain a vehement fire in, whether of coal or wood.

There are divers kinds of furnaces, of various forms, and for various uſes.

The domeſtic furnace, uſed in making confections, &c. is uſually of iron, or earth.

Thoſe uſed by the goldſmiths, refiners, &c. are much larger, and of a different ſtructure.

Thoſe wherein lime, bricks, &c. are burnt, are called kilns.

Furnace, in general, means a veſſel or place in which high, or long continued heat can be applied in chemiſtry, in the arts, and domeſtic economy, and theſe are either fixed or portable.

Furnaces are principally divided into two kinds, thoſe which act by the draught of a chimney and called *air* or *wind furnaces*, and thoſe in which the air is forced in by bellows and called *blaſt* furnaces. But before we give deſcriptions of the different furnaces uſed in various chemical and other operations, we ſhall give a brief outline of their general principles, firſt premiſing that furnaces commonly conſiſt of three diſtinct parts; a body, or cavity to contain the fuel, a chimney to carry off the heated air and ſmoke, and a receptacle under, and ſeparated from the body by a grate, and called the aſh-pit. Although the conſtruction of furnaces is a ſubject of the greateſt importance to thoſe employed in chemical and metallurgic operations, we yet do not find that any chemiſt or other philoſophical writer has given principles, or any thing like a theory, from which rules might be deduced for the conſtruction of a furnace of any kind, that ſhould with certainty fulfil its intention; and a perſon, wiſhing to build a furnace, has hitherto had no other guide than that of taking the exact dimenſions of ſome other furnace, that by mere gueſs has been ſo conſtructed as to act well. One fact we may uſe as a general rule, that is, that ſince the heat is generated by combuſtion, it muſt be the greateſt when the greateſt quantity of fuel is conſumed in the leaſt time, and when the fuel is in ſufficient quantity, the heat will be in proportion to the quantity of oxygen paſſing through the fire in a given time.

In ſuch a furnace as we have juſt pointed out, with a view to define the parts, if the fire be kindled, the air in that part will become ſpecifically lighter, and will therefore aſcend; the place of the aſcending air muſt be ſupplied from below, and if there be no opening below, but through the grate, all the oxygen which enters muſt contribute to the increaſe of the combuſtion.

Every increaſe of heat will give an additional levity to

the air, and for a certain length of time the heat will continue to increaſe till it arrives at its maximum.

The velocity with which heated air aſcends is as the difference of ſpecific gravity between that of the atmoſphere and the heated air. The principles on which the motion ariſing from a change of ſpecific gravity may be referred to the caſe of two weights hanging over a pulley. If they are of equal weight no motion is produced, but if one be increaſed, or the other diminiſhed, the heavy one will deſcend and the light one aſcend, with a velocity proportionate to their difference.

If the ſum of the weights be W and their difference P, then, according to Mr. Atwood's theorem, which he confirmed by experiment, the velocity at any point will be $\frac{P}{W}$ multiplied by the velocity which a body would acquire by falling freely through the ſame ſpace.

The riſing or falling of bodies in different fluids may be referred to the ſame calculation, by ſubſtituting their ſpecific gravities for the abſolute gravity of the weights.

Let 1 = the denſity of the ſurrounding air,

d = the difference of temperature between the ſurrounding and heated air in degrees of Fahrenheit,

P = the number of degrees of Fahrenheit required to double the bulk of a given quantity of air,

h = the height of the chimney,

S = the ſpace a body will fall through in a ſecond of time,

v = the velocity of the aſcending air: then the increaſe of bulk in the heated air will be $1 + \frac{d}{P}$, and the denſity, compared with the ſurrounding air, will be $\frac{P}{P + d}$. The difference of denſity will be $1 - \frac{P}{P + d} = \frac{d}{P + d}$, and the ſum of their denſities $\frac{2P + d}{P + d}$; then $\frac{d}{P + d} \div \frac{2P + d}{P + d} = \frac{d}{2P + d}$. This fraction, agreeable to Mr. Atwood's theorem, multiplied into the velocity a body would acquire by falling through h, will give the velocity of the aſcending air;

$S : 4S^2 :: h : 4Sh$; then $2S^{\frac{1}{2}}h^{\frac{1}{2}}$ will be the velocity a body would acquire by falling through h.

Hence $\frac{d}{2P + d} \times 2S^{\frac{1}{2}}h^{\frac{1}{2}} = v$, the velocity of the aſcending current.

In finding d, let the temperature at the bottom of the chimney = B; that at top T; and let the temperature of the air which enters at the grate be M: then $d = M - \frac{B + T}{2}$.

The above theorem will require an equation for the friction of the tube, which will be very great in chimneys made of brick. It is plain that if it were not for the friction of the tube, the velocity would be as the ſquare root of the height, all other things being equal.

In order to aſcertain how far the friction of the tube affects the ratio of the ſquare root of the height, I took (ſays the writer of this article) an iron tube of one foot long and two inches in diameter, having a funnel-ſhaped mouth, at the lower end, four inches wide, and about the ſame length. At the top of the tube was placed a ſmall paper fly, with its axis vertical, ſo that it might be turned by the riſing current, in a manner ſimilar to the fly of a ſmoke jack.

I found that a very ſmall change of temperature was capable of putting the fly in motion. And that keeping both my hands upon the outſide of the funnel, at the ſame time that there was free acceſs of air into its mouth, I had conſtantly about 45 revolutions made by the fly in a minute. Reckoning the difference of temperature, or d, 45° Fahrenheit, which was about the fact, it would give by the theorem above ſtated the velocity about $\frac{3}{5}$ths of a foot per ſecond, which was near the truth.

The fly was then removed and placed at the top of the tube, lengthened to four feet. The velocity in this inſtance by the theorem ſhould have been 75, but did not exceed five, ſo that the defect produced by the friction was .25. It would appear, therefore, that every increaſe of velocity, by increaſing the height of the tube given by the theorem, may be divided by two, to reduce it to experiment. For the retardation by the friction, and the acceleration of its riſing, are in the ſame ratio, that is, as the ſquare root of the height. If, however, the velocity be increaſed by the change of temperature, or as d, then the friction will be increaſed in a greater ratio; for the friction is as the ſquare of the velocity. Therefore, if the velocity be twice as great from increaſing d, the friction will be four times as great. Hence the height of a chimney cannot increaſe the power of a furnace only to a certain extent, ſince the friction, after a certain limit, would prevent the acceleration, and bring the velocity to an uniform motion.

By other experiments I found that the manner in which the air enters the mouth of the tube is of ſome conſequence. When the mouth of the funnel was held about two inches above the ſurface of a table, the current up the tube was hardly ſufficient to put the fly in motion, and it would not begin to move till the mouth was elevated four or five inches. If, however, one-half the funnel reſted upon the table, and the other over the edge of it, the fly went at the rate of 45 revolutions in a minute. When the funnel's mouth was covered with paper, having a hole in the middle equal to the area of the tube, 47 revolutions were produced; but when the whole mouth was expoſed about the ſame height above the floor, it produced 49 revolutions.

It appears, therefore, that when the air can aſcend freely and perpendicularly to the entrance of the furnace, it is to the greateſt advantage.

Since, agreeably to the nature of our theorem, the velocity of the current muſt depend upon the difference of temperature between the internal and external air, the air entering the furnace ought to be as cool as poſſible. A furnace, therefore, ſhould be ſo ſituated, that its air may be ſupplied from a cellar below, into which its aſh-pit ſhould terminate. This cellar ſhould be as ſpacious as poſſible, and the aſh-pit ſhould be at leaſt four times the width of the furnace, reckoning from the grate to the floor; but the higher the better, becauſe the air, as we have before ſtated, is ſupplied with ſo much more facility in a perpendicular direction.

The grate of an air-furnace conſiſts of a number of ſingle bars, having ſhoulders at each end, ſo that when they are laid ſide by ſide, bringing their ſhoulders together, the interſtices between the bars may be nearly equal to the breadth of the bars. The diſtance between the bars is here rather more than is in common uſe, but for producing great degrees of heat, this account will be found to anſwer in practice. The bars are merely laid upon two bearers placed in the brick work at right angles to the bars; one of the bearers being looſe for the purpoſe of ſliding backwards to let all the bars fall down with the fire. Without this contrivance,

trivance, after any proceſs is finiſhed, the fire would have to burn itſelf out, and it would be much more troubleſome to clean the furnace when it is choaked with ſlag.

The height of the fire-place muſt be ſuited to the purpoſe to which the furnace is applied. If it is a melting furnace, the height muſt be ſuch that the fuel may be about half the width of the furnace above the top of the crucible, the latter being raiſed about $\frac{1}{4}$th the width of the furnace above the grate.

The chimney of an air-furnace ſhould be as wide as the ſum of all the interſtices through which the air enters the fire, allowing nothing for friction; but as this is very conſiderable, at leaſt that ought to be double, ſo that the chimney ſhould never be leſs than half that of the furnace.

The height of the chimney is the next conſideration. In the preſent ſtate of our knowledge we have no exact rule for the height of chimneys of furnaces. Indeed it will depend upon ſo many circumſtances, that it would be difficult to give this ſtatement exactly; ſince, however, the height is limited by the friction, it will be important to avoid all thoſe circumſtances on which the friction depends. The principal of theſe are, the roughneſs and narrowneſs of the chimney. The velocity of the aſcending air will be inverſely as the width; and the friction will be as the ſquare of the velocity. It is equally certain that the friction will be much increaſed if the chimney be rough in the inſide, but more particularly when it is crooked, or when the air is interrupted by having to move in any other direction than that of a perpendicular one.

When, therefore, the chimney conſiſts of an upright priſm or cylinder, having its interior ſurface as ſmooth as poſſible, it muſt act to the greateſt advantage poſſible.

If the chimney be made of brick, thoſe ſides of the bricks intended to form the interior of the chimney ſhould be rubbed to make them ſmooth, and laid with fine well-tempered fire clay, that the interior ſurface may be free from cavities and other inequalities.

If the chimney conſiſts of iron lined with clay, it ſhould conſiſt of lengths of about two feet each. After each of the pieces are lined and well dried, but not hard baked, the inſide ſhould be ſcraped or rubbed, to give them greater ſmoothneſs. By this means the height of the chimney may be increaſed to advantage beyond the ordinary height; ſince the above pieces or lengths may be fitted together and ſeparated with the greateſt facility, and the maximum of height may be eaſily aſcertained by experiment.

Another very important circumſtance ought to be attended to in the conſtruction of chimneys. The air which is heated in paſſing through the fire ſhould retain its heat, if poſſible, till it clears the top of the chimney. Although this cannot be effectually accompliſhed, it may be effected as far as the non-conducting power of the materials of the chimney will admit.

Common bricks are very bad conductors, and conſequently not well adapted for chimneys. But ſome fire-bricks of looſe aggregation are ſtill better calculated to retain the heat.

The beſt method, however, of making perfect chimneys, is firſt to build one of very cloſe, ſmooth bricks, making the internal ſurface as above directed. This ſhould be ſurrounded with a ſecond chimney, leaving a cavity between the two about the breadth of a brick. This cavity ſhould be filled with powdered coak, or, what is better, powdered charcoal. The heated air would retain its original temperature much longer in ſuch a chimney, which would admit of its being carried higher, and increaſe the draught.

The chimneys of portable furnaces are generally made of rolled iron. Theſe chimneys carry off the heat ſo rapidly, that the height is very ſoon limited, and beyond that point becomes an evil. It has been recommended by Lavoiſier to make the chimney of a double iron tube, and fill up the cavity with powdered charcoal. By this means, however, the internal tube would become ſo hot as to be eaſily acted upon by the air, and by ſulphuring the fuel conſequently would ſoon be deſtroyed. If the cavity between the two tubes were to be filled with a ſoft compoſition of equal parts of lime, clay, and ſand, making the cavity between the tubes about half the width of the inner tube, an earthen tube would be formed, which would form an excellent chimney, even after the interior tube of iron was deſtroyed. The furnace itſelf, being lined to a proportionate thickneſs with the above compoſition, would make a portable air-furnace capable of producing the greateſt degrees of heat.

In thoſe air-furnaces, where the fire-place is required to be diſtinct from the chimney and open at the top, ſuch as *Plate* II. *fig.* 3, the chimney is required to be connected with the fire-place by an horizontal channel called a flue. This flue muſt always be conſidered as an impediment to the draught of a furnace, and ought never to be uſed but where the ſeparation of the chimney from the fire-place is abſolutely neceſſary. From the experiments above-mentioned, it will appear that the air of a furnace ſhould aſcend as perpendicularly as poſſible; hence a horizontal flue ought in all caſes to be avoided, and it will be equally evident that this evil will be ſtill greater when the air has to deſcend, as in the furnace *Plate* II. *fig* 3. In all furnaces, therefore, where the fire-place is intended to be ſeparated from the chimney, the flue ſhould be made to aſcend as much as poſſible by making an obtuſe angle with the ſide of the furnace inſtead of a right one, as in *Plate* I. *fig.* 1. Various opinions have been advanced relative to the width of the flue. When we conſider, however, that the flue is a part of the chimney, all opinions muſt give way, for if the flue is not as wide as the chimney the air muſt have to move with a proportionably greater velocity in that part, and in the ſame degree leſſen the draught of the furnace. Hence the flue ſhould be the width of the chimney as near as poſſible.

Although in ſtrictneſs all furnaces are air-furnaces, yet, as we have above ſaid, they are uſually diſtinguiſhed into thoſe where the air is forced through the fire by bellows, and thoſe where the air enters by what is called the draught of the chimney.

Theſe are again denominated either from their conſtruction, or the particular uſes to which they are applied, as will be ſeen in the courſe of this article. Generally ſpeaking, the furnaces uſed in chemical operations, and for melting and refining metals, are of the latter kind or air-furnace; and we ſhall now proceed to deſcribe the parts and particular uſes.

FURNACE, *Air*. An air-furnace, calculated to produce great degrees of heat, particularly adapted for a melting furnace of the fixed kind, and poſſeſſing all the advantages to be given to it, is repreſented in *Plate* I. *fig.* 1; *a* is the aſh-pit of the furnace; *b* the grate; *c* the fire-place; *d* the cover, which conſiſts of an iron frame filled up with fire brick. The cover ſlides ſideways to open the furnace; *g e* is in place of the flue of the common air-furnace, but here is made a part of the chimney *b*. The part *e f g* may be taken away without injuring the furnace, and the receſs may be employed for many purpoſes, ſuch as roaſting ſubſtances, fitting crucibles upon it before they are introduced into the furnace; and occaſionally a cupel may be ſet upon it, for the purpoſe of aſſaying metals, having at the ſame time a ſmall opening in the cover *d*, for the purpoſe of admitting air. This furnace will be found much more powerful in not having a contracted flue, and at the ſame time making an obtuſe

angle with the ſide of the furnace. From what has been previouſly obſerved, the high aſh-pit will contribute much to its action. It is alſo recommended that the chimney ſhould be double, and the interſtices filled with powdered coak.

Fig. 2. repreſents a ſection of a portable air-furnace, adapted to general purpoſes: *a b* is a frame of caſt iron ſtanding on three legs; *c* a diſh of rolled iron for the aſhes to fall into; *a o* the top of the frame, has a hole in the centre a little wider than the fire-place, into which the grate is fitted; *d* is a groove paſſing quite through the frame, a little wider than the hole in the middle, and immediately under the grate. Different pieces of ſheet iron are made to fit this groove, having different ſized openings for the purpoſe of regulating the draught. One of them, however, has no opening, and is intended to ſhut out the air entirely. The openings in theſe regulating ſlides being in the centre, the air will enter the furnace perpendicularly, and its paſſage will be much facilitated by the height of the grate from the floor, and by the air having a free acceſs on all ſides to the furnace.

i k is the fire-place; *e* the cover, conſiſting of either one round brick made on purpoſe, fitted into an iron frame, or of ſeveral pieces fitted into the ſame. The outſide of the furnace is made of rolled iron, lined with a compound of two parts clay, two of coarſe ſand, and one of lime. The chimney is alſo of rolled iron, and conſiſts of double tubes, *no* and *pq*, rivetted to the outſide of the furnace. The cavity between the tubes is filled with the above-mentioned compoſition. The other parts of the chimney, when it is required to increaſe its height, may be made in pieces of about two feet in length, conſiſting, like the parts attached to the furnace, of a double tube, and the cavity filled up as before directed. The inner tube muſt be a little ſhorter than the outer tube, ſo that the additional length of the outer tube may form the joint in putting the chimney together. A hole is made in the body of the furnace at *i*, and a ſimilar one on the oppoſite ſide, for the purpoſe of introducing a tube through the furnace, which is required in many experiments. A ſlit is alſo made in the furnace at *k*, for the purpoſe of introducing the neck of a retort. The hole and ſlit above-mentioned have correſpondent plugs made of the ſame ſubſtance as the lining of the furnace, by which theſe openings are cloſed when not wanted. There is another opening at *g* fitted by the plug *h*: this is uſed for the introduction of fuel when it is not convenient to introduce it at the mouth of the furnace. Occaſionally, alſo, a ſmall muffle may be introduced into it at this opening, the other end of the muffle reſting upon the part *s*.

The cover being removed, a ſand-bath mug may be introduced, ſimilar to that in Dr. Black's, *Plate* II. *fig.* 7.

When a retort is introduced, and the bottom does not happen to be ſupported by the fuel, it is liable to move, and ſometimes to be broken, by reſting entirely upon the neck. This inconvenience may be remedied, by paſſing a ſolid plug through the furnace at *i*. This plug may be made by coating a piece of iron with a compound of very pure clay and ſand, to render it as infuſible as poſſible, ſince it will be expoſed to the greateſt heat of the furnace. The middle of this ſupport muſt contain a receſs to receive the bottom of the retort. When all the openings are cloſed, and a ſlide introduced at *a*, having an opening equal to the width of the furnace, this furnace will be found a moſt powerful melting furnace; and, by introducing different ſlides, it may be employed where the moſt moderate heat is required.

The air-furnace repreſented in *Plate* I. *fig.* 3, is principally intended for enamelling and aſſaying in the cupel, where the excluſion of every thing but the air of the atmoſphere is particularly neceſſary: *a b* is an iron frame, ſimilar to that of *fig.* 2, having a groove at *d*, for the ſliding plates to regulate the draught, and a tray at *e* to receive the aſhes; *g a y o* is the body of the furnace, made of rolled iron, and lined ſimilar to that of *fig.* 2, leaving the ſpace *m n* for the fire-place; *g p* is a dome connected at *p* by a ſliding hoop, with the chimney *w*; *s* is a circular damper; *f* is a muffle, having a plug at *e*; *t* is the ſtrong earthen tube ſtanding upon the grate, having an opening, *t*, quite through it, which correſponds with a ſimilar opening in the bottom of the muffle. This tube alſo ſerves as a ſupport for the muffle; *x* is an opening through the coating of the furnace, correſponding with a ſimilar hole in the end of the muffle. The end of the muffle is made convex, ſo as accurately to fit the ſide of the concave fire-place. Hence, a current of air will paſs up the tube, *t*, into the muffle, which will eſcape at the opening, *x*, into the chimney *l*. This current can be regulated by the circular damper *q*. The plug, *e*, is only to be taken out to inſpect the proceſs, the damper, *q*, being at the ſame time ſhut to prevent the entrance of cold air into the muffle.

On each ſide of the dome are two openings, ſuch as *b*, having plugs to fit. Theſe are for the purpoſe of introducing fuel during the aſſaying proceſs.

The advantages of this furnace, for the purpoſe of aſſaying, are obvious, ſince it can be regulated to the greateſt nicety. When the current of cold air tends to cool the muffle, or the heat of the furnace is deficient, the damper, *q*, can be ſhut more or leſs; and if the heat is too great, that at *q* may be opened, and *s* ſhut to any degree.

This furnace may very eaſily be converted into a melting-furnace, or even to one for general purpoſes. The dome *g p*, and the muffle *f*, being removed, and a cap put upon the mouth of the chimney *w*, the furnace having a cover ſimilar to that of *fig.* 2: the plug, *y*, being removed, will form the flue, the opening, *x*, being of no conſequence, particularly when the damper, *q*, is ſhut; and a plug muſt be introduced at *e*, where the muffle was taken out. The chimney may be lengthened from the part *z* by pieces ſimilar to thoſe recommended in *fig.* 2.

An air-furnace, on the common plan, is repreſented in *Plate* II. *fig.* 2, in which *a c* is the fire-place; *c* the grate; *b* the cover; *d* the flue; and *e* the chimney. This furnace differs from the air-furnace already deſcribed only in the conſtruction of the flue, and the aſh-pit.

A fixed air-furnace, invented by Mr. Knight, is ſhewn in *fig.* 3: *a b* is the fire-place; *b* the grate; *c* the entrance for the air under the grate; *e* is the flue; *f* a cavity or chamber, for the purpoſe of baking crucibles, and other uſes; *y* the paſſage for the air into the chimney *h*; and *i* is a ſliding damper. Although this furnace poſſeſſes great conveniences, it is not calculated for producing the greateſt degrees of heat, ſince the air muſt meet with much obſtruction in its paſſage from the fire-place to the chimney. *Fig.* 4. is a furnace invented by Mr. Muſhet, intended as an experimental furnace for the purpoſe of aſſaying ores, &c.: *a b c d* is a cylinder of caſt iron, lined with fire-bricks, ſo as to conſtitute the fire-place *e f*; *y* is the grate having a receſs in the middle for the reception of a crucible ſtand; *s* the aſh-pit; *o* is the flue; and *g* the cover: *h i* is a rod of ſteel faſtened into the bottom of the caſt iron cylinder at *h*, and having at the other end an index *i k*, fitted to the arc *q r*, which is attached to the cylinder. When the furnace is uſed, the exceſs of expanſion of the ſteel rod above the caſt iron cylinder will give motion to the index, and if the arc be graduated, ſo as to correſpond with Wedgwood's pyrometer, the degree of heat, in any experiment, will be known. In order to prevent the ſteel rod, which is poliſhed, from oxydation, it is incloſed in a tube of

iron,

iron, and the cavity filled up with powdered charcoal. The fire-place, from the grate to the cover, is three feet; the diameter at the grate ten inches, and at the top nine inches. The height of the chimney, the inventor recommends, ſhould not be leſs than thirty feet, and the width nine inches throughout.

Although this furnace has not been generally adopted, the thought is very ingenious, and, no doubt, practicable, to a certain extent. The ſcale would moſt likely require to be altered from time to time; firſt, from the change in the expanſibility of the ſteel rod; and, ſecondly, from the increaſe of the conducting power in the bricks. Theſe objections may be much obviated by attending to theſe changes. At all events, the pyrometer will enable the operator to find the relative heat, ſhould it even fail in meaſuring the abſolute degrees, which will certainly be a great acquiſition.

Dr. Black's reverberatory air-furnace is ſhewn in *Plate* II. *fig.* 1: *a b* is the fire-place; *b* the grate; *c* the cover; *a e* is an horizontal cavity through which the flame reverberates, and paſſes up the chimney *l*; *d* is a door for introducing the materials to be operated upon.

This furnace is uſed for roaſting various ſubſtances, ſuch as the ores of metals, for the purpoſe of expelling their volatile matter. It may be alſo employed for the cupellation of metals, the door *d* being a little opened for the admiſſion of atmoſpheric air.

Fig. 5. is a repreſentation of Mr. Knight's portable air-furnace; *a b* is the fire-place; *b c* the aſh-pit, which is cloſed on every ſide, excepting at the regiſter door, where the air is admitted; *o* is an opening for the reception of fuel; *e* is a receſs for the neck of a retort. *Fig.* 9. is a dome fitting the top of the furnace, to which the tube *fig.* 10. is connected, which unites with another tube inſerted into a common chimney. *Fig.* 8. is a ſand-bath, which is uſed in the abſence of the dome, and, like it, is connected with the tube 10.

This furnace is made of rolled iron, and lined with an earthy compoſition. *Fig.* 6. is a perſpective view of Dr. Black's portable air-furnace, which, but for its confined aſh-pit, has not as yet been improved upon: *a b* is the fire-place; *b c* the aſh-pit; *e* a ſliding door for the admiſſion of fuel, &c.; *d*, another door for the ſame purpoſe, and alſo for the introduction of a muffle. *Fig.* 11. is a cover, and *fig.* 7. a ſand-bath; *f* is a chimney, which is lengthened by pipes of rolled iron, or connected by the ſame with another chimney. This furnace, like the laſt, is made of rolled iron, and lined with clay and ſand.

Another air-furnace, of great power, and very convenient for operations, has been conſtructed and employed by Mr. Muſhet in his numerous and valuable experiments on iron and ſteel, a portion of which he has communicated to the public through the medium of the Philoſophical Magazine: he has obligingly furniſhed us with the drawing and deſcription. *Plate* III. *fig.* 1. is the ſection of an aſſay or melting, and annealing, and alſo a ſmall reverberatory furnace for fuſing in very high heats with the flame of pit-coal. A is the aſſay-furnace; B the reverberatory furnace; and C the annealing, or cementing-furnace.

The aſſay-furnace is caſed in caſt iron, with a flanch projecting inward, the breadth of a brick, and about half an inch more, which ſerves inſtead of bearers for the bars. (See *fig.* 2. at D.) Upon this flanch the brick-work is reared; it ought to be of good fire-bricks on the bed; the furnace is nine inches ſquare; total height 27 inches; from the top of the flanch, to the bottom of the flue, the interval is 18 inches; the flue is four inches high; the height above is five inches; flue ſeven inches long, and keeps opening into the chimney, as may be ſeen in *fig.* 3, at E. If the chimney is under 25 feet in height, a larger flue is requiſite; and if beyond 35 feet, a ſmaller flue will throw the heat more regularly through the furnace. In general, however, more harm enſues from too ſmall, than from too large a flue. G is the floor-line, and alſo repreſents the edge of a grate which covers the aſh-pit, which is better ſeen in the ground-plan, *fig.* 3, and in *fig.* 2, at H. This grate lies nine inches from the bars, leaving an open ſpace for the admiſſion of air; it projects 24 inches outwards, and ſerves the operator to ſtand upon.

II, in *figs.* 1 and 2, is the aſh-pit; in *fig.* 3, which is a ground plan of the chimney and furnaces, C is the annealing, or cementing-furnace, in which the crucibles are annealed, or baked, to a bright red heat, and from thence introduced, along with the matter to be operated upon, into the aſſay-furnace. It alſo ſerves inſtead of a cementing-furnace, being eaſily made to produce a heat of 100° of Wedgwood: it may be made of any ſize, from 9 to 14 inches ſquare, a 9-inch chimney being ſufficiently wide to the extent of an 18-inch furnace.

The chimney to each furnace is carried up five feet perpendicular; they then gradually incline to the centre opening, which they enter about twelve feet above the flues: L, L, L, are dampers: from the grates of this aſſay-furnace, to the top of the chimney, the interval is 33 feet.

This furnace has melted 400 grains of malleable iron in ten minutes; and half a pound from lumps in 40 minutes. If the materials to be operated upon are prepared with judgment, any experiment, to the extent of half a pound of matter, may be performed in half an hour, and leſs quantities in much leſs time. When approaching to its higheſt heat, a Stourbridge clay crucible (which drop in 168 of Wedgwood,) will diſappear in 15 minutes, from the time that it is put in. The firſt five bring it to 140° of Wedgwood, at which caſt iron boils. Steel boils in it at 162°, and malleable iron boils at 170° to 172° of Wedgwood. It is probable, however, that the advantages of this furnace do not reſult from the height of the chimney, (which is not great,) or from the ſize of its opening; more, it is likely, depends upon the flue; the opening of the grate bars; the ſize of the fuel; and particularly the feeding of the fire.

FURNACE, *Almond*, or *Alman*. This is alſo called a ſweep, and is uſed for ſeparating metals from cinders, ſlag, broken teſts, crucibles, &c. See SWEEP.

FURNACE, *Aſſay*. The furnaces above deſcribed may all be uſed for aſſaying or cupelling, ſee *Plates* I, II, III.

FURNACE, called *athanor* or *tower* furnace. This was a conſtruction of air-furnace, calculated to preſerve an equable degree of heat for a conſiderable length of time; it was much employed by the alchemiſts and chemiſts of the laſt and preceding century in their tedious and repeated diſtillations, calcinations, &c. but is not at preſent in uſe.

FURNACE, *Balling*. See IRON.

FURNACE, *Bellows* or *Blaſt*. Having given an account of the principles, and deſcribed the varieties of air, or draught furnaces, we ſhall give ſome account of thoſe furnaces which are ſupplied with their air by mechanical means, and are called blaſt-furnaces. This part, however, will not compriſe thoſe on the large ſcale for ſmelting iron, as that ſubject has been amply treated under the article BLAST-*Furnace*. We ſhall, therefore, confine ourſelves to the ſmaller blaſt-furnaces employed in chemical experiments requiring great and ſudden heat.

It will appear, from what has been obſerved reſpecting the principles of furnaces, that if the aſh-pit of a common air-furnace were made perfectly cloſe in every part, excepting through the grate, and an opening into the aſh-pit into which the nozzle of a pair of double bellows may be in-

ſerted,

ſerted, a blaſt-furnace would be found differing from an air-furnace only in the mode of forcing the air into the fire. Indeed its action would be ſo ſimilar to that of an air-furnace, that it might for moſt purpoſes anſwer the ſame end.

The blaſt-furnace for philoſophical experiments was much improved by the ingenious Dr. Lewis, who fitted up a black-lead crucible for this purpoſe. The pot choſen ſhould be of the largeſt ſize, and if a cover or dome, or an additional part be wanted, another pot with a portion of its lower narrow part ſawed off makes a very convenient one. A round plate or ſlip ſawed off from the ſolid part of the bottom ſerves very commodiouſly both for a grate and for a ſupport to the crucible; eight or nine holes, about three quarters of an inch in diameter, are bored round the outer part of the plate for the tranſmiſſion of the air forced in by the bellows, which holes are made to widen downwards to prevent their being choaked up by pieces of the fuel. The air was forced in by bellows by an aperture on the ſide of the pot.

In operations which require a conſiderable degree of concentrated heat, it has been propoſed to impel a number of flames into one point by ſtreams of air driven from different parts of the circumference of the fuel to the middle by means of ſeveral bellows placed round the furnace. But a number of bellows being incommodious, Dr. Lewis has contrived to multiply the ſtream of air from one bellows. The pot which ſerves as a furnace for this purpoſe has a number of holes bored at ſmall diſtances in ſpiral lines all over it, from the bottom up to ſuch height as the fuel is deſigned to reach to.

The crucible is placed on a proper ſupport in the bottom; and the holes are obliquely directed towards the crucible, ſo that the impelled heat plays in a kind of ſpiral upon its ſurface. The pot which ſerves for the blaſt furnace already deſcribed, with an iron ring at the top, receives this perforated pot ſo far, that all its holes are within the cavity, which cavity has no other outlet than the round aperture for the bellows; and therefore the air thus blown in will diſtribute itſelf through the perforation of the inner pot.

Mr. Arthur Aikin has conſiderably improved upon this plan of Dr. Lewis's, and the following is a deſcription of his furnace, as publiſhed in the Philoſophical Magazine.

Plate IV. *fig.* 3. is a view of a ſection of this furnace. It is formed of three black-lead crucibles. The 1ſt, *a*, is a crucible cut off near to the bottom, leaving a portion of the internal cavity; the 2d, *b*, is what contains the fire and the crucible. The bottom of this crucible is perforated with holes for the admiſſion of air, as ſhewn at *fig.* 4, which is blown into the cavity in the baſe part *a*, by double bellows. The ſtand of the crucible has a projecting part which fits a hole in the bottom of the crucible *b*, in order that it may ſtand more firmly (ſee *fig.* 5.); *c* is a third crucible ſometimes inverted upon that of *b*, when the fire requires to be heaped up higher, or to keep off the glare of light. This has a hole in the ſide to let out the air, and another into the bottom laterally, for the purpoſe of introducing an iron inſtrument to lift it on and off.

This furnace is particularly adapted for a lecture room, ſince its fire can be raiſed to its full heat in a very little time; at the ſame time it is capable of producing a greater heat than almoſt any other furnace.

Mr. Aikin has adapted this furnace to experiments with the cupel, by having a crucible with a hole through the bottom, and a ſtand having a correſponding hole through it, communicating with the cavity in the part *c*. In the inſide of the crucible are ſeveral projections forming a ſhoulder or flange to ſet the cupel upon. An earthen tube is fitted into the cover extending obliquely out of the mouth of the furnace; this ſerves to look down for inſpecting the proceſs.

Several kinds of ſmall blaſt furnaces are alſo uſed in the arts, particularly that uſed in melting pig iron for the purpoſe of caſting. This furnace is called a cupola, and will be deſcribed under iron. See IRON.

FURNACES *for making Colours*, are thoſe for ſubliming cinnabar or ſulphuret of mercury for making vermilion; for ſubliming ſulphuret of arſenic for making king's yellow; for calcining blood for making Pruſſian blue, ochre, &c. &c. For their conſtruction and uſe, ſee the arts, and the different articles in this work.

FURNACE *uſed for enamelling Pictures*. The extreme delicacy which is neceſſary in the proceſs of firing or burning in the colours in enamel painting, renders the conſtruction of the furnace an object of the utmoſt importance to the artiſt, whoſe labours are liable to be irrecoverably loſt by the ſlighteſt miſmanagement of the proceſs, or error in the formation of the furnace.

We are enabled, through the kindneſs of Mr. Bone, of Berner ſtreet, London, enamel painter to the king and prince of Wales, to preſent our readers and artiſts of this claſs with a drawing of the furnace which he has employed for firing his moſt celebrated productions, and which, we may ſafely ſay, have not been equalled either for the richneſs of colour and accuracy of deſign, or for the ſize to which he has extended the paintings on enamel, which were formerly confined to the moſt minute ſubjects. The lower part of *Plate* V. contains theſe drawings, which are two vertical ſections taken on planes perpendicular to each other; the ſame letters of reference applying to both. A repreſents the fire grate extended over the aſh-pit, B, of the furnace; the fire door at C for the admiſſion of the fuel is placed at the back of the furnace or ſide oppoſite to that where the operator is ſtationed, and in a ſeparate room: this is intended that the ſmoke, which will at ſometimes iſſue from the mouth of the furnace, may not endanger the pictures. The room, therefore, where the operation is performed, has no connection with the fire, ſo that the whole may be conducted without duſt or ſmoke. The pictures are placed in a muffle E, which is open only at one end; it is ſupported upon three ſmall arches, F, F, F, of brick-work extending acroſs the furnace; the ſpaces between theſe form three flues, which convey the flame of the fuel beneath the muffle. The mouths of theſe flues are ſhewn by the three dark ſquares *fig.* 11; they then turn up over the arched roof K, of the fire-place, and under the muffle between the arches F, F, F, at the commencement of theſe flues ſhewn by dark ſquares in *fig.* 11, and marked *a* in *fig.* 10. The flame divides, and a part proceeds over the muffle at *b*, being reverberated upon it by the arched roof of the chamber in which the muffle is ſituated. After paſſing over and under the muffle, the two currents of flame eſcape together to the chimney N, through three flues *d*, which are beneath an iron chamber H, called the annealing oven. In this four ſhelves are fixed to contain the articles which are to be annealed, previous to being introduced into the muffle. This is done through the open end which is expoſed at *e* to the open air, the junction of the muffle with the wall of the furnace being made by fire clay inſerted between them. Before the mouth of the muffle an iron plate, *f*, is placed ſupported by brackets: this, together with the wall of the furnace, forms a table to ſupport the picture when it is withdrawn from the muffle for examination. The muffle is made of fire clay in one piece, but it is very difficult to obtain materials which will withſtand the heat when in ſo large a maſs without cracking, which the beſt that can be procured

will

will do; frequently it, however, is not a very material defect, if a ſmall crack takes place at the upper part, as it begets a confidence that the muffle will not crack any further, owing probably to the unequal contraction of the parts of the muffle having liberty of action.

The operation of burning in the colours of a painting, or, as it is technically termed, *firing*, is conducted in the following manner: the picture painted, and prepared as deſcribed in our article PAINTING *in Enamel*, is placed upon a planch or flat piece of fire-ſtone, with a ſmall quantity of whiting between them, the uſe of which will be explained hereafter. Theſe are put into the loweſt ſhelf of the annealing oven H, and the door of the oven cloſed to prevent the entrance of duſt. The fire is now lighted on the grate, and after burning from three to four hours, according to the ſtate of the weather and direction of the wind, the muffle acquires a vivid white heat, and of ſimilar appearance in all parts: when this happens it is judged proper to begin firing; the pictures in the oven in the mean time have gradually acquired ſuch a heat as to be in no danger of cracking from the change of heat on entering the muffle; the planches have uſually reached a low red heat by the time the muffle is properly hot; and it is ſuppoſed that the oil uſed in mixing up the colours is nearly all evaporated, the painting exhibiting a very dull and faint appearance. It is proper that the door of the annealing oven ſhould not be too cloſe, that the vapour from the oil may readily eſcape.

The planch and picture upon it are now removed from the annealing oven by an iron fork, *fig.* 7, uſed in a manner ſimilar to a baker's peel, and introduced into the muffle: the doors are ſhut cloſe; the operator now looks through a ſmall hole in one of the doors, furniſhed with a ſliding cover, and attentively watches the picture; he ſees it gradually heat till it acquires the ſame colour as the muffle; the ſurface of the picture is then obſerved to aſſume a gloſſy appearance, ariſing from the fuſion of the enamel; at firſt this commences at the farther part of the muffle, but extends itſelf, with aſtoniſhing celerity, over the whole ſurface, if the operation is well conducted. The picture is now withdrawn from the muffle upon the table before its mouth, and examined before a ſtrong light, if every part is equally gloſſy; if not, it is returned to the muffle; in this ſtate the picture and planch only exhibit a maſs at a white heat; no traces of painting or colour can be diſcovered, and the whole judgment muſt be formed from its appearing equally fuſed in every part of the ſurface.

The fuſing being now completed, the picture is returned to the annealing oven; and the fire being put out by taking away the bars of the fire, the whole furnace cools gradually together, the picture remaining in the oven ſome hours before it is removed to paint again upon it. The operation of firing a picture requires to be performed from twelve to twenty-five times, according to the tints required, and the nature of the picture: the pictures are liable to crack whilſt in the muffle, an accident that cannot often be repaired, in which caſe the labour of painting is all loſt. The principal precaution againſt this is to proportion the flues in ſuch a manner that the annealing oven ſhall always be of ſuch a temperature that the pictures taken from it, and introduced into the muffle, may not experience ſuch a change of temperature as to fly. In Mr. Bone's furnace this is ſo well regulated, that he ſeldom finds his paintings crack in the firing, though it coſt him many ſevere diſappointments before he obtained this perfection by repeated trials: this diſpoſition to crack appears to depend almoſt as much upon the plate and enamel as the conſtruction of the furnace, and it is no proof becauſe a painting ſtands the firſt firings well, that it will not fly in the ſucceeding. Enamel pictures are nearly all liable to cockle or warp in the firing, in a greater or leſs degree, though this may be obviated ſo far, by great care in the preparation of the metal plate, as to be no ſerious detriment to the effect of the pictures: the method of preparing theſe plates is explained in the article ENAMELLING. For an account of the colours, and art of painting, ſee PAINTING *in Enamel*, which is a ſubject requiring long experience, to be added to the uſual knowledge of a painter, as the colours are in fact produced by the firing, being very different in appearance when laid on, and without any of the brilliancy for which this ſpecies of painting is diſtinguiſhed The artiſt muſt judge concerning the effect which his painting will produce by his recollection of the change of each colour, and its combination with others, inſtead of being able to examine it conſtantly by its appearance: but it is eſſential to the perfection of enamel painting, that all the colours employed ſhould blend together in the firing, and at the ſame heat, or ſome would be too much burnt before others were properly fuſed; and they muſt be of ſuch a nature as not to emit any vapour when in the fire, as this would produce bubbles in the ſurface, and deſtroy the effect of the painting.

As the colours at preſent known which will ſtand theſe teſts are but few, and require compounding together to produce the various tints, it is an additional reaſon why none can be admitted but ſuch as are acted upon in a ſimilar manner by the fire. It is conjectured that the crack in the muffle, being found rather to improve than leſſen the effect, may ariſe from a minute draught which will take placethrough the muffle, carrying off any vapours proceeding from the oil, which may remain in the colours after annealing, or other cauſes, which vapour, if confined to the picture, might be detrimental to the colours. As the generality of enamel plates are made with the ſurface convex, it becomes neceſſary, when they are large, to ſupport the centre of the plate from ſinking, which they are very liable to do when in a ſtate of fuſion. To prevent this accident, the planch muſt have a bed of powdered whiting laid upon it, with its ſurface made to fit the concavity of the enamel plate as nearly as poſſible, carefully avoiding all preſſure upon the plate, leaſt it ſhould receive any ſtrain. If this operation is nicely conducted, the plates may be made to keep their ſhape much better than by any other means that have as yet been deviſed.

FURNACE *for enamelling watch Dial-plates.* This furnace, though very ſimple in its conſtruction, differs from all the others we have deſcribed in not having any bars or grating for the admiſſion of air to the bottom of the fire; the only paſſage for air being through or under the muffle, which in this kind of enamelling conſiſts only of a ſimple arch of clay without either bottom or back.

This furnace is ſingularly adapted to the purpoſe for which it is uſed, as a very intenſe heat is obtained with a comparatively ſmall quantity of fuel, in addition to which the work may be brought almoſt in contact with the coals without receiving any injury from their dirt; clearneſs in this kind of enamelling being very juſtly conſidered one of its greateſt perfections. *Fig.* 1. of *Plate* V. *of Furnaces*, repreſents a front elevation; A, A, are two piers of brick work, upon which reſt the arch B, covering the aſh, or coak-pit, C. From each ſide of theſe piers project the three bricks D, D, D, which ſupport the hearth, or iron plate, E; another plate of caſt iron lies juſt beneath this, which ſerves for the bottom of the furnace, and which may be ſeen in the ſection at F, *fig.* 2. Upon this plate of iron ſtand the Welſh lumps, G, G, forming the interior ſides of the furnace; the one which forms the back may be ſeen at G,

fig. 2.

fig. 2: the brick-work is then carried upon each ſide over the piers, and bound together by the iron bar H, which likewiſe ſerves to ſupport the brick-work over the front, in which is fixed the regiſter, or damper, I. When the furnace is completed thus far, the flue may be carried up to a convenient height, or turned into one already formed.

To give the reader a clear idea of the method of uſing this furnace, as well as the way in which the fuel ſhould be placed, we have given, *fig.* 2, a vertical ſection through the line C I, perpendicular to the front; and that the parts in each may be compared, we have uſed the ſame letters of reference as far as the parts could be ſeen in each figure.

When the fire is to be made up for uſe, the muffle is to be placed in the furnace; one end reſting on the iron ſupport, as ſhewn at K, *fig.* 1, and the other end is to be kept level with the front by putting a piece of coak under each ſide. The ſpace on each ſide is then to be filled with ſmall pieces of coak, and at the back of the muffle ſmall coak muſt likewiſe be put in till it reaches about half way up the end. A ſolid piece of coak muſt then be ſelected, which muſt be large enough to cover the end of the muffle, and upon this a ſecond piece muſt be placed to ſupply the place of the firſt when that is burned away. The ſpace then immediately above the muffle muſt be filled with middling ſized pieces of coak, carefully building it up in the front, ſo as to keep it even with the ſides G, G. The door, as ſhewn at *fig.* 3, is then to be placed in the front, preſſing it cloſe up to the ſides G, G. To light the fire, nothing more is neceſſary than to fill the ſpace under the muffle with red-hot charcoal, and by drawing the damper a good way out the fuel will ſoon be alight all over. In *fig.* 2. it will be found that we have endeavoured to ſhew the poſition of the fuel placed in the order of our deſcription, with a ſection of the muffle ſhewing the height of the charcoal which lies at the bottom when the fire is in a ſtate fit for uſe. For we muſt here obſerve that it will be always neceſſary to beat that pretty ſmoothly down, that the apparatus which the dial lies on may be placed ſteadily upon it.

As it would be difficult in this figure to ſhew the poſition of the dial-plate in the fire, we have given, at *fig.* 8, a ſection of the apparatus as it is placed under the muffle; *a* being the dial-plate; *b b*, the ring; *c*, the planch; *d*, the turner. In uſing theſe, the turner is firſt placed ſteadily upon the bed of charcoal, and the dial, being placed upon the ring, is laid as nearly as poſſible in the centre of the planch, which is conveyed under the muffle, and placed upon the turner with the ſpring tongs, as ſhewn at *fig.* 6. When one ſide of the plate is nearly melted, the planch may be turned round by a ſlight touch with the tongs, till the whole dial is completely fuſed all over, when it muſt be withdrawn from the furnace, and placed juſt in the front of the muffle to cool gradually.

Fig. 4. is an end elevation of the muffle placed on the prop, as ſhewn at *fig.* 1.

Fig. 5. is a vertical ſection of the ſame through the line *a b*.

Fig. 9. is the iron key with an aperture in the end, which fits the ſquare pin, *a*, in the door, as ſhewn at *fig.* 3, and is uſed to remove the door from the front of the furnace when it is hot.

FURNACE, *Founders*, is of different forms, according to the kinds of works to be caſt. See FOUNDERY and IRON.

FURNACE, *Glaſs-Houſe*. See GLASS.

FURNACE *for Glaſs-Painters*. See PAINTING *on Glaſs*.

FURNACE, *Hatters*. See HAT.

FURNACE, *Lamp*. See LAMP.

FURNACE, *Letter Founders*. See LETTER-FOUNDERY.

FURNACE, *Melting*. See *Air*-FURNACE.

FURNACE, *Plumbers*, is of three kinds: in the firſt they melt the lead, whereof ſheets are to be caſt. This is only a ſort of large copper, or receptacle like a copper, made of fire-ſtone, and coated well round with clay, having a little iron pan at the bottom. In the ſecond, they melt the lead to be caſt in moulds for pipes, &c. which are not to be ſoldered. The third is the tinning furnace, which is a ſquare frame of wood, or ſometimes a maſs of ſtone-work, with brick hearth, whereon is made a charcoal fire, which ſerves them for the applying of thin tin leaves on the works. See PLUMBERY.

FURNACES *for baking Porcelain and Pottery*. See KILN and PORCELAIN.

FURNACES, *Portable*. See above, Knight's, Black's, Lewis's, Muſhet's, Aikin's, &c.

FURNACE *uſed for baking Tobacco-pipes*. We may, perhaps, be criticiſed for introducing into our plates the implements of ſo trifling a manufacture, but we ſhall excuſe ourſelves, on account of the ingenious ſtructure of the furnace, and the application which may be made of it to other and more important purpoſes. This furnace is to be admired for equality of the heat in every part of the crucible, or pot, in which the pipes, or other articles to be heated, are placed, at the ſame time that the flame is not permitted to enter, ſo as to ſoil the articles it contains. This crucible is marked A A, *Plate* III. *figs.* 4 and 5: it is of a cylindrical figure, terminated at the top by a hemiſphere; it is placed over the fire-place, B, and encloſed within a furnace, D D, of brick-work, lined with fire-brick E E: between this lining and the crucible is a ſpace of about four inches, all round in which the flame from the fire-place circulates, without interruption, except what ariſes from the numerous ſupports which are neceſſary to ſuſtain the crucible in its proper poſition; but as theſe are always placed edge-ways to the flame, and are very thin, they cauſe but little obſtruction to its action: the ſupports are 12 ribs, between the crucible and the lining, which form the ſame number of flues, as ſhewn by the dotted lines *x*, *fig.* 5, (the dotted circle A being the crucible): the ribs are perforated with occaſional apertures, (ſee the ſection, *fig.* 4.) to connect one flue with the adjoining; but the principal bearing of the crucible is taken from five piers, *b b c*, formed of bricks, projecting one over the other: one of theſe piers, *c*, is placed at the back of the fire-place, and the other four at the ſides *b*, *b*, and projecting at the top, nearly into the centre of the crucible, ſo as to ſupport and ſtrengthen the bottom of it, which reſts upon theſe piers, the ſpaces between which form the mouths, or commencement of the flues ſurrounding the crucible: at the top of the crucible all the flues unite in the dome, L, of the fire-brick lining, and this has a circular opening through it, leading into the chimney N.

The lining, F E E, of the chimney is open on one ſide, (ſee the plan,) to form the door, at which the pipes are taken in and out of the furnace; the opening is permanently cloſed as high as *k*, *fig.* 4, by an iron plate plaſtered with fire-clay; above this it is left open, and only cloſed when the furnace is burning by temporary brick-work: when this is removed, the furnace can be filled or emptied through the opening; and, for this purpoſe, the crucible has a ſimilar opening in its ſide: when the furnace is burning, this aperture is cloſed, by an ingenious contrivance: the workman firſt ſpreads a layer of clay round the edge of the opening; he then ſticks the ſtems of broken pipes acroſs, from one ſide to the other, and plaſters the interſtices with clay in a manner exactly ſimilar to the lath and plaſter uſed in building. The whole of the crucible is made in this manner; the bottom is compoſed of a great number of fragments of pipes, radiating to

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the centre; theſe are coated with a layer of clay at the circumference; a number of the bowls of broken pipes are inſerted into the clay: in theſe, other fragments are placed upright, to form the ſides of the crucible. The ribs round the outſide, which form the flues, are conſtructed in the ſame manner, as is alſo the dome, L, of the fire-brick lining; by this means the crucible can be made very ſtrong, but at the ſame time ſo thin, as to require but little clay to conſtruct it, and is leſs liable to ſplit by the heat, than a veſſel formed of thicker materials. This method might, we think, be advantageouſly applied in other caſes, where a very thin veſſel or lining is required for a furnace. The pipes which are to be baked are arranged within the crucible, as ſhewn in the ſection, the bowls reſting againſt the circumference, and the other ends ſupported upon circular pieces of clay, *r*, which are ſet up in the centre for that purpoſe; ſix ſmall ribs are made to project inwards, all round the crucible, at the proper heights, to ſupport the different ranges of pipes, without having ſo many reſting upon each other, as to endanger their being cruſhed by the weight. By this mode of arrangement, the furnace is made to contain 50 groſs, or 7200 pipes: theſe require to be burned from ſeven to nine hours; and the heat is at firſt brought on gently, and afterwards increaſed to the full heat required for baking this ſpecies of pottery: the fire is regulated by a ſimple kind of damper applied over the aperture in the dome, L, of the fire-brick lining. This is a mixture of horſe-dung, ſand, and pipe-clay, well worked together, and ſpread in thin layers upon coarſe brown paper: a ſheet of this being laid over the hole in the dome, ſo as to cover more or leſs of it, will give the means of increaſing or diminiſhing the draught, and, conſequently, the heat of the furnace.

We ſhall conclude this article with ſome uſeful hints relative to the different kinds of fuel, the management of furnaces, and the quality and form of crucibles.

The fuel employed is of three kinds; namely, pit-coal, coak, and charcoal; the firſt of which is ſeldom employed but for reverberatory furnaces, where ſubſtances are to be heated by flame, or heated air. The nature of coaks varies according to the manner of preparing them, and the nature of the coal. For ſome purpoſes, ſuch as melting ſteel, or in other ſituations, where long continued and intenſe heat is required, the coaks are made ſo hard as to exhibit a bright, white, cryſtalline fracture. In other caſes, where great heat is not required, and where expedition is more an object, the ſoft coaks are preferable. When a clear fire, free from ſmoke, and the ſuffocating vapour of ſulphurous acid, from pit-coal coak, is required, charcoal is found exceedingly convenient. Charcoal is alſo ſometimes mixed with coak, for the purpoſe of making the coak kindle more ſpeedily.

When coak, or pit-coal, is employed, the grate is liable to be choaked, from the fuſion of the earthy matter with which it moſtly abounds. An iron rod, with a hook at one end, is uſed for removing this ſubſtance from the grate, which otherwiſe would prevent the paſſage of the air. After an air-furnace has been uſed for ſeveral hours, when the fire is let out, the bars ought to be taken out for the purpoſe of removing all the ſlaggy matter.

Nothing, perhaps, is of more importance, in the dry operations of chemiſtry, than good crucibles. Formerly we had no good crucibles but what came from Holland, and thoſe termed Heſſian crucibles. The moſt eſſential point in making good crucibles, is to get clay as free as poſſible from metallic oxyds, particularly iron. A crucible ſhould be capable of bearing a heat that will thoroughly fuſe the ſubſtance put into it, without becoming itſelf ſo ſoft, as not to bear lifting out of the fire. And it ſhould alſo be capable of bearing ſudden extremes of heat and cold, without cracking. The firſt of theſe objects is attained, by introducing as much pure clay into its compoſition as poſſible. Crucibles, made ſolely of clay, however, are very liable to crack with extremes of heat and cold. This latter evil has been avoided, by mixing the coarſe powder of burnt clay with the pure clay; and ſometimes for the burned clay pure white ſand has been uſed. The crucibles uſed for melting ſteel, which requires greater heat than is generally uſed, are made with Stourbridge clay, and the powder of other hard coaks, which are uſed as fuel. Theſe pots will ſometimes bear four heats, or meltings, without cracking or loſing their form.

The inſide of a crucible is in figure nearly a paraboloid, and the outſide a truncated cone; ſo that the ſides are gradually thicker towards the bottom. The ſtands and covers of crucibles ought to be made of the ſame materials as the crucibles: the ſtand ſhould be cylindrical, and of the diameter of the bottom of the crucible.

Previouſly to a crucible being put into the fire, it ſhould be gradually heated to at leaſt a low red heat; and a good crucible, which has been heated till it begins to vitrify, can ſeldom be truſted a ſecond time in the fire.

A crucible ſhould never be introduced, or taken out of the fire by tongs, holding it by one ſide only, but by ſuch as will embrace it cloſely on the outſide, by having the mouth of the tongs of the curvature of the crucible. When a crucible is very hot in the furnace, the fire ſhould not be ſuffered to get very low, ſince the introduction of a great quantity of cold fuel will be liable to break the crucible. Crucibles are much more liable to crack when they have been baked very hard. If they are merely hard enough to bear putting into the fire, and to bear the weight of the materials, it is ſufficient.

FURNACE, *Reverberatory*. See above, Dr. Black's, Mr. Muſhet's, and the article IRON.

FURNACE, *Simple*. See *Air*-FURNACE, *Plate* I. *fig.* 1.

FURNACE, *Smelting*. See above, BLAST-*Furnace*, IRON, ORES, SMELTING.

FURNACE, *Wind*. See *Air*-FURNACE.

FURNACE *for making Steel*. See STEEL.

FURNACE *for procuring Zinc from its Ore*. See ZINC.

FURNACE *of a mine*, in the *Art of War*. See CHAMBER and MINE.

FURNACE. See TORNAGE.

FURNEAUX, PHILIP, in *Biography*, was born at Totneſs, in Devonſhire, in the year 1726. He received his claſſical education at the free-ſchool of his native town, and was a contemporary with the celebrated Dr. Kennicott. An intimacy between theſe learned men was contracted in youth; it increaſed in advancing life, and continued till death ſeparated the bonds of friendſhip. The object of their purſuits was ſimilar, though they took different methods to attain it. Dr. Kennicott was a member of the eſtabliſhed church, but Mr. Furneaux ſought for learning, and aimed to be uſeful among the Diſſenters. He ſtudied under the patronage of Mr. Coward's funds, and having diligently purſued that courſe of learning which is preparatory to the exerciſe of the miniſtry, he ſettled with a congregation at St. Thomas' Southwark, and ſoon afterwards was choſen one of the Sunday evening lecturers at Salters' hall, in London. He became a very diſtinguiſhed preacher, on account of the ſolemnity and fervour of his manner, and the energy of his pulpit diſcourſes. In 1753 he removed to Clapham, and ſucceeded Mr. Moſes Lowman, the well-known writer on the book of Revelation,

as paſtor of the diſſenting congregation in that village. Here he continued his miniſterial duties for more than 23 years, and under his labours that ſociety became one of the moſt opulent and reſpectable in the neighbourhood of the metropolis. During this period he received the diploma of doctor of divinity, and was elected one of the truſtees to the fund, to which he was in a great meaſure indebted for his education. In the year 1777 he was attacked by a malady, which terminated in mental derangement, from which he never completely recovered till his death, which happened in the year 1783, when he had attained to his fifty-eighth year. As a writer of great force and energy, Dr. Furneaux is known by a few ſingle ſermons, but to general readers, more particularly by his "Letters to the honourable Mr. Juſtice Blackſtone, concerning his Expoſition of the Act of Toleration, and ſome poſitions relative to religious liberty, in his celebrated Commentaries on the Laws of England." The judge never condeſcended to notice this able attack upon his work, but he did more; he felt he had taken his ſtand on ground that was not tenable, and in his ſubſequent editions omitted ſome obnoxious paſſages and altered others, which had brought upon him the animadverſions of Dr. Furneaux. To the ſecond edition of this work, publiſhed in 1771, an appendix was ſubjoined, containing "Authentic copies of the argument of the late honourable Mr. Juſtice Foſter, in the court of the Judges Delegates, and of the ſpeech of the Right honourable lord Mansfield, in the Houſe of Lords, in the cauſe between the city of London and the Diſſenters, in the year 1767;" this latter he wrote entirely from memory, but with ſuch correctneſs, that it received the full approbation of the learned lord, with whoſe notes, taken on the occaſion, it fully correſponded. So highly did his lordſhip regard the doctor, that when under the moſt grievous calamity, to which we have referred, he contributed liberally to his ſupport. Dr. Furneaux was author likewiſe of "An Eſſay on Toleration," in which he had a particular view to an application which had then been lately made by the diſſenting miniſters to parliament. Gen. Biog.

FURNEAUX *Iſland*, in *Geography*, an iſland in the Pacific ocean, lying in S. lat. 17° 5′. W. long. 143° 16′, diſcovered by Bougainville, and afterwards by captain Cook, ſo named in honour of captain Furneaux, who commanded the Adventurer in his ſecond voyage. This iſland, together with Reſolution iſland, S. lat. 17° 24′. W. long. 141° 39′; Doubtful iſland, S. lat. 17° 20′. W. long. 141° 38′; and Adventure iſland, S. lat. 17 4′. W. long. 144° 30′, and ſeveral others, conſtitute a cluſter of low, and half-drowned iſles, denominated by the French navigator the "Dangerous Archipelago." Furneaux iſland is rather a coral-ſhoal than an iſland, of about 20 leagues in circuit. The ſmall part of it, which is land, conſiſts of little iſlets ranged along the north ſide, and connected by ſand-banks and breakers. Theſe iſlets are clothed with wood, among which the cocoa-nut trees are diſtinguiſhable. Captain Cook ranged the ſouth ſide of this ſhoal at the diſtance of one or two miles from the coral-bank, againſt which the ſea broke in a tremendous ſurf. In the middle is a large lake or inland ſea, in which was a canoe under ſail.

FURNES, or VUERNE, a town of France, and chief place of a diſtrict in the department of the Lys, ſeated on the canal that leads from Bruges to Dunkirk, about three miles from the ſea. The town-houſe is a good building, adorned with figures of kings and princes; it has a handſome tower, with muſical chimes; 15 miles S. W. of Oſtend. The place contains 3,220, and the canton 13,088 inhabitants, on a territory of 192½ kiliometres, in 19 communes. The whole extent of the diſtrict comprehends 715 cantons, 91 communes, and 49,808 inhabitants. N. lat. 51° 4′. E. long. 2° 27′.

FURNITURE, in *Dialling*, certain additional points and lines drawn on a dial, by way of ornament.

Such are the ſigns of the zodiac, length of days, parallels of declination, azimuths, meridians of the principal cities, Babylonic and Italian hours, points of the compaſs, &c. See DIAL.

For drawing furniture on dials, the *analemma*, or trigon of ſigns, is an inſtrument of principal uſe.

FURO, in *Zoology*, a name given by ſome authors to the *Ferret*, a ſpecies of the MUSTELA, which ſee.

FUROR UTERINUS, in *Medicine*, a term employed by Sennertus, and others, to denote a ſpecies of madneſs in females, which is principally characterized by an ungovernable deſire for the ſexual intercourſe. It is called by the noſologiſts *Nymphomania*, which ſee.

FURR, in *Commerce*. See FUR.

FURRETIERRE, ANTHONY, in *Biography*, was born at Paris in 1620. He was intended for the profeſſion of the law, and obtained an office in that department, but at length entered the eccleſiaſtical ſtate, and roſe to preferment in the church. He was diſtinguiſhed by ſome compoſitions in verſe and proſe, and became a member of the French academy, the meetings of which he attended with great aſſiduity; but being embroiled in diſputes reſpecting a dictionary which he propoſed to publiſh, and which was ſuppoſed to have originated from one then compiling under the auſpices of the academy, he was expelled, and continued, till his death, in a ſtate of expulſion. The academy was not content with carrying on their reſentment while the object of it was alive, but decreed that the uſual funeral ſervice performed on the deceaſe of a member ſhould not be performed for Furretierre. This was in the year 1688: His "Dictionnaire Univerſel" did not appear till two years after his death. An improved edition was publiſhed in 1701, in three volumes folio, and again in four volumes at Amſterdam in 1725. This work has ſerved as the baſis of the "Dictionnaire de Trevoux," publiſhed in 1771, in eight volumes. Furretierre was author of other works, as "Five Satires, in Verſe;" "The Goſpel Parables, in Verſe;" and "Le Roman Bourgeois." Moreri.

FURRS, *Timber of*. See TIMBER.

FURR, in *Heraldry*, a repreſentation of the ſkins of certain wild beaſts, ſeen both in the doublings of the mantles of coat-armour, and in the armour itſelf.

The heralds uſe two metals, five colours, and two furrs, or hairy ſkins; *viz.* ermine and vair.

The origin of theſe furrs Mackenzy aſcribes to the ſhield's being anciently covered with ſkins; which ſkins, or coverings, were afterwards repreſented in the ſhields; a more probable derivation, in our opinion, than to ſay they were placed on ſhields, becauſe they had been worn in mantles and garments.

Furrs either conſiſt of one colour, which is white; but cannot be uſed in arms ſingly, or more than one; and theſe either two, or more than two.

Furrs of two colours are either ermine, being white with black ſpots; ermines, black with white ſpots; ermines, whoſe ground is yellow, and the powdering black; or pean, which is black powdered with yellow. When the ground is white, powdered with black ſpots, each ſpot having one red hair in the middle, it is called erminites.

Furrs of more than two colours are called *vair*, and *vairy*; which ſee.

FURRIER,

FURRIER, a perſon who trades, or works, in furrs, or lines robes, &c. therewith.

FURRIER'S *Clippings*, in *Agriculture*, the refuſe clippings produced in large manufactories by furriers; and which are capable of being employed as manure with great advantage. They are much employed in Hertfordſhire and ſome other counties contiguous to the metropolis; where they are uſually purchaſed at from about twelve to thirteen ſhillings the quarter, which conſiſts of a ten-buſhel ſack crammed quite full, and moſtly weighing about two hundred and a half. They are conveyed to the lands at the expence of about three-pence the quarter. And they are applied by ſowing them over the ground, by the hand, from a ſeed-ſcuttle, at the further charge of about three-pence the quarter, where wheat or barley is deſigned to be ſown, being immediately afterwards turned in by the plough, and then the ſeed is ſown and harrowed in. After this has been done all ſuch pieces of the clippings as are left above the ſurface are picked, dibbled, or ſhoved into the mould by the point of a ſtick made for the purpoſe, in order to prevent their being carried away or devoured by dogs, crows, &c. which are very fond of eating them. The quantity generally made uſe of to the ſtatute acre is about three-quarters. They are found to anſwer extremely well on light, dry, chalky, or gravelly ſoils, where they are ſuppoſed to hold the moiſture in a manner ſo as to prove of great aſſiſtance to the crops in ſuch ſeaſons as are hot and dry. In the wetter ſorts of land they are not believed to afford much benefit. See MANURE.

FURRING *of a Ship*, is laying on double planks on her ſides. This is done after the ſhip is built, and is by the ſailors called *plank upon plank*. But there is another way of furring, which is more properly ſo called; and that is, when a ſhip's planks are ripped, and new timbers are put on the former timbers, and on them other planks; which is done ſometimes to make the ſhip bear the ſails the better.

FURRINGS, or *Furrs*, in *Architecture*, are uſed for the making good of the rafter-feet in the cornice.

When rafters are cut with a knee, theſe furrings are pieces which go ſtraight along with the rafter, from the top of the knee to the cornice.

When rafters are rotten or ſunk hollow in the middle, there are pieces cut thickeſt in the middle, and tapering towards each end, which are nailed upon them to make them ſtraight. Such pieces are called furrs; and the putting them on is called furring the rafters.

FURRIPOUR, in *Geography*, a town of Hindooſtan, in Rohilcund; 12 miles S. of Barcilly.

FURROW, among *Gardeners*, denotes a ridge or ſwelling on the ſide of a tree, ſtalk, or fruit.

FURROW, in *Agriculture*, the trench or opening made by the plough in breaking up, turning, or ſtirring land. The furrows ſhould in general be leſs perfectly turned when for the ſeed, than in caſes of breaking or ſtirring the ground.

FURROW-*plough*, ſuch as is employed in forming water furrows. See FURROWING *Plough*.

FURROW, *Two*, or *Double Plough*, a name applied to ſuch ploughs as are conſtructed in a double manner, or ſo as to produce two furrows at the ſame time. See PLOUGH.

FURROW-*roller*, a particular tool of the roller kind, contrived ſo as to operate in the furrows of the ridges.

FURROW-*ſlice*, the narrow ſlice or ſlip of earth raiſed and turned over by the plough, in breaking up or ſtirring land.

The Scotch writers on huſbandry frequently denominate it *fur-ſlice*.

FURROW, *Water*, a deep open ſort of trench or furrow, made by a plough, contrived for the purpoſe or otherwiſe, in lands under tillage, in order to draw off and drain them of the water that may ſtagnate or prove injurious to the growth of the crops. Theſe furrows ſhould conſtantly be drawn in ſuch directions as are the moſt proper for readily diſcharging the water, even ſlanting acroſs the ridges where the nature of the ſituation requires it; and be kept perfectly open and free by means of the ſpade during the winter months, eſpecially where the land is inclined to be wet, and the crops are of the wheat kind. The forming of theſe furrow-drains ſhould be executed immediately after the ſowing of the land has been finiſhed. They are particularly neceſſary on all the more ſtiff and retentive ſorts of land, as without them the crops ſeldom ſucceed well in ſuch caſes.

FURROWING PLOUGH, a ſort of plough conſtructed for the purpoſe of forming water-furrows in lands of the more heavy moiſt kinds.

This ſort of work is much more readily, as well as much more effectually performed, by this ſort of plough than thoſe of the common kind. See PLOUGH.

FURRUCKABAD, in *Geography*, a town of Hindooſtan, in the circar of Rohilcund, on the weſt ſide of the Ganges, and capital of a diſtrict belonging to a prince of the Patan Rohilla tribe; about 30 miles in length along the bank of the Ganges; 76 miles N.W. of Lucknow. This ſmall independent territory has been added to the Britiſh dominions. N. lat. 27° 23'. E. long. 79° 52'.—Alſo, a town of Hindooſtan, in the country of Bengal, near the Ganges; 42 miles N.N.W. of Moorſhedabad.

FURRY'S TOWN, a town of the iſland of Jamaica, in the county of St. James; 20 miles N.E. of Savannah-la-Mer.

FURSEY, a ſmall iſland of England, at the entrance into Pool harbour.

FURSHOUT. See FARSCHOUT.

FURSTEMBERG, FERDINAND DE, in *Biography*, an eminent prelate, was a deſcendant from the free barons of that name in Weſtphalia, and was born at Bilſtein in 1626. He ſtudied at Cologne, where he contracted an intimate friendſhip with Chigi, who was then nuncio, and afterwards a cardinal and pope. During the cardinalateſhip of Chigi, he invited Furſtemberg to reſide with him, whom he raiſed to the biſhopric of Paderborn in 1661, when he himſelf was ſeated in the papal chair, under the title of Alexander VII. The high reputation of the biſhop attracted the notice of Van Galen, who appointed him his coadjutor, and whom he ſucceeded in 1678, when he was declared by the pope apoſtolical vicar of all the north of Europe. He was a zealous catholic, and anxious for the converſion of thoſe who were not already within the pale of the church; but at the ſame time he did not neglect the cultivation of the belles lettres, either by his own efforts or thoſe of many learned men whom he patronized. He died in 1683. As an author he collected a number of MSS. and monuments of antiquity, and gave to the world a valuable work relative to thoſe ſubjects, entitled "Monumenta Paderbornenſia." He alſo printed at Rome a collection of Latin poems, entitled "Septem Virorum illuſtrium Poemata." In this work there were many poems of his own, written with much purity. A magnificent edition of theſe poems was publiſhed in the ſame year in which he died, at the Louvre, at the expence of the king of France. Moreri.

FURSTENAU, JOHN-HERMAN, was born at Herforden, in Weſtphalia, in the month of May, 1688. Having paſſed through his early ſtudies in his native town, he commenced his courſes of medicine in Saxony at the age of eighteen, and attended with diligence the ſchools of Wittemberg, Jena, and Halle, and became a licentiate in medicine in the laſt mentioned univerſity. About 1709 he returned to Herforden, and immediately obtained a conſiderable ſhare of practice; but having conceived the deſign of viſiting the Low Countries, he commenced his journey in 1711, in order to hear thoſe great maſters of his art, who at that time flouriſhed ſo numerouſly in the cities of Amſterdam, Leyden, Utrecht, the Hague, Delft, and Dordrecht. Having profited much by their inſtructions, whether in the chair, in hoſpitals, or in private communication, he returned to his native place at the end of a year, and recommended the practice of his profeſſion with the ſame ardour as when he quitted Halle, but with more knowledge and greater reſources. Nevertheleſs he again interrupted his practice by another journey in 1716. He married in 1717, with the intention of ſettling at Herforden; but Charles I. landgrave of Heſſe, cauſed him to remove thence, in order to take an appointment in the univerſity of Rintlen, where he became a profeſſor in 1720. He died at Rintlen on the 7th of April, 1756, at the age of 68 years. He left ſeveral works: the firſt of theſe was frequently re-printed, and bears the title of "Deſiderata Medica." It includes alſo "Deſiderata Anatomico-Phyſiologica; Deſiderata circa morbos et eorum ſigna; Quæ deſiderantur in Praxi Medica; Deſiderata Chirurgica." 2. "De Fatis Medicorum, Oratio Inauguralis," 1720. 3. "De morbis Juriſconſultorum Epiſtola," 1721. 4. "De Dyſenteria alba in puerperâ Diſſertatio," 1723. 5. "Programmata nonnulla, tempore Magiſtratûs Academici impreſſa," 1724 and 1725.

FURSTENAU, in *Geography*, a town of Germany, in the biſhopric of Oſnabruck; 15 miles N.N.W. of Oſnabruck.—Alſo, a town of Saxony, in the margraviate of Meiſſen; 3 miles S. of Lauenſtein.—Alſo, a town of Pruſſia, in Pomerania, 8 miles N. of Marienburg.—Alſo, a town of Sileſia, in the principality of Breſlau; 15 miles S.W. of Breſlau.—Alſo, a town of Germany, in the county of Erbach, on the Mumling; 4 miles N. of Erbach.

FURSTENBERG, a town of Germany, in the county of Waldeck; 10 miles N. of Waldeck.—Alſo, a town of Germany, in the principality of Furſtenberg, with an ancient caſtle, which gives name to an ancient family, princes of the empire; 14 miles N.N.W. of Schaffhauſen. N. lat. 47° 57'. E. long. 8° 27'.—Alſo, a principality of Germany, in the circle of Swabia, founded in the 13th century, and divided into ſeveral branches, all of which are extinct except that of Stuhlingen.—Alſo, a town of Germany, in the biſhopric of Paderborn; 2 miles N.E. of Wenenburg.—Alſo, a town of Luſatia, on the Oder; 13 miles S. of Francfort on the Oder. N. lat. 52° 7'. E. long. 14° 48.—Alſo, a town of Germany, in the duchy of Mecklenburgh, on the Havel; 10 miles S.E. of Strelitz. N. lat. 53° 10'. E. long. 13° 14'.

FURSTENECK, a town and caſtle of Germany, in the biſhopric of Fulda; 13 miles N. of Fulda.

FURSTENFELD, a town of the duchy of Stiria, on the confines of Hungary, near the conflux of the rivers Feiſtritz and Laufnitz; 30 miles E. of Gratz. N. lat. 47° 3'. E. long. 15 59'.—Alſo, a town of Germany, in the New Mark of Brandenburg; 10 miles N. of Cuſtrin. N. lat. 52° 48'. E. long. 14° 42'.

FURSTENWALDE, a town of Germany, in the Middle Mark of Brandenburg, on the Spree; 26 miles E. of Berlin. N. lat. 52° 22'. E. long. 14° 8'.—Alſo, a town of Saxony, in the margraviate of Meiſſen; 2 miles S. of Lauenſtein.

FURSTENWERDER, a town of Germany, in the circle of Upper Saxony, between the Damſee and Wahrenſee, in the Ucker Mark of Brandenburg; 10 miles W.N.W. of Prenzlow. N. lat. 53° 23'. E. long. 13° 36'.

FURTH, a town of Lower Bavaria, on the Champl; 56 miles N.N W. of Paſſau. N. lat. 49° 17'. E. long. 12° 42'.—Alſo, a town of Germany, in the circle of the Lower Rhine; 6 miles S.E. of Heppenheim.—Alſo, a town of Germany, in the principality of Anſpach, on the Rednitz; large and well-peopled, with a number of artiſans. In this town the Jews have a ſynagogue and a printing-office; 4 miles W. Nuremberg.

FURUM, a ſmall iſland in the Baltic, near the E. coaſt of Sweden. N. lat. 57° 17'. E. long. 16° 32'.

FURUNCULUS, (from *furo*, to rage, on account of the violent inflammatory ſymptoms which precede ſuppuration,) a term, in *Surgery*, ſignifying what is more commonly called a boil, which is well known to be a circumſcribed, very prominent, hard, deep red, exceedingly ſore, inflammatory, little ſwelling, ſcarcely ever becoming larger than a pigeon's egg, and, in general, being conſiderably ſmaller.

The tumour, as Mr. Pearſon has deſcribed, generally appears under the figure of a cone, the baſe of which is a good deal below the ſurface, while the apex is ſeldom much elevated above the level of the ſkin. Upon the moſt prominent part of the boil there is commonly a whitiſh or livid puſtule, which is exquiſitely ſenſible, and immediately under which the abſceſs is ſituated. For the reader ſhould underſtand that it is the diſpoſition of a boil to enter into an imperfect kind of ſuppuration, which alſo takes place with remarkable ſlowneſs. The matter contained in the ſwelling is ſmall in quantity, mixed with red globules, and ſurrounded by a ſloughy ſubſtance, which forms a ſort of cyſt.

In ordinary caſes, only one boil occurs on the ſame ſubject, but ſometimes many ſuch tumours are met with on the ſame patient. This is ſaid to happen more particularly on children, and after the termination of ſome acute diſeaſe.

A boil is ſeldom ſo afflicting a complaint as to require the attendance of a ſurgeon, unleſs when the ſwelling is above the uſual ſize, or there are ſeveral affecting the ſame patient, and producing febrile ſymptoms.

We may obſerve that the furunculus is a complaint which is much more common in children and young perſons than in people more advanced in life. One may infer from this circumſtance, and from ſeveral of theſe tumours often occuring on the ſame patient, that the cauſes are of a conſtitutional deſcription, although their exact nature ſeems involved in obſcurity.

The chief indications in the treatment are, in general, to promote ſuppuration, to make a free and early opening with a lancet, and to preſs out the matter and ſloughs. The poultice may then be continued two or three days longer, at the end of which time any ſimple dreſſing will ſerve to complete the cure.

In the majority of caſes it would only retard the termination of the complaint to attempt to bring about a reſolution of the inflammation, ſo great is the tendency to that kind of ſuppuration which we have above deſcribed. Some authors allow, however, that a few inſtances do occur in which ſuch

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an endeavour may very properly be made, by applying a mixture of honey and vitriolic acid, or elſe ſpirit of wine or camphorated oil.

For the moſt part ſuppuration is to be promoted, and then the beſt application is a ſmall linſeed poultice.

If the ſurgeon were to wait events, a ſmall opening, inadequate to the diſcharge of the matter and ſloughs, would be ſpontaneouſly formed after a conſiderable time. Hence, the advantage of taking an early opportunity to make a free opening with a lancet, after doing which, as much of the contents of the ſwelling ſhould be preſſed out as can be done without producing too much pain. It is always proper, in this, as in every other inflammatory caſe, to adminiſter gentle aperient medicines, and alſo febrifuge ones, when any fever prevails.

When any induration remains after the ſore is healed, the part ſhould be rubbed with a little mercurial ointment.

Some ſurgical writers deſcribe a chronic ſpecies of boil, which, they ſay, is frequently met with in ſubjects who have ſeverely ſuffered from the ſmall-pox, meaſles, lues venerea, ſcrofula, or uſe of mercury. (See Munnick's Praxis Chirurgica, cap. 3. p. 19.) Mr. Pearſon ſtates, amongſt other circumſtances, that this kind of furunculus is commonly ſituated on the extremities; that it is not attended with much pain, nor any material diſcolouration of the ſkin, until ſuppuration is a good deal advanced; that maturation is ſeldom completed in leſs than three or four weeks; that the contents of the tumour are a thin ſanies; and that, when the ſwelling is large, and ſuppuration has been very ſlow, a good deal of cellular ſubſtance will be diſcharged in the form of ſloughs, leaving a very deep cavity. (See Principles of Surgery, p. 72—73).

There can be no doubt, that, in this laſt caſe, the large quantity of gangrenous miſchief might be prevented by making a free and early opening in the tumour with a lancet. This maxim cannot be too ſtrongly inſiſted upon in every inſtance of anthrax and troubleſome boils.

We agree with Mr. Pearſon, that bark and opium may ſometimes prove uſeful to patients labouring under very painful ſloughy boils; but we regard his precept to apply the hydrargyrus nitratus ruber to the gangrenous cavity, as only deſerving of univerſal condemnation. The pernicious cuſtom of cramming any abſceſſes with red precipitate met with the juſt reprobation of that diſtinguiſhed practitioner, Mr. Pott, who expoſed the abſurdity of the practice in his treatiſe on the fiſtula in ano, and we confidently believe, that, in the preſent improved ſtate of ſurgical knowledge, Mr. Pearſon may offer the above bad advice without the leaſt danger of its being followed. If he could turn one apothecary's apprentice into an advocate for ſuch employment of the red precipitate, we confeſs that we ſhould be ſomewhat ſurpriſed; for, although an author may ſet up for a dogmatiſt, and deliver an erroneous aſſertion with all the formality of the hundred and twenty-fifth aphoriſm, the counſel, if very abſurd, will only be reſpected till the deluded ſtudent happens to open another ſurgical book.

FURUNCULUS, in *Zoology*, the name given by many authors to the ferret, called alſo the *furo* and *ictis*. See MUSTELA *furo*.

FURUO, in *Geography*, a ſmall iſland in the N. part of the gulf of Bothnia. N. lat. 65° 40'. E. long. 22° 24'.

FURUSUND, an iſland in the Baltic, belonging to Sweden. N. lat. 59° 46'. E. long. 18 45'.

FURZE, in *Botany*. See ULEX.

FURZE, in *Agriculture*, a ſort of low ſhrubby plant, of a very hardy nature, and which is armed with prickles. By ſome botanical writers it is known under the name of *geniſta ſpinoſa*, and by others under that of *ulex europæus*, and provincially it is often termed *whin* or *gorſe*. It will grow well on moſt kinds of poor dry ſoils, and it propagates ſo rapidly by the ſeeds, that, where once eſtabliſhed in a ſpot of ground, it ſoon overſpreads the whole ſpace; for, as the ſeeds ripen, their pods are opened by the warmth of the ſun, and they are thrown out to a conſiderable diſtance all around, where they vegetate, and ſoon fill the ground with young plants.

It is probable that this plant may, in ſome ſituations, and under particular circumſtances, be cultivated to advantage for the feeding of horſes and ſtore cattle, on light, poor, ſandy, dry ſoils, which cannot be employed in the growth of grain, or crops of green vegetables. This method of making uſe of furze has prevailed for a conſiderable length of time, both on the continent and in ſome parts of this kingdom, as in the more northern parts of Scotland.

Where furze is raiſed on purpoſe for the food of cattle, and eſpecially on ſoils like the above-mentioned, their ſeeds ſhould be ſown in February, March, or April, and the ground be prepared as for barley. Six pounds of ſeed are ſufficient for an acre of land; being but lightly covered over. The young plants muſt be preſerved from cattle during the firſt year, and they will be fit to mow or cut in the next. The following methods of cultivating this plant, with the view of converting it to the feeding of animals, have been found by Dr. Anderſon to be the moſt ſucceſsful on the better kinds of land. A field of a good, dry, loamy land, being well prepared, he ſowed, along with a crop of barley, the ſeeds of the whin in the ſame way as clover is uſually ſown, allowing at the rate of from fifteen to thirty pounds of ſeed to the acre. The ſeeds, if harrowed in, and rolled with the barley, quickly ſpring up and advance under the ſhelter of the barley, during the ſummer, and keep alive during the winter. Next ſeaſon, if the field has not a great tendency to run to graſs, ſo as to choke them, they advance rapidly after Midſummer, ſo as to produce a pretty full crop before winter. This you may begin to cut with the ſcythe immediately after your clover fails, and continue to cut it as it is wanted during the whole of the winter; but it is ſuppoſed, he ſays, that after the month of February the taſte of this plant alters, as it is in general believed that after that time horſes and cattle are no longer fond of it. It is however obſerved, that never having had a ſufficiency of whins to ſerve longer than till towards the middle of February, or beginning of March, he cannot aſſert this fact from his own experience. He has frequently ſeen horſes beating the whins with their hoofs ſo as to bruiſe the prickles, and then eat them, even in the months of April and May; and he ſays, that ſheep which have been uſed to this food certainly pick off the bloſſoms and the young pods at that ſeaſon, and probably the prickles alſo; ſo that it is poſſible the opinion may only be a vulgar error without any foundation in truth.

This is, the writer thinks, the beſt way of rearing whins as a crop for a winter food for cattle or horſes. But for ſheep, who take to this food very kindly when they have once been accuſtomed to it, leſs nicety is required; for, if the ſeeds be ſimply ſown broad-caſt very thin (about a pound of ſeed per acre), upon the pooreſt ſoils, after they come up the ſheep of themſelves will crop the plants, and ſoon bring them into round cloſe buſhes, as this animal nibbles off the prickles one by one very quickly, ſo as not to be hurt by them. Sheep, however, who have not been uſed to this mode of browſing, do not know how to proceed, and often will not taſte them, but a few that have been

been uſed to the food will, the writer obſerves, ſoon teach all the reſt how to uſe it.

And another very economical way of rearing whins, but which he has ſeen practiſed, rather than experienced himſelf, is this. Let a farm be incloſed by means of a ditch all round, with a bank thrown up on one ſide; and if ſtones can be had, let the face of that bank be lined with the ſtones, from bottom to near the top; this lining to ſlope backwards with an angle of about ſixty or ſeventy degrees from the horizon. Any kind of ſtones, even round ones gathered from the land, will anſwer the purpoſe very well: upon the top of the bank ſow whin ſeeds pretty thick, and throw a few of them along the face of the bank. Young plants will quickly appear. Let them grow for two years, and then cut them down by means of a hedge-bill, ſtripping down by the face of the bank. This mode of cutting is very eaſy; and as the ſeeds ſoon inſinuate themſelves among the crannies of the ſtones, the whole face of the bank becomes a cloſe hedge, whoſe ſhoots ſpring up with great luxuriance. If another ditch be made on the other ſide of the bank, and if this be managed in the ſame way, and the hedge cut down only once every ſecond year, (and in this way it affords very good food for beaſts,) the inſide and outſide being cut down alternately, the fence will at all times continue good, as the hedge at the top will at all times be complete. This mode of rearing whins is, he remarks, both convenient and economical. But where ſtones cannot be obtained for making the facing, the bank very ſoon moulders down, and becomes unfit for the purpoſes of a fence. This will alſo often be the caſe where ſtones are made uſe of when the ſoil is of a looſe nature.

Various circumſtances have, the writer ſays, prevented him from aſcertaining what is the weight of the crop that may be thus obtained; but he thinks he may ſafely venture to ſay that it is at leaſt equal to that of a crop of green clover; and if it be conſidered that this affords a green ſucculent food during winter, on which cattle can be fatted as well as on cut graſs in ſummer, it will, he thinks, be admitted, that it muſt be accounted even a more valuable crop than clover. After being cut, he alſo remarks that it ſprings up the following ſeaſon with greater vigour than before; and, in this ſituation, acquires a degree of health and ſucculence very different from what it is ever obſerved to poſſeſs in its natural ſtate. He has ſeen ſhoots of one ſeaſon near four feet in length. The prickles too are ſo ſoft, and the ſtones ſo tender, that very little bruiſing is neceſſary; indeed horſes, that have been accuſtomed to this food, would eat it without any bruiſing at all; but cattle, whoſe mouths ſeem to be more tender, always require it to be well bruiſed. How long crops of this ſort may continue to be annually cut over, without wearing out, he cannot ſay; but he believes a long while, in favourable circumſtances; however, one thing is neceſſary to attend to in order to guard againſt its being deſtroyed. As, during the beginning of the ſeaſon nature ſeems to be ſolely employed about the work of fructification only, and it is not till near Midſummer that the whin begins to puſh forth its wood-bearing branches, which advance with great luxuriance only during the latter part of the ſeaſon, it may happen that if care be not taken to have the graſs that ſprings upon the field before the whin begins to ſend out its ſhoots eaten cloſe down, that graſs will acquire ſuch a luxuriance before the young branches of the whin begin to advance, as to overtop them, and choke them entirely. Whoever, therefore, has a field under this particular crop muſt, he ſays, be careful to advert to this circumſtance; or, if the field be in good heart he will infallibly loſe it. The field therefore ſhould be kept as a paſture, as bare as poſſible during the beginning of the ſeaſon, and the cattle ſhould only be taken from it when the ſhoots of the whin are diſcovered to begin to advance with vigour. Under this management, he preſumes it may be kept for many years, and yield full crops: but unleſs the mowers be particularly attentive, at the beginning, to cut it as low as poſſible, it will very ſoon become impoſſible to cut the field with a ſcythe, as the ſtumps will ſoon acquire ſo much ſtrength as to break the ſcythe when it happens to touch them in any ſtrong part.

It has been remarked, in a paper in the ninth volume of the Annals of Agriculture, that by cutting a part of the ground down in this way, every third year, very large crops may be obtained. It is alſo probable, that the plants may continue longer. October is the proper time to begin mowing or cutting them. They continue to ſhoot till Chriſtmas, and are fit for uſe until March. Horſes are ſaid to eat them as readily as they do hay, after they have been chopped with a cleaver, and bruiſed or pounded by a mill, or otherwiſe, ſo as to take off their ſharp points; and it is ſaid, that an acre of ground will produce ten or fifteen tons of this fodder, and that it will go as far as an equal quantity of hay. Some mix the bruiſed furze with chopped ſtraw; an hundred of ſtraw to a ton of furze; but in whichever way employed, only the growth of the year ſhould be cut for the cattle to feed upon.

It has been further remarked, by Dr. Anderſon, that he knows few plants that deſerve the attention of the farmer more than the whin. Horſes are particularly fond of it, ſo much ſo, that ſome perſons think they may be made to perform hard work upon it, without any feeding of grain; but he thinks it tends more to fatten a horſe than to fit him for hard labour, and that therefore ſome grain ſhould be given with it where the work is ſevere. Cattle, he ſays, eat it perfectly well when thoroughly bruiſed, and grow fat upon it as upon turnips; but unleſs it be very well bruiſed for them they will not eat it freely, and the farmer will be diſappointed in his expectations. Cows that are fed upon it yield nearly as much milk as while fed upon graſs, which is free from any bad taſte; and the beſt winter-made butter he ever ſaw was obtained from the milk of a cow that was fed upon this plant. This food ſhould be made uſe of ſoon after being prepared. Two buſhels, with a proper allowance of hay, have been found to be ſufficient for a day, for three horſes, performing the ſame labour as with corn. It alſo ſeemed uſeful to horſes labouring under broken-wind and greaſe. Poor hungry gravelly ſoils, which would not have let for five ſhillings the acre, have alſo been rendered worth twenty ſhillings, by ſowing them with furze-ſeed, in places where fuel has been ſcarce; this being frequently uſed for heating ovens, burning lime and bricks, and alſo for drying malt; but it is not worth cultivating in countries where fuel of any kind is cheap, or upon ſuch lands as will produce good graſs, corn, or other crops employed as the food of animals.

It was formerly much the practice to ſow the ſeeds of the common furze, in order to form hedges round the fields; and where the ſoils were light, the plants ſoon became ſtrong enough for a fence againſt cattle: but as theſe hedges are apt to grow naked at the bottom, in a very ſhort time, and the plants too frequently fail, ſo as to leave conſiderable gaps, and are alſo liable to ſpread their ſeeds over the neighbouring fields, the cuſtom has of late been greatly in diſuſe.

Where, however, this practice is attempted, the ſpecies commonly known by the title of the French furze is the beſt for the purpoſe, as it thickens more near the ground,

and

and grows to a greater height. This ſort begins to blow about the middle of January, and continues in bloſſom all the ſummer; while the Engliſh furze does not blow until towards the end of the ſpring, and finiſhes its bloſſoming at the ſame time as the other.

It has been ſtated by Mr. Young, that Dr. Taylor, in Surrey, has a poor field of ſix acres, worth about ſeven ſhillings an acre, which is ſown with furze, and by that means converted to one of the moſt profitable on the farm: the land being cleared from couch in April 1782; mown in 1784 to thicken it; and cut for the firſt crop in 1786, and ſince that period regularly every two years, three acres per annum. The laſt year's cut of three acres produced ſeven thouſand ſeven hundred faggots, which ſold at 3*l.* 3*s.* the thouſand on the ſpot, which is 24*l.* 5*s.* 6*d.*; cutting and binding, one ſhilling and ſixpence the hundred, or 5*l.* 15*s.* 6*d.*; clear return 18*l.* 10*s.* Suppoſe tithes, rates and fences to equal 5*s.* rent 7*s.*, in all 12*s.*, or for three acres 1*l.* 16*s.*, this further charge deducted from the above leaves a net profit of 16*l.* 14*s.*; or per acre 5*l.* 11*s.* 4*d.*; and per acre per annum 2*l.* 15*s.* 8*d.*, which is, the writer ſuppoſes, a greater net profit than any man receives from wheat, upon ſuch ſorts of land. It is likewiſe further ſuggeſted, that the doctor ſuppoſes the produce rather increaſes than diminiſhes. In regard to the time of cutting, it is recommended as the beſt ſeaſon to perform it in dry weather in February, or the beginning of March, when the ſevere froſts are over, and there is no danger of the furze plants being injured by them.

It is not unfrequently neceſſary, in bringing waſte lands of the moor kinds into the ſtate of cultivation, to extirpate theſe plants, which is often difficult to perform. The beſt method is probably by very deep ploughing, ſo as to effectually eradicate them. As the ſeeds lie in the ground for ſome time without being injured, young plants will occaſionally make their appearance, but theſe in general readily give way to the ſubſequent ploughings and harrowings.

FURZE-*grounds*, thoſe portions or ſpots of ground that are deſtined for, or covered with furze. There are many extenſive tracts of land which are wholly covered with this ſort of plants. The author of the Rural Economy of Yorkſhire ſtates it as the opinion of a perſon of great experience, that old furze grounds, from which fuel has been repeatedly carried, and which are much depauperated, may in general be readily improved in this way: Firſt let the furze be grubbed up; then ſow graſs ſeeds on the grubbed ſurface, without ploughing; and let the land remain in this ſtate until it has acquired a degree of firmneſs, the ſmaller roots left in it being decayed, and the ſurface become covered. Then ſod-burn and lime it, &c. breaking it up for a courſe of arable crops; cloſing it with cultivated graſs. Should the furze begin again to grow and be troubleſome, the proceſs of paring and burning muſt be repeated, as in the former caſe. In this way the furze may ſoon be completely deſtroyed.

Such furze grounds as are intended to be cut over for cattle food, muſt be managed in the manner that has been directed in ſpeaking of furze. See FURZE.

FURZE-*mill*, in *Rural Economy*, is a mill, or machine, conſtructed for the purpoſe of cruſhing or bruiſing furze, in order to its being employed in the feeding of horſes, and other animals. Several different contrivances have been had recourſe to at different times in this view; but we believe that formed by a large ſtone, on the principle of the cyder mill, is the moſt effectual in performing the work.

A mill for this purpoſe may likewiſe be ſeen at the Board of Agriculture, which is ſaid to anſwer well in performing the buſineſs.

The method of conſtructing a mill for this purpoſe, and the manner of employing it, have been fully deſcribed and pointed out in the fifth volume of the Tranſactions of the Bath Agricultural Society. The writer remarks that it conſiſts of a large circular ſtone ſet on its edge (the weightier and bigger the better), with a wooden axis paſſing through its centre. One end of this axis is fixed upon a pivot placed in the centre of a circular area, and to the other end of it is fixed a yoke, to which the horſe that is to move it is attached. The ſtone being placed on its edge, when the horſe moves, it revolves round its axis in a circular groove, or ſtone trough, (this trough ſhould be made of hewn ſtone,) exactly in the ſame manner as a ſugar-baker's, or a tanner's mill. The whins being placed in this trough, are bruiſed by the weight of the ſtone as it paſſes over them; and being raiſed up by a three-pronged fork by the attendant, after they have been well flatted down, they riſe in a ſort of melted cake, which, being ſet in ſome meaſure upon its edge, is again ſmaſhed down by the wheel or ſtone as it revolves. In this way the operation is continued, by ſucceſſively preſenting new ſurfaces to the action of the wheel, till the whole is reduced into a ſoft pulpy maſs, that can eaſily be eaten by the animals to which it is to be preſented. During the continuance of this proceſs, it is neceſſary, the writer obſerves, to pour plenty of water upon the whins, at different times, without the help of which they can ſcarcely be reduced to a pulp ſoft enough. On this account it will be proper to make choice of a place for the machine, where plenty of water can be obtained with little trouble. It follows alſo, that, as rain can never be prejudicial to this operation, it may be placed in the open air with propriety and advantage.

And as the operation is greatly facilitated, by a judicious way of raiſing or turning the whins, during the performance of the work, which experience will enable any attentive perſon to attain, but which cannot be taught by words only; the writer would adviſe any perſon who ſhould think of erecting an apparatus of this ſort, to put one of his moſt ſagacious ſervants to conduct this operation at the beginning, as ſuch a perſon will more quickly diſcover the circumſtances that facilitate the proceſs, than one of a ſlower comprehenſion. After he has become expert at the buſineſs, he will be able to inſtruct an inferior perſon, who may then be employed for the purpoſe. But in whatever way it ſhall be conducted, the perſon who begins this manufacture muſt lay his account with performing very little work for ſome time at the firſt, in compariſon of what he will be able afterwards to execute with eaſe, and in a more perfect manner.

It is ſuggeſted, that where the whins that are to be employed for this purpoſe grow naturally in the ſoil in irregular buſhes, it is a troubleſome work to cut and gather them. To underſtand the proper mode of managing this buſineſs in all its departments, it is, the writer thinks, neceſſary to advert to ſeveral particulars in the natural economy of this ſingular plant. Inſtead of leaves, the whin is furniſhed with an innumerable quantity of prickles. Theſe ſpring out from every part of the young ſtem, and are, at the firſt, like the ſtem itſelf to which they adhere, ſucculent, ſoft, and inoffenſive; but, like the ſtems alſo, they become gradually harder as the ſeaſon advances, and ſeem, indeed, to a caſual obſerver, to form a part of that ſtem, though they are as different from it as the leaves of other trees are from the branches which produce them. Theſe prickles do not, the writer obſerves, like the leaves of moſt deciduous trees, fall

off at the approach of winter; but, like evergreens, they remain upon the branches all winter, and retain, during that time, their full ſucculence and verdure. Early in the ſpring innumerable bloſſoms ſpring out around theſe prickles, adhering to them, and not to the ſtem. The bloſſoms are ſucceeded by pods containing the ſeeds, which gradually ripen; a little after Midſummer the ſeeds harden, and the pods ſlowly become dry and wither, the prickles to which they adhere becoming dry and withered at the ſame time, and gradually looſen from the ſtalk, which ſtill continues freſh, though it has now attained a woody conſiſtence. Theſe prickles, having now performed all the functions that nature had deſigned them, fall off in part, at firſt from the ſtalk, and in part adhere to it for ſome time, till they are gradually ſhaken off by the agitation of the wind, or other cauſes. Hence it happens, that it is only the ſurface or top twigs of a whin buſh that are green, ſoft, and ſucculent; the ſtems below being dry and woody, and frequently covered with dry prickles, that are not only not uſeful as food for cattle, but rather hurtful to them, on account of the hardneſs of their conſiſtence, and ſharpneſs of their prickles. In gathering whins, therefore, for food for cattle, they are only the tender top ſhoots that are wanted; and the eaſieſt method of gathering them that our practice has yet diſcovered, is to take a forked ſtick in the left hand (the readieſt thing is the branch of a tree of a proper ſize) and a ſickle in the right hand (both hands, but more eſpecially the right, ſhould be armed with ſtrong gloves); then thruſting the ſickle among the young ſhoots, and pulling it backward, the forked ſtick, when oppoſed to them, keeps the branches ſteady enough to produce a reſiſtance ſufficient to make the ſickle cut them; and as the tops of the whins are intermixed with each other, they ſtick to the prongs of the fork, which, after it is as full as it can hold, is taken to a ſide, and cleared by preſſing the whins to the ground and pulling the fork backwards. Theſe little heaps are afterwards forked to a cart, and preſſed down by a man walking upon them, having his legs covered with large ſtrong boots made on purpoſe, and thus are carried home. Where the whins have grown upon a good ſoil, and have made very vigorous ſhoots, they may be thus reaped pretty expeditiouſly; but if the ſoil has been poor, and the ſhoots ſhort, the expence of this operation is very conſiderable; and as theſe ſhort whins are, in other reſpects, of a very inferior quality to the others as food for beaſts, it is only at times when fodder is ſcarce and dear that they can be economically applied to this uſe. But by being cultivated in the manner that has been deſcribed in ſpeaking of furze, the labour may not only be much leſſened, but the advantages of this winter food be more fully obtained.

Some, however, in performing this buſineſs, make uſe of a very ſtiff ſhort ſcythe, which is found to execute the work quickly, and in a tolerably perfect manner, when the workman becomes fully acquainted with the method of uſing it.

FUSA, in the *Italian Muſic*, the name of one of the muſical notes, frequently alſo called *caroma*, and by us *quaver*.

FUSANA, in *Geography*, a town of Africa, in Tunis; 28 miles S.W. of Keff.

FUSANUS, in *Botany*, derived from *Fuſain*, the French name for Euonymus or ſpindle-tree, a genus of the claſs and order *Polygamia Monoecia*, and natural order *Eleagni*, Juſſ. 75.

Generic character. Hermaphrodite. Cal. Perianth one-leafed, turbinate, half five-cleft (four-cleft, Berg.); clefts ovate-acute, from flat ſpreading, with the tips gibboſe-uncinate, ſomewhat concave. *Cor.* none. *Stam.* Filaments four, linear, grooved in the middle, a little longer than the germ, inſerted into the calyx near it, and occupying the ſinus of it. Anthers roundiſh, compreſſed, four-lobed, erect. *Piſt.* Germ large, turbinate, almoſt inferior, wide at top, from flat ſomewhat concave, ſtriated, quadrangular, with four hollowed ſinuſes, each on each ſide of the germ ſolitary. Style thick, very ſhort, ſubquadrangular. Stigmas four, obtuſe, cruciform, ſmall. *Per.* Drupe.

Male. Cal. &c. as in the hermaphrodite, but the fruit abortive.

Eſſential character. Herm. Cal. five-cleft. *Cor.* none. *Stam.* four. *Germ* inferior; *ſtigmas* four. Drupe. *Male. Cal.* &c. of the former. *Fruit* abortive.

Species, 1. *F. Compreſſus*, flat-ſtalked F. Linn. Syſt. ed. 13. 765. Reich. 4. 330. Ait. Hort. Kew. 3. 433. Theſium Colpoon. Linn. Suppl. 161. Syſt. ed. 14. 250. Colpoon compreſſum. Berg. Cap. 38. t. 1. f. 1. A tree, with compreſſed and anticipital branches. *Leaves* oppoſite, obovate, blunt with a point, flat, quite entire, ſmooth, on ſhort petioles. *Racemes* from the axils of the branches, erect, compreſſed, ſcarcely longer than the leaves. The number of parts in the flowers four or five. The fruitful tree has a three-leaved involucre at the baſe of the germ with five glands. According to Juſſieu, it is a glaucous ſhrub, with oppoſite branches. The younger does not think it neceſſary to ſeparate it from the Theſiums. Juſſieu doubts whether it may not be more nearly allied to the Rhamni. A native of the Cape of Good Hope; introduced in 1756 by Mr. F. Maſſon. It is increaſed by cuttings, planted early in the ſummer in a good loamy earth, in pots, ſet in a glaſs-caſe or hot bed, ſhaded and watered gently till they have ſtruck root.

FUSARDE, in *Architecture*, a French word for an aſtragal, or ſmall convex moulding carved into beads.

FUSEADO, in *Geography*, a town of Naples, in Calabria Citra; 15 miles N.W. of Coſenza.

FUSEE, in *Horology*, is a mechanical contrivance for equalizing the power of the main-ſpring of a watch, chronometer, or portable clock, in all its different ſtates of tenſion. When a ſuſpended weight is uſed as the maintaining power of a clock, the cord, gut, or chain, by which it is ſuſpended, is wound round a cylindrical barrel, that has not the leaſt ſenſible variation in its diameter; on which account the ſuſpended power never varies in its intenſity, as it is wound off in its deſcent; in this caſe no contrivance is neceſſary for equalizing that power, which is already unvarying from its own nature. But a clock with ſuch a power is not portable, or at leaſt not conveniently ſo; a ſpring has therefore been adopted to ſupply the place of a ſuſpended weight in portable machines for meaſuring time, and as the power of all ſprings varies with its diſtance from the quieſcent poſition, the power derived from the force of a ſpring requires to be modified according to circumſtances, before it can become a proper ſubſtitute for a ſuſpended weight acting conſtantly, by means of its gravitation, with a ſlow and controlled velocity, ſo as to gain no acceſſion by acceleration. The firſt contrivance, we have ſaid in another place, was that which was denominated *ſtack-freed*, conſiſting of two ſprings, ſomehow oppoſing each other's action alternately, in a way that has never been well deſcribed; but the contrivance called the fuſee has been found of permanent uſe in practice, and conſequently merits a particular deſcription: we cannot, however, convey to our readers a clear idea of the nature and due conſtruction of the fuſee, without taking into conſideration, along with it, the main-ſpring, its box, and the chain that connects them. Theſe indeed

indeed, have been generally deſcribed under the articles CHRONOMETER and CLOCK; but as the theory, on which the ſhape of the fuſee depends, has not been adverted to, it is neceſſary that we ſhould treat the ſubject more particularly in this place.

The ſteel arbor, that paſſes through the ſpring-box, has a ſquare on its protruding end, on which a ſtrong ratchet-wheel is inſerted; and a catch, with a ſpring preſſing on it, ſcrewed to one of the plates of the frame of the works, always holds it faſt in any poſition given it; ſo that the box will turn freely, when urged round, without any motion in its arbor; upon this fixed arbor is a ſtud within the box, on which the interior end of the ſpring, intended for the maintaining power, is hooked, by a hole made near the extremity of the ſaid ſpring; while the exterior end of the ſame ſpring is pinned to the ſide of the box, the convex part of one ſuiting the concave part of the other, and the breadth of the ſpring being a gauge for the depth of the box. The diameter of the box depends upon the length and thickneſs of the ſpring conjointly; the ſtrength of the ſpring depends upon its breadth and thickneſs taken together, when of a given length; and the time it will continue to act at once coiling up, or winding, as it is called, will depend partly on its length, and partly on its ſtrength, for as the time in which the fuſee is made to revolve once muſt be guided by the whole time that the machine is intended to go at once winding, divided by the number of effective ſpirals or turns on the fuſee, when the ſpring is either too ſhort to admit of the requiſite number of turns to correſpond to the fuſee, or too weak to actuate the works for the whole time of going, the dimenſions of that ſpring will not anſwer the requiſite conditions, and muſt be changed for one of more ſuitable dimenſions. The relative forces of the ſpring when coiled up, and when nearly relaxed, muſt alſo be aſcertained by weights ſuſpended by the gut or chain, that is, wound round the exterior ſurface of the barrel; for on the ratio of theſe extreme weights, or powers, depend not only the relative diameters of the oppoſite ends of the fuſee, but alſo its actual length; the latter of which meaſures, we believe, is uſually taken at random, or agreeably to ſome propoſed model that has no dependence on, or connection with, the ratio of the extreme powers of the identical ſpring that is to be adopted; whereas an attention to the ratio in queſtion is a condition in the conſtruction, that it will appear preſently ought not to be diſpenſed with, particularly when the workmanſhip profeſſes to be of a ſuperior kind.

Conceiving now the main-ſpring coiled up in the box, (which operation requires a tool to force it properly in,) with the interior end faſt to the fixed arbor, and the exterior end pinned to the ſide of the box; let us ſuppoſe the gut, or chain, faſt alſo to the ſide of the box, near one of its ends, and wound a few times round the box, the outer end being at liberty; then, ſuppoſing the ſpring that is coiled to be in a comparatively relaxed ſtate, preſſing againſt the concavity of the box, with an effort calculated to unwind itſelf, in this caſe the central part of the box is not filled by the ſpring; pull now the free end of the gut or chain, ſo as to wind it from the box, while its faſt end prevents its ſlipping off without carrying the box round along with it, as many times as there are folds thereon, and, as the box is faſt to the exterior end of the included ſpring, this ſpring is thus brought round the fixed arbor that holds its interior end, and its folds are gradually brought up to fill the central part of the box, in which ſituation its intenſity is increaſed, in conſequence of its being moved from its quieſcent poſition: remit now the gut or chain, and the barrel will retrograde and wind on the folds again, while the included ſpring is relaxing itſelf gradually by a correſponding diminution of power, till it is again in its quieſcent poſition. Thus the power of the ſpring, contained in the box, is always diſpoſed to pull back the box itſelf whenever the hand, or any external force applied to the chain, has pulled it round in a forward direction.

Again, let us ſuppoſe the free end of the chain, that is ſpoken of as having been pulled, to be wound round a cylinder, placed in a frame parallel to the arbor of the box, and made faſt to its end, in ſuch a manner, that turning the cylinder round on the pivots of its arbor, will wind the chain round it while it is unwound from the box; in this caſe the incloſed ſpring is wound up as before, by being drawn towards the centre of its box; and provided its force were the ſame in all ſituations, or diſtances from the quieſcent point, the cylinder in queſtion would be a proper fuſee for the machine to be actuated by, after it had the great wheel attached to it, and the uſual ratchet for winding applied; but we have ſaid that the force of the main-ſpring is always varying as it relaxes itſelf, after it has been wound up to the centre of the box; therefore the cylinder muſt neceſſarily be ſo changed into another figure, that the place of action of the chain on its ſurface ſhall be more or leſs diſtant from its axis of motion, as the law of variation in the force of the main-ſpring ſhall demand, in order that the force tranſmitted to the train of wheel-work, and through it to the balance or pendulum, may be invariable, or very nearly ſo. It is obvious, from this view of the ſubject, that the figure of the body, ſubſtituted for the cylinder in queſtion, as a fuſee, muſt taper according to ſome certain law, either by ſtraight lines forming the fruſtum of a cone, or by curves of ſome order, bounding the ſides of the ſaid figure; and that the point of the chain's action ſhall recede from the axis of the fuſee's motion, as it revolves, in ſuch a way, while the force of the main-ſpring is diminiſhed by its relaxation, or departure from the centre of its box, that the product ariſing from the force of the ſpring, multiplied by the acting radius of the fuſee, ſhall be in every ſituation the ſame; for then the effectual power of the main-ſpring, as it regards the train, will be invariable. It can hardly be expected that the workman can determine the exact figure, and proportional diameters of his fuſee, by any mathematical rule that may be laid down from the meaſurement of the ſpring's extreme powers; but for the ſake of illuſtrating the theory of a fuſee's action more particularly, we will preſent the reader with ſome rules and calculations on this ſubject, propoſed by the late Benj. Martin, which are ſufficiently comprehenſive to take in all caſes. The figure of the curve, which will form the ſuperficies of the fuſee, by a revolution about its axis, may be inveſtigated as follows: Let B C D, in *fig.* 6. of *Plate* XXXVI. of *Horology*, be the curve, and A L the axis of the fuſee produced; let D be the point where the end of the chain is fixed on the fuſee, when the clock or watch is down, or the main-ſpring relaxed, and B the point where it lies when the ſpring is wound up: from the points B and D, let fall the perpendiculars B A and D H reſpectively to the axis A L, in which perpendiculars produced, let there be taken A E and H I proportional to the reſpective forces of the main-ſpring, when acting by the chain at the points of extreme power B and D; through the points E and I, let the right line E I K be drawn, till it interſects the axis produced at K, and from any point C on the curve, let C F be drawn perpendicular to the axis in the point G, then will F G repreſent the acting force of the ſpring when the chain is pulling it round on the point C. Now ſince the force acting on the firſt wheel of the train ought always to be uniformly the ſame, and as this force is always

always as the product or rectangle of the lines C F × G F, this given quantity may be made = $a\,b$, in which case we shall have F G = $\frac{a\ b}{\text{G C}}$. To determine, therefore, the equation of the curve B C D, let K H = a, H I = b, H G = x, and G C = y; then because of the similar triangles H K I and G K F, we have H K : H I : : G K : F G = $\frac{a\,b}{y}$; that is, $a : b : : a + x : \frac{a\,b}{y}$; whence we have $a\,a = a\,y + x\,y$, which is the equation of the curve, and which shews it to be that of the *hyperbola* with respect to the space between the curve and its asymptotes. Hence when $x = 0$, then $a = y$, or H K = H D; also when the point G arrives at A, then y = A B; and because E A × A B = I H × H D, we have E A : I H : : H D : A B : : a : y : : so is the greatest force of the spring upon the fusee to its least force. Again, because the ordinates H D, A B, &c. are at right angles to A L, the curve B C D is that called an *equilateral hyperbola*, by the revolution of which about its axis A K, or common asymptote, the true form of the solid or fusee is generated, as seen in *fig.* 7.

Our *fig.* 7. contains the substance of three figures, as given by Martin, and the letters of reference are altered, so as to prevent the recurrence of the same letters, which in the original account rendered the references very ambiguous to the reader; $\alpha\ \beta\ \gamma$, $\delta\ \varepsilon\ \zeta$, $\eta\ \theta\ \iota$, and $\varkappa\ \lambda\ \mu$, are so many opposite equilateral hyperbolas described about the asymptotes $\nu\ \xi$, and $o\ \pi$ intersecting one another in the centre ϱ. Put $\varrho\,\sigma$ [$= \sigma\beta$] = 1, then $\varrho\,\beta = \sqrt{2}$ = radius of the circle $\beta\ \theta\ \varepsilon\ \lambda$ touching the four equal hyperbolas in their respective vertices: again, $\varrho\,\tau = \varrho\,\upsilon = \sqrt{\varrho\,\xi^2 + \xi\,\upsilon^2} = 2$ is the distance of the focus of each hyperbola from the centre; and lastly, the parameter $a\,b = \theta\,\lambda$ the diameter of the circle, agreeably to the properties of the hyperbola. It is therefore plain, that the section of any given fusee, $\alpha\ \beta\ \theta\ \eta$, through its axis $\nu\ \xi$, is determined by two equal arcs $\alpha\ \beta$ and $\eta\ \theta$ of two equal and adjacent hyperbolas, beginning from their vertices β and θ. It is also evident, that, since $\sigma\ \beta$ and $\nu\ \alpha$ do represent the two extreme forces of the main-spring, in every fusee properly made, $\theta\ \beta$ and $\eta\ \alpha$ of the greatest and least ends thereof, must be exactly proportioned to the least and greatest force of the spring reciprocally.

It also follows, that when the proportion of the greatest and least force of the spring is known, or the ratio of $\sigma\ \beta$ to $\nu\ \alpha$ is given, then also the length of the fusee $\nu\ \sigma$ is a given quantity of a determinate length. Lastly, it is evident, that when the length of the fusee and one of the two forces $\sigma\ \beta$ or $\nu\ \alpha$ are given, then the other corresponding force is determinable, and not to be assumed at pleasure.

Having thus determined the geometrical form of the fusee, it may not be unacceptable to the reader to give an illustration of this theory by examples of the different cases. Let us therefore put $\sigma\ \beta = a$, $\nu\ \alpha = y$, and $\nu\ \sigma = x$, and then the equation $a\,a = a\,y + x\,y$ will appear in its proper form; whence if a and y be given to find x, we have $\frac{a\,a}{y} - a = x$; when x is given, or $x = 1$, we have given the ratio of a to y; for then $a\,a = a\,y + y$; consequently $a : y : : a + 1 : a$. When a and x are given, then $\frac{a^2}{a + y} = y$; and lastly, when x and y are given, we have $a^2 - a\,y = x\,y$, and, completing the square, $a = \sqrt{x\,y + \frac{1}{4}y^2} + y$.

The proper denominations for expressing the respective forces, a and y, of the main-spring, may be ounces and fractional parts, which we will suppose to be represented by so many tenth parts of an inch in the measures $\sigma\ \beta$, $\sigma\ \nu$, and $\nu\ \alpha$ of the fusee. These forces may be determined thus; let M N O P be the barrel containing the spring, and let Q N $\eta\ \alpha$ be the position or direction of the chain or gut upon the barrel and fusee when the spring is wound up; then, supposing the chain disengaged from the fusee, and carried under or behind the barrel, in the direction N Q M to the pulley R, so as to pass over and support the weight S in equilibrio, this weight will express the force of the spring in this situation. In like manner, if T $\theta\ \beta$ be the chain when the spring is down or relaxed, and it be detached and carried under the barrel, in the direction O T P, to the pulley U, so as to pass over it, and to support the weight V, which is just large enough to balance the smallest force of the spring, then $\sigma\ \beta = a : \nu\ \alpha = y : :$ S : V.

Case 1.—Suppose the weight S to be 63 ounces, and the weight V to be 21; then a = 63 and y = 21; or, which is the same thing, a = 3 and y = 1; hence we find $x = \frac{a\ a}{y} - a = 6 = 2\,a$, that is, when the extreme forces are 3 : 1, the length of the fusee $\nu\ \sigma$ is equal to the diameter of its base or thick end $\beta\ \theta$. When S : V : : 2 : 1 : : $\sigma\ \beta$: $\nu\ \alpha$, then $x = \alpha$, or $\sigma\ \nu = \sigma\ \beta$; also when S : V : : 3 : 2, then $x = \frac{1}{2}\,a$; and universally if S : V : : m : n : : a : y : : $a + x$: a, then it will be $\frac{m - n}{n}\,a = x$.

Case 2.—Given the length of the fusee $\sigma\ \nu = 6$, to determine the ratio of the forces or weights S, V, which will give the diameters $\theta\ \beta$ and $\eta\ \alpha$ of the opposite ends of the fusee. Since $a^2 = a\,y + 6\,y$ agreeably to the laws of the hyperbola, we have $a : y : : a + 6 : a$; then by assuming the value of a we have that of y thus; suppose a = 3, then $a : y : : 3 + 6 : 3 : : 3 : 1$; and in this case the diameter $\theta\ \beta$ is three times the diameter $\eta\ \alpha$; and because $a : y : : m : n$, therefore for any assumed ratio, we have $\frac{n}{m - n}\,x = a$; thus if $m : n : : 2 : 1$, then $x = a$; or if $m : n : : 3 : 2$, then $2\,x = a$; consequently if $x = 6$, we have a = 12, and y = 8.

Case 3.—Given the length of the fusee, and the greatest force of the main-spring to find the least force of the same. Suppose $x = \sigma\ \nu = 6$, and $a = \sigma\ \beta = 3$, then $y = \frac{a^2}{a + x} = \frac{9}{9} = 1$; so that if S = 63 ounces, we have V = 21; and if $x = a$, then $y = \frac{1}{2}\,a$, or $\theta\ \beta = 2\ \eta\ \alpha$.

Case 4.—Given the length of the fusee, and the least force of the main-spring, to find the greatest. Let x = 6, and y = 1, then $\sqrt{x\,y + \frac{1}{4}y^2} + \frac{1}{2}\,y = \sqrt{6.25} + 0.5 = 3 = a$, so that if y = 21 ounces, the greatest force will be a = 63: therefore, in every case, the form and dimensions of the fusee are, or may be, geometrically determined.

But we have yet to shew how the requisite hyperbola $\alpha\ \beta\ \gamma$ may be described, as a pattern for the curve of the fusee. Suppose the extreme forces of the main-spring to be, as we have before assumed, as 63 to 21; then having drawn two lines $\nu\ \xi$ and $o\ \pi$ to intersect at ϱ at right angles for asymptotes, let the angles $\nu\ \varrho\ \pi$ and $o\ \varrho\ \xi$ be bisected by the right line $\tau\ \varrho\ \varepsilon$, continued each way indefinitely. Then having determined the diameter of the base $\theta\ \beta$ of the fusee, take that extent in the dividers, and set it off each way from the centre ϱ in the line $\tau\ \varepsilon$ to τ and ϕ, which points will be the foci of the two opposite hyperbolas $\alpha\ \beta\ \gamma$ and $\delta\ \varepsilon\ \zeta$. In the focus ϕ fix a ruler $\phi\ \chi\ \downarrow$, so as to be moveable round a pin as a centre at ϕ; then take a thread, as much shorter

than

than the ruler as is equal to the diameter $\beta\,\varepsilon$ of the circle $\beta\,\theta\,\varepsilon\,\lambda$, and make one end of it faſt to the end, $\downarrow$, of the ruler, and the other to a pin fixed in the other focus τ; then a tracer ſtretching the ſaid thread, at the edge of the ruler at any point χ, will trace the required hyperbola, while the ruler is made to turn on its centre of motion φ; for in every caſe the difference of the two lines $\downarrow\chi$ and $\tau\,\chi$, taken from any point x in the deſcribed curve, will always be equal to the diameter $\beta\,\varepsilon$, agreeably to the laws of the hyperbolic curve. When the proper curve is thus formed on paper, for any particular main-ſpring, it may be transferred to card-paper, or ſheet-braſs; as a pattern or gauge to be applied to the fuſee-engine, as will be hereafter deſcribed.

FUSEE-*engine* is an engine contrived for cutting the ſpiral groove, that winds round the ſolid part of the fuſee, which is formed, as we have ſhewn above, by the revolution of an hyperbolic curve. Various conſtructions of this uſeful engine have been deviſed by different ingenious workmen, but it would be difficult to trace each modification to its reſpective inventor, nor indeed is it a matter of much importance, as the general principle is the ſame in all, namely, the application of a ſliding cutting tool to the ſurface of a revolving fuſee; the different methods of adjuſting and limiting the velocities of the moving parts of the engine, and a proviſion for the ſteadineſs of thoſe motions, have given riſe to various applications of the mechanical powers to produce the ſame ultimate effect. We ſhall lay before our readers a few varieties of the engine in queſtion, ſuch as we deem the moſt uſeful in practice, from an examination of which, it will be obvious to the mechaniſt, that other combinations, to anſwer the ſame purpoſe, might be deviſed without difficulty.

1. *Fuſee-engine acting by means of an inclined Plane.*—The firſt fuſee-engine that we propoſe to deſcribe, and that which, in our eſtimation, is the ſteadieſt in its action, is repreſented by *fig.* 1. of *Plate* XXXVII. of *Horology*, and is that which was formerly uſed by the late Brower, whoſe cutting engine we deſcribed as made by Hindley of York; and we have reaſon to believe that the fuſee-engine before us was contrived by the ſame ingenious mechaniſt. A A is a ſolid block of hard wood, that may lie on a table, or have feet of its own, to ſupport it: B B are two firm iron ſupports ſcrewed to the ſaid block, and bearing the ſtrong triangular bridges C, C; through theſe triangular bridges paſſes a long priſm of ſmooth iron, the end of which is ſeen at D; upon this ſtrong priſm ſtand three upright iron, or ſteel, pieces E, F, and G, formed like the puppets of a lathe, the laſt of which is moveable at pleaſure, and the whole taken together conſtitute a frame very much reſembling that of a lathe: H we will call the mandril, or arbor, that paſſes through circular holes in the puppets E and F, and has a winch, I, to be turned by; the cylindrical piece of ſteel, K, paſſes through the puppet G, and is fixed at any depth in the hole by the lever and ſcrew L, over it, which ſcrew enters the head of the puppet, and preſſes againſt the convex ſide of K, the inner end of which is pointed by a cone, and its outer end has a conical hole drilled in it, by which means the piece, K, may be made to bear either againſt a hole, or a point in any arbor that a fuſee may happen to have; M is a lever with a projecting pin ſcrewed to the interior end of the mandril, ſo as to revolve with it, and the arbor of the fuſee, O, which bears againſt a cylindrical hole at this end of the mandril with one end, and againſt the cylindrical point of piece K with the other, carries a ſecond lever N, ſeen ſeparately in *fig.* 2, which correſponds to what is called a *dog* in a turning frame; this dog is fixed to the arbor of the fuſee, by a ſmall thumb-ſcrew at its lower end, as ſeen in *fig.* 2, and the oblong hole at its upper end receives the projecting pin of lever M, ſo that when this lever revolves with the mandril, the dog and fuſee are carried round at the ſame time. On the projecting parts, P, P, of the puppets, F, G, which have each a triangular hole, is ſupported a ſecond, but a ſmaller priſm, Q, of iron, or ſteel, that may be fixed in any poſition, to the right or left, by ſliding without ſhake in the two triangular and diſtant holes above-named: to this priſm, Q, is fixed a ſliding perforated piece, R, by means of a thumb-ſcrew ſeen under Q, and at right angles to this ſliding piece, R, is fixed faſt a third ſtill ſmaller priſm, S, which conſequently may be fixed over any part of priſm Q, ſo as to be oppoſite the fuſee O, or any part of it; along this third priſm, S, ſlides the upright bearer T, that may alſo be fixed at any diſtance from the end of S by another thumb-ſcrew, which appears under it; the bearer, T, therefore ſlides alſo along the ſecond priſm, Q, whenever the piece, R, is moved in making the adjuſtment for poſition; at the top of this bearer is a ſquare hole of conſiderable depth, in which the cutting tool, U, ſlides without ſhake, and any ſlight preſſure on the handle at U of the cutting tool will apply its cutting point to the ſurface of the revolving fuſee, the winch, I, being turned at the ſame time; but the tool U, or the fuſee, muſt one of them have a lateral motion, otherwiſe the groove cut by the ſaid point would form a circle only on the ſurface of the fuſee; to render the groove ſpiral, therefore, is the buſineſs of the remaining portion of the apparatus.

W X Y Z is a long metallic frame with its ſides made perfectly parallel, ſo as to ſlide without ſhake within the two fixed parallel bars of metal, *a a* and *b b*, which are ſcrewed to the puppets E and F; this frame is counterbalanced by a weight ſuſpended by a ſtring, not ſeen in the figure, that is faſtened to its ſuperior end, before it paſſes over a fixed friction-wheel, not neceſſary to be exhibited; and on the mandril, behind this frame, is a pinion inſerted that acts with the rack, or toothed bar, that is viſible at the middle of the lower part of the frame, to which it is made faſt; hence, whenever the winch, I, is turned, not only the fuſee revolves, but the frame, W X Y Z, aſcends or deſcends, accordingly as the turns are made direct or retrograde: *c d e* is a metallic bar, ſimilar to one of the bars that conſtitutes the ſides of the frame, and is moveable round a pin at *d*, as a centre of motion; the extreme croſs-pieces or end pieces of the frame have each a circular perforation quite through, large enough to admit each a ſcrew through them, of which the milled nuts are viſible near W and Z reſpectively; it is obvious, therefore, that this bar, *c d e*, may be fixed either parallel to the ſides of the frame, or at any given angle of inclination, within the limits of the circular apertures, the edges of which are, or may be, graduated; for when the bar is turned round its centre from its parallel poſition, as in the figure, the thumb-ſcrews will act on its extreme ends, and ſet it faſt. Laſtly a weight, V, is ſuſpended by a cord, going round a fixed friction-wheel on the cheek *a a* of puppet E, and made faſt to the ſecond priſm, Q, at the end near R, ſo as to pull this priſm, and ſurmounted cutting tool, U, towards the inclined bar of the frame, till an elaſtic croſs-bar, *f f*, attached to the end of the ſaid priſm, comes in contact with the ſtraight edge of the inclined bar, in which ſituation the priſm in queſtion will remain at reſt while the frame is at reſt; but when the frame is made to aſcend by the pinion of the winch, the weight, V, preſerves the contact of the elaſtic bar, *f f*, with the ſide of the inclined bar, and deſcending, pulls after it the priſm Q, with its cutting-tool,

the fuſee, in the mean time, being made to revolve; it is evident, therefore, that if one hand of the workman turn the winch, I, while the other is preſſing gently againſt the handle, U, of the cutting-tool, a groove will be made on the ſurface of the fuſee of ſome determined number of revolutions, which ſhall depend on the quantity of the bar's inclination, that regulates the motion of the priſm; and as this inclination is adjuſtable, a given number of ſpiral turns may be aſſigned by adjuſtment, to a given length of the fuſee to be cut. At the ſame time, as the fuſee is not cylindrical, the regulation of the preſſure by hand only muſt be very nice, to make the tool cut the groove of equal depth in every part of the ſucceſſive revolutions, where the diameter is continually varying its dimenſions. To obviate any inaccuracy that is liable to ariſe from this operation, the French have applied a piece of metal formed into the proper hyperbolic curve, as a guide, or gauge, for the run of the cutting tool, ſuch as is repreſented by *fig.* 3, which we will deſcribe as adapted to our preſent engine, though it was applied, according to F. Berthoud, by M. Lelievre to an engine, contrived by him, of a conſtruction nearly ſimilar to the one we are deſcribing, except that the ſliding frame moved horizontally, whereas our's moves vertically.

In the figure laſt named, A B is a braſs frame, carrying the cutting tool U, and its ſupporter T, adapted to the priſm Q, in *fig.* 1; but at C, where the cutting point is connected with A B, is a piece of metal formed into an hyperbolic curve, as ſeen detached at D, near the ſaid figure; this curve, or gauge, is formed by the rules laid down in our preceding article FUSEE, and is fixed by a clamping piece, E, with a thumb-ſcrew at the required poſition, as to depth, while the ſcrews at the ends of A B adjuſt the lateral poſition, for the length of the fuſee, by means of the oblong holes that allow the whole frame of this figure to ſlide to the right and left, as occaſion may require, before it is finally fixed for action. In this ſituation of the apparatus, a pin is inſerted faſt into the ſtem of the cutting tool near C, ſo as to be in contact with the edge of the curve; the conſequence of which contrivance is, that while the cutting tool goes along with the priſm Q, in *fig.* 1, as before deſcribed, the pin, reſting againſt the edge of the fixed curve, is puſhed outwards at the ſame time that the tool advances in a lateral direction, along the ſide of the fuſee, and the bottom of the ſpiral groove thus cut is gauged to a given depth, depending not on the ſhape of the fuſee itſelf, but of the hyperbolic curve at the edge of the ſmall plate, C, which in fact forms the fuſee, at the ſame time that it is grooved by the cutting point. This contrivance has not, that we know of, been uſed in England, notwithſtanding its ingenuity and practicability, and the reaſon may be, that, as we have obſerved before, every particular ſpring, uſed as a main-ſpring, requires its own appropriate curve, and it would be endleſs to have a curved piece made for every ſeparate fuſee that is to be cut by the engine: beſides, a ſpring is rarely found uniform in its variation of force with the variation of tenſion, throughout its whole time of unwinding; ſo that, after all, tentative adjuſtments of the depth of certain ſpirals, to correſpond to the actual force of the ſpring, at the ſeveral ſtates of relaxation, become neceſſary, to enſure an uniformity of the ſpring's influence on the train of wheel-work: the tool which our Engliſh watch and clock-makers uſe, to aſcertain the proper dimenſions of the fuſee, when formed and grooved, has been already deſcribed among the other CLOCK *tools*, and may be ſeen at *fig.* 10. of *Plate* XXI. of *Horology*; and when any particular part of the fuſee requires to be diminiſhed, or to have its groove deepened, the fuſee is put either into a common turning frame, or into the FUSEE *frame*, hereafter deſcribed, (*fig.* 3. of *Plate* XXXVIII.) and the cutting point is ſuffered to run by the guidance of the groove already formed, till the given part is found deep enough, after a repetition of trials, made with the ſpring properly fixed, as to tenſion, and wound up to the given part of the fuſee that has been altered. Thus every point in the ſpiral groove of a fuſee may be adjuſted to the acting force of the ſpring with which it is to be uſed; and we beg leave to repeat, that theſe adjuſtments of the fuſee, by trial of the fuſee-tool, ought never to be omitted when a new main-ſpring is firſt uſed in any watch or clock, however old; for as ſoon might we expect that the expanſion of mercury, in a new tube, would correſpond to an old ſcale previouſly made, as that a new main-ſpring ſhall have its extreme and intermediate forces exactly compenſated by an old fuſee without new adjuſtments.

2 FUSEE-*engine acting by the union of a ſcrew, a double lever, and a pair of wheels.*—The fuſee-engine which we now come to deſcribe unites the combined powers of wheel-work, the ſcrews, and the double lever, to modify the reſpective motions of the fuſee and of the cutting tool, in the following manner; A B, in *fig.* 4. of the laſt plate, is a plate of braſs fixed, or otherwiſe placed on a table, during the act of uſing the engine now before us; C C and D D are two pair of puppets, reſpectively ſcrewed to the plate A B, and united reſpectively by the edge-bars lying on the ſaid plate; the little frame under *fig.* 5, ſeen there detached, is ſcrewed on the ſame plate A B, between the two edge-bars, to which it will ſlide parallel, before it is fixed by its thumb-ſcrew beneath; this ſmall frame receives the fuſee between its cylindrical holding pieces E and F, and the piece E is moreover uſed as a ſtud for a looſe wheel to revolve round; a pin projecting from the plane of this wheel impels a dog, as in our laſt engine, fixed on the fuſee-arbor, to which it communicates motion whenever the wheel revolves; this wheel is impelled by another, placed faſt on the tapped arbor, of the winch I, that fits in a hole made in the puppet C, near the winch, and is ſupported at the other end by a cylindrical piece with a conical point, entering the hole of the other puppet C; whenever therefore the winch is turned, both wheels and the fuſee will all revolve, though not all in the ſame direction, nor yet in the ſame time, unleſs the two wheels have like dimenſions and numbers of teeth. The perforated cylindrical piece G, which if tapped to receive the ſcrew of the arbor, is prevented from turning round, as the arbor revolves, by a projecting piece below it, that ſurrounds a fixed ſtrong wire H K, which ſlides, or is at liberty to ſlide, in two cocks ſcrewed to the puppets C and C, as ſeen in the figure; therefore, when the arbor containing the male ſcrew revolves, by means of its winch, the piece G, with the correſponding female ſcrew, is drawn towards the winch gradually, and the regularity of this motion will depend on the due inclination of the threads of the ſcrew, which therefore ought not to be *drunk*, as the workmen call the imperfection in this reſpect; but the piece G would be at liberty to travel along the whole length of the arbor, if there were no ſtops at the limited diſtances: to obviate this, the wheel on the tapped arbor has a pin alſo projecting from its plane, and the two ſliding pieces L and M will clamp at any given points of the wire juſt deſcribed; near the laſt named wheel the wire is cranked ſo as to permit the wheel to paſs through its crank in its preſent poſition, but when the piece under G ſlides along the wire till it meets with the clamp L, it puſhes the wire altogether before it, till the angular part of the crank falls in the way of the wheel's pin, when all further motion is arreſted by the locking of the wheel; a contrary motion will alſo lock the

wheel

wheel by a pin behind the wheel, when the clamp M is acted on, and the diſtance of the clamps muſt depend upon the length of the fuſee to be cut, as we ſhall ſee more clearly preſently. Above and below the moveable piece G are fixed two ſtrong wires N and O, which running parallel to each other, are ſo fixed, by a pin paſſing along ſocket P, that they have thereon one common centre of motion, in the manner of a long joint; this ſocket is attached to the double lever, ſeen detached at *fig.* 6, with five holes near its centre, and with a ſimilar ſocket at its oppoſite end; the cock, which is ſeen in *fig.* 7, is fixed by a ſcrew and ſteady pin to the bottom plate A B, beyond the ſmall frame E F, and ſupports the double lever P Q, by a pin placed in ſome one of its five holes, accordingly as the oppoſite ends of the lever are to be proportioned to each other, that is, accordingly as the central pin is inſerted into the firſt, ſecond, or third, &c. hole of the double lever. R is a long bar, of equal breadth throughout, that ſupports the cutting tool S, and that is at liberty to ſlide within the puppets D and D without ſhake; another pair of ſtrong wires, like N and O, are made faſt to this bar above and below, which wires have alſo their common centre of motion round a long pin, paſſing through the ſocket Q, at the oppoſite end of the double lever.

From this arrangement it is evident, that whenever the piece G is drawn towards the winch, by the revolution of the latter, the wires N and O will make their end of the double lever follow; but as the oppoſite end of the ſaid lever will move in a contrary direction, its wires will draw back the long bar R, and with it the cutting tool, the fuſee in the mean time being revolving; hence it is obvious that a little preſſure on the handle S of the cutting tool will form a ſpiral groove, ſuch as was deſcribed when we detailed the operations of the laſt engine. The number of turns on the fuſee may be limited either by altering the central pin between the oppoſite levers, or by changing the wheels for others of different ratios, with reſpect to their diameters and numbers of teeth, or by both jointly when great nicety is required. We are diſpoſed to think that the variety of fittings in this conſtruction, and the union of different powers, are not calculated to render the motions to be produced equally ſteady, particularly when the parts of action have been a little looſened by uſe.

It may not be improper to ſubjoin here another method of applying the cutting point to the fuſee, which ſeems calculated to prevent parallax or lateral motion of the point; R, in *fig.* 8, as in *fig.* 4, is the edge-bar bearing the cutter D fixed faſt to the upright lever B; this lever is faſt on the arbor A, which turns on two pivots at the cocks *a* and *a* fixed to the bar R; then ſuppoſing D to have a handle like S in *fig.* 4, the motion of the arbor A round its pivots will allow the cutting point to approach, or recede from the fuſee, according to the quantity of preſſure applied to it in the act of cutting. This conſtruction is not ſo common as that in *fig.* 4, but muſt be more ſteady, and would probably cut better if there were a joint where D is made faſt to B, to preſerve the horizontal poſition of the cutting-tool as it recedes or advances.

3. *Fuſee-engine* (*common*) *acting by the union of one ſcrew and two ſingle levers.*—The fuſee-engine repreſented in *fig.* 1. of *Plate* XXXVIII. of *Horology*, is the common engine taken from one of the Lancaſhire pattern-books, and is the moſt ſimple of any; A B C D is a plate of braſs, on which the dove-tailed plate E F ſlides without ſhake, and with but little friction, the ſides being perfectly parallel. The axis of the handle is ſupported by the bearing pieces A and G faſt to the under plate, and has a ſcrew cut on it throughout its length between the ſaid bearing pieces; the thick end H of the lever H I is tapped ſo as to receive the ſcrew of the axis without ſhake, to which it can be adapted by the ſcrew at H; this lever has an oblong aperture through it, in the direction of its length from H nearly to I, and is moveable round the pin at K, that enters the lower plate through a ſecond aperture at the extreme end of the lever; L M is a ſecond lever, turning on the pin M fixed to the ſliding plate, and ſet faſt by the milled nut L, over any point of the circular aperture N, as the inclination may require; O L is an endleſs ſcrew of ſlow motion, for regulating the accuracy of the adjuſtment to the point where the nut fixes the lever; and T is a pin fixed in the lever L M, that paſſes through the oblong apertures of lever H I, and gives motion to the ſliding plate E F, whenever the handle turns the axis of the ſcrew, and as the cutting point P Q is attached to this plate, by the cocks R and S, it alſo moves with the ſame velocity; this velocity depends on the diſtance of the pin T from K the centre of its motion, and may therefore be regulated by the nut L and ſcrew O L, to the requiſite angular velocity, that may ſuit each turn of the handle, or fuſee attached to it by a clamping piece between G and D.

The operation of cutting the fuſee by this engine, it is preſumed, can require no further explanation.

4. *Fuſee-engine* (*old*), *acting by the union of a wheel and pinion, a ſcrew, a ſimple lever, and a ſliding frame.*—*Fig.* 2, of the laſt plate, exhibits a perſpective view of the old fuſee engine as given in the Lancaſhire pattern books; A B C D, as before, is the inferior frame, and E F the ſliding frame, but inſtead of dove-tailed edges this upper frame ſlides by means of four cylindrical pieces paſſing through correſponding holes in the edges of the lower frame, as ſeen in the figure; there is alſo an axis formed into a ſcrew, turned by the handle, acting in the part H of the inviſible lever H I, as before, which lever lies here under the frames; but a wheel G on a ſeparate axis, that carries the fuſee, is actuated by a pinion on the axis of the handle. The ſecond lever L M of the preceding engine is here wanting; but the nut T is in place of its pin T, and penetrates one of the circular holes in the ſuperincumbent piece R T, ſo as to lay hold of the lever H I through a concealed aperture in the ſliding frame E F; the diſtance of the hole uſed from the centre of the lever's motion K regulates the velocity, as before, of the ſliding frame, and conſequently of the cutting point P Q, ſcrewed to it by a pair of embracing cocks, while the ſcrew, taking into the nut R, adjuſts the exact ſituation of the hole occupied by the milled nut T. In all other reſpects the operation of cutting the fuſee is the ſame as in the other engines. Sometimes we have ſeen a ſcrew acting againſt the ſliding frame and placed between the cylindrical pieces on the inner edge of the under frame to prevent jerks, but when the ſcrew and other acting parts are well fitted, this is unneceſſary. From theſe four engines it is eaſy to perceive, as we have obſerved, that various other modifications may be adopted to anſwer the ſame purpoſe.

Fusee *Frame.*—When a fuſee has been cut by an engine, and is found on trial to have ſome place or places of too large a diameter for the main-ſpring to act equally with, a little frame, like that in *fig.* 3. of the laſt plate, is ſometimes uſed, where the cutting tool A has its point put in the ſpiral groove, and is made to reſt on a cylindrical arbor B, that reſts on the equal rollers C and D, fixed in the reſpective ends of the frame, by means of a grooved pulley, ſo that as the fuſee revolves, the ſaid arbor B moves laterally, and keeps the point of the cutting tool in the groove, at right angles to the arbor of the fuſee, and thus any particular part only of the fuſee may be reduced, by partially turning the handle, as the circumſtances of the caſe may require.

FUSEE, *Fuze*, or *Fuſe*, in *War*. See FUZE.

FUSHENG, in *Geography*, a town of Perſia, in Choraſan, 36 miles N. of Herat.

FUSIBILITY, that quality in metals and minerals, which diſpoſes them for fuſion.

Gold is more fuſible than iron or copper; but leſs ſo than ſilver, tin, and lead.

Borax is frequently mixed with metals, to render them more fuſible.

FUSIFORMIS, RADIX, in *Botany*, a ſpindle-ſhaped root, as in the carrot, parſnep, and radiſh. See ROOT.

FUSIGNANO, in *Geography*, a town of Italy, in the department of the Lower Po; 24 miles S. E. of Ferrara.

FUSIL, in *Heraldry*, by the French called *fuſee*, q. d. ſpindle, is a bearing of a rhomboidal figure, more ſlender than the lozenge; its upper and lower angles being more acute than the two middle ones.

FUSIL, in *Military Language*, is a light muſket, nearly ſimilar to a carabine, but in general more neatly finiſhed; it being uſually intended for the uſe of officers attached to light companies, and thoſe appertaining to fuſileer corps, to yagers, rangers, chaſſeurs, carabineers, and others in which light arms are uſually employed. Formerly the officers attached to grenadier companies bore fuſils, but within theſe few years that practice has been diſcontinued, nor do many officers in any corps uſe them; ſwords being the only weapons ordinarily borne. The fuſils intended for officers are generally mounted with ſilver, and have bayonets of a light conſtruction; the bore uſually calculated for balls of eighteen to the pound, and the length of the barrels from thirty-four to thirty-eight inches. We conſider the fuſil as being an eligible weapon for all officers whoſe duty it may particularly be to engage in deſultory ſkirmiſhes, and eſpecially in that horrid ſpecies of warfare, termed "buſh-fighting," but for the ordinary branches of ſervice performed by regiments of the line, they are certainly ill calculated, on account of their being cumbrous, and a check upon thoſe active ſervices connected with the preſervation of order, and the prompt execution of whatever evolutions may be performed. The eſpontoon, though by no means a choice implement, is certainly more efficient in keeping the muſkets down to a proper level, while it furniſhes no inſignificant means of defence, eſpecially againſt a ſingle horſeman. For the ſame reaſon no ſerjeants ſhould bear fuſils; halberts being in every inſtance ſuperior. We underſtand from good authority that non-commiſſioned, and ſometimes even commiſſioned officers who bear fire-arms, do not attend ſo much to the preſervation of diſcipline, as they do to the taking aim with their fuſils, wherever opportunity offers for "taking a good ſhot."

FUSIL-*man*, commonly called *fugle-man*, is a non-commiſſioned officer or ſoldier, whoſe duty is to give the time for the ſeveral motions of the firelock, the facings, &c. performed by any body of men. His poſt is uſually in front, commonly towards the right flank; but common ſenſe points out that it ſhould always be more centrical, eſpecially for whole regiments, the rear ranks of which are often compelled to perform their motions partly by gueſs, and partly by a rapid adaptation of what they ſee doing by the front rank. This inconvenience is neceſſarily increaſed in proportion to the obliquity or deviation from a central poſition.

The motions of the fuſil-man ſhould, in contradiſtinction to thoſe of the ſoldiers in general, be broad, open, and ſtrongly marked. The quitting of a hand ſhould be denoted by forcibly throwing the reſpective arm upwards, and wide from the body; and the joining a hand ſhould be denoted by the reverſe, that is, by throwing the correſponding arm forcibly towards, or acroſs the body. The motion of a foot ſhould be on a ſimilar principle, and all facings ſhould be marked by firſt raiſing the right hand and throwing back the right foot, then as the body caſts round, reſtoring them with a ſweeping motion to their places. Without ſuch demonſtrations, which certainly appear individually ludicrous, no corps could go through their motions with exactneſs.

FUSILE COLUMN and MARBLE; ſee the ſubſtantives.

FUSILEER, in *Military Language*. This deſignation ſhould literally apply to men bearing fuſils, but it is in many inſtances given to regiments which vary but little from the ordinary claſs of regiments of the line. The duties of a fuſileer, properly ſpeaking, are chiefly directed to the ſame ſervices as appertain to light infantry, and to the ſeveral corps performing the more deſultory and detached operations of a campaign; conſequently the dreſs ought to be ſo faſhioned as to allow perfect freedom of motion, and not to be ſubject to hitching among boughs, &c. The colour ought to conform to the general face of the country; thus, where much verdure prevails, green ſhould be adopted; but where the ſoil is generally barren, any medium ſhade of brown, or of ruſſet, or of olive colour, will be preferable; ſince ſuch will tend beſt to the concealment of thoſe who may be ordered to occupy, poſſeſs, &c. for the purpoſe of ſurpriſing, or of annoying an enemy. Fuſileers ſhould wear ſtout ſhoes, with whole gaiters of ſubſtantial but very pliant leather, reaching over the knees, double-milled pantaloons and jacket, without any facings, or glittering buttons; the belts ſhould be of the ſame colour as the cloth, as ought alſo the cap, which ſhould be of leather, with flaps to let down both before and behind: every article ſhould be water-proof, and made to fit very compactly, but without deteriorating the freedom of motion. The fuſil and the bayonet ought to be browned over all thoſe parts uſually kept bright; in order that no rays ſhould be reflected from them. This mode is now very properly becoming very general in the Britiſh ſervice, and carries with it the important recommendation of conſiderably diminiſhing thoſe minor duties of the ſoldier which often cannot be executed, and when they can, rarely fail while on active ſervice to trench upon the little reſt he may occaſionally be able to obtain.

FUSILUS, in *Botany*, a name given by ſome to the fuſanus, a more common name for the euonymus.

FUSILY, or FUSILE, in *Heraldry*, is when a field, or ordinary, is entirely covered over, or divided into fuſils.

FUSINI, in *Geography*, a town of Japan, in the iſland of Niphon, 16 miles S.E. of Meaco.

FUSION, the ſolution or melting of metals, minerals, &c. by means of fire; or the act of changing them from their ſolid ſtate to a fluor.

The word is derived from the Latin, *fuſio*; of *fundo*, *I pour out*. Whence, alſo, *effuſion*, *infuſion*, *ſuffuſion*, and *transfuſion*; which ſee.

To give the ore its metallic form, they fuſe it; when it is in fuſion, the metalline ſubſtance, being the heavieſt, ſinks to the bottom of the furnace; the other terreſtrial matters riſing, in form of ſcoria, to the ſurface.

It is commonly imagined, that the fuſion and metalline form of ores is wholly the effect of fire; and we have theories of fuſibility founded on this principle; but it is a miſtaken one. Fire, no doubt, is the principal agent; but fire, alone, is not ſufficient. A mineral, or piece of metal not purified, being put alone in a crucible, melts with great difficulty, and never becomes a perfect metal; copper ore, for inſtance, being thus applied, its impure part forms a

ſcoria,

ſcoria, and vitrifies; the metalline part reſiding at bottom, under the appearance of a black regulus. To promote the fuſion and ſeparation, they mix coals, or ſtones, or cinders, or old ſcoriæ, along with the ore; the inflammable principle in which, by help of fire, fuſes them perfectly, ſets the heterogeneous part at liberty, and raiſes it to the top. See FLUX.

The general reaſon of fuſion is pretty eaſily aſſigned. The firmneſs or ſolidity of a body ariſes from the force wherewith its particles cohere. And the coheſion of all bodies is as the quantity of contact in the component particles.

Now the corpuſcles of fire, entering with rapidity into the pores of the metal, agitate, and, by degrees, looſen, divide and diminiſh their contact; till at length there is not enough to hinder their rolling over each other, and giving way upon the leaſt impulſe.

The dilatation obſervable in all fuſion, is a proof that the particles of the bodies are ſeparated, and ſet at a diſtance from each other; and, conſequently, their contacts and coheſions diminiſhed.

In effect, rarefaction and dilatation are the neceſſary conſequences of fire and heat.

From the difference of coheſion proceeds that variety we obſerve in the fuſion of bodies; for ſuch as have leaſt contact of parts, ſooneſt give way to the fire; and ſome will melt away by the warmth of a vapour only: thus air and mercury are ſo fuſible, that the heat of the atmoſphere is always ſufficient to keep them fluid; when others, which have a ſtronger contact, are not to be ſeparated without much difficulty. Upon this account, vegetables very eaſily diſunite, minerals ſlower, and metals ſloweſt of all; and of the laſt, thoſe wherein the contact of parts is leaſt, as in lead and tin, moſt readily melt; but thoſe which are moſt compact, as gold and ſilver, are not to be managed but by a violent heat.

If now the force of coheſion were proportional to the quantity of matter, or to the weight of bodies, we might from ſtatics account for all the variety that occurs in fuſion: for by knowing the ſpecific gravity of a body, we ſhould then know what force is required to melt it; but becauſe the ſame quantity of matter may be ſo variouſly diſpoſed, that in one body there ſhall be a much greater contact than in another, though the gravity be equal, or even greater in the latter, therefore the force of the coheſion cannot be eſtimated by gravity; for lead, though more ponderous than all other metals except gold, yet in the fire is more eaſily melted than almoſt any other; ſo that it neceſſarily follows, that in this metal there muſt be a leſs coheſion, or contact of parts, how much ſoever it may exceed others in the quantity of its matter.

Bodies after fuſion return again into a ſolid maſs, upon removing them from the fire; becauſe their particles hereupon approach nearer to one another by their attractive force, and are compelled to unite.

Such as conſiſt of homogeneous and unalterable parts, as wax, gums, and the purer metals, recover their ancient form: for when the ſame texture of parts remains in the whole body, it muſt of courſe re-aſſume the ſame appearance, when the ſeparating power ceaſeth to act; but other bodies whoſe parts with reſpect to denſity and ſurface are extremely different from one another, while ſome are carried off by the force or heat, and others are changed as to figure and poſition, muſt be forced to appear in another form; for they cannot recover their original phaſes, unleſs every particle could reinſtate itſelf in that very ſituation it had before, which may be hindered infinite ways; as may be experienced eaſily in heterogeneous bodies.

The difference, therefore, obſerved even in homogeneous bodies after liquefaction, is no ways to be accounted for but from the changeableneſs of ſurface in their parts: for thoſe bodies whoſe parts conſtantly retain the ſame ſurfaces never loſe their form; but others, by having the ſurfaces of their parts altered, have a different texture, and put on another appearance.

It had been formerly an opinion, very generally received, that the ſolution of metals by lightning is effected by a kind of cold fuſion; and the inſtances that have been uſually alleged in ſupport of this opinion, are thoſe of a ſword being melted in its ſcabbard, and of money being melted in a bag, whilſt the ſcabbard and bag remained unhurt. But it appears, by a variety of experiments and obſervations, collected in the progreſs of electricity to its preſent advanced ſtate, that this kind of fuſion is attended with heat and ignition, as in the caſe of common fuſion. Phil. Tranſ. vol. li. part. i. art. 30 and 31.

FUSIVATA, in *Geography*, a town of Japan, in the iſland of Niphon; 56 miles S.S.E. of Meaco.

FUST, in *Architecture*, the ſhaft of a column; or that part comprehended between the baſe and the capital; called alſo the naked.

The word is French, and literally ſignifies a *caſk*.

The fuſt is that cylindrical part, which makes, as it were, the body or trunk of the column, excluſive of the head and foot.

FUSTIAN, in *Commerce*, a kind of cotton ſtuff, which ſeems, as it were, quilted, or whaled on one ſide.

Manege derives the word from *fuſtanum*, which in the corrupt Latin writers is uſed in the ſame ſenſe, and is ſuppoſed to be formed from *fuſtis*, on account of the tree whereon the cotton grows. Bochart derives it from *fuſtat*, which, in Arabic, ſignifies the ancient city of Memphis, where cotton is produced in great abundance. Right fuſtians ſhould be made altogether of cotton thread, both woof and warp.

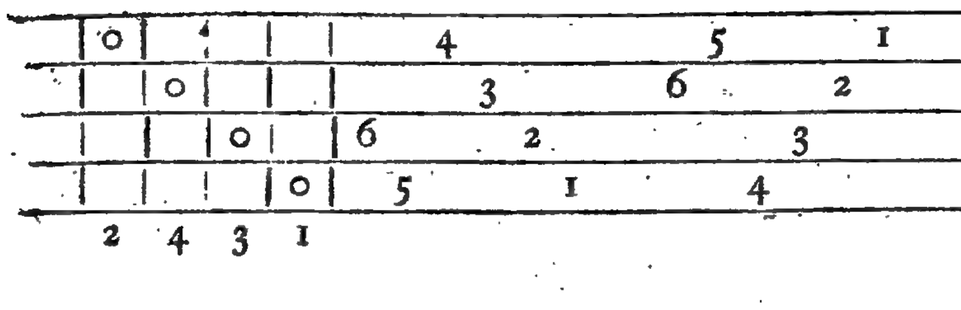
FUSTIAN, in the *Manufacture of Cloth*, is a ſpecies of coarſe thick twilled cotton, and is generally dyed of an olive, leaden, or other dark colour previouſly to its being uſed. Beſides the common fuſtian which is known by the name of pillow (probably pilaw) fuſtian, this manufacture, which is chiefly carried on in Lancaſhire, and the weſt riding of Yorkſhire, comprehends the cotton ſtuffs known by the names corduroy, velverett, velveteen, thickſett, and the other thick fabrics uſed for men's wearing apparel. The commoneſt kind of fuſtian is merely a twill of four, and ſometimes five leaves of a very cloſe ſtout fabric, and is very narrow, ſeldom exceeding 17 or 18 inches in breadth. It is cut from the loom in half pieces or ends as they are uſually called, and after undergoing the ſubſequent operations of dyeing, dreſſing, and folding is ready for the market. The end or half piece is generally from 30 to 40 yards.

The draught and cording of common fuſtian is very ſimple, being generally a regular or unbroken tweel of four or five leaves. Below are ſpecimens of a few different kinds ſelected from thoſe moſt general in Lancaſhire.

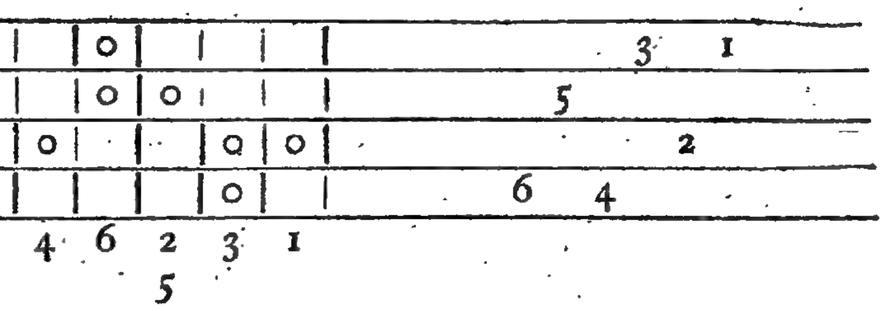
The number of leaves of heddles are directed by the lines acroſs the paper, and the cording by the cyphers at the left hand corners, thoſe which raiſe every leaf being diſtinguiſhed by the cyphers, and thoſe which ſink them left blank, as more eſpecially explained in the article DRAUGHT and *Cording*.

FUSTIAN.

No. 1.—Pillow Fuſtian.

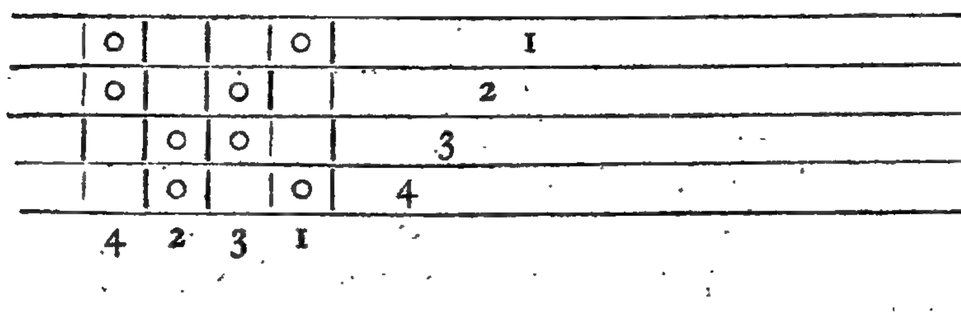


No. 2.—Plain Velveret.

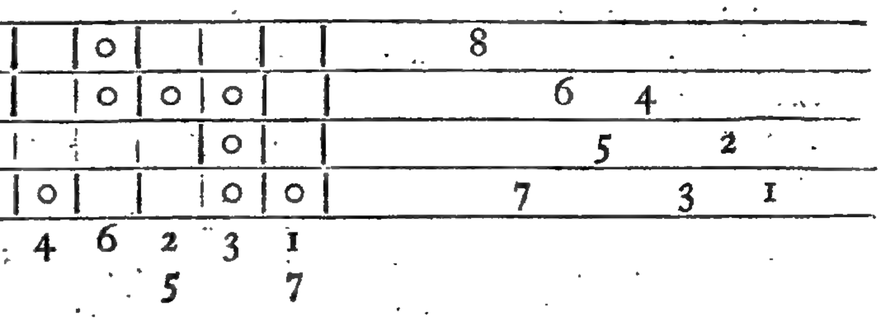


Of the above each contains four leaves of heddles or healds; that repreſented by No. 1. is wrought by four treddles, and that which is diſtinguiſhed by No. 2. by five; the ſucceſſion of inſerting the threads of warp into the heddles will be diſcovered by the figures between the lines, and the order in which the treddles are to be ſucceſſively preſſed down by the figures below.

No. 3.—Double Jean.

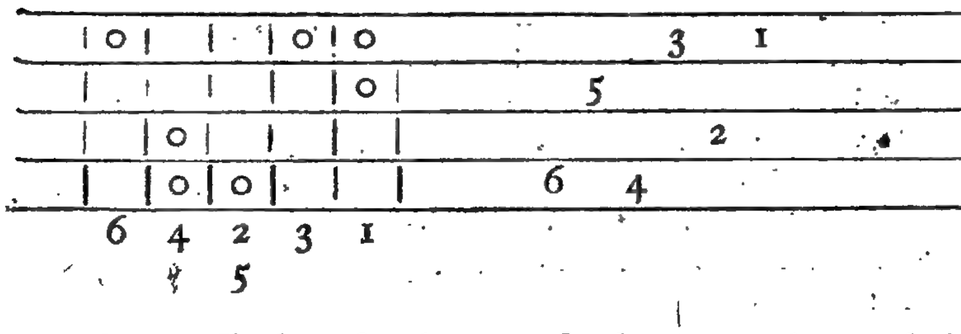


No. 4.—Plain Thickſett.

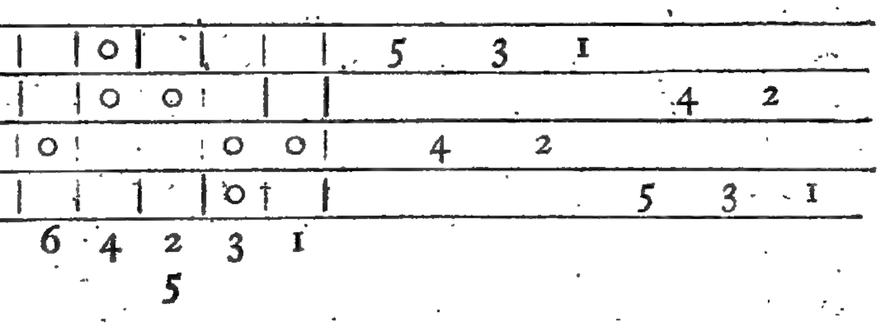


Theſe, like the former, are wrought with leaves. No. 3. requires four, and No. 4. five treddles. The ſucceſſion of inſerting the threads of warp, and of working the treddles, are marked by the reſpective numbers between and under the lines, as in the former example. Both are fabrics of cloth in very general uſe and eſtimation as low priced articles.

No. 5.—Beſt Thickſett.

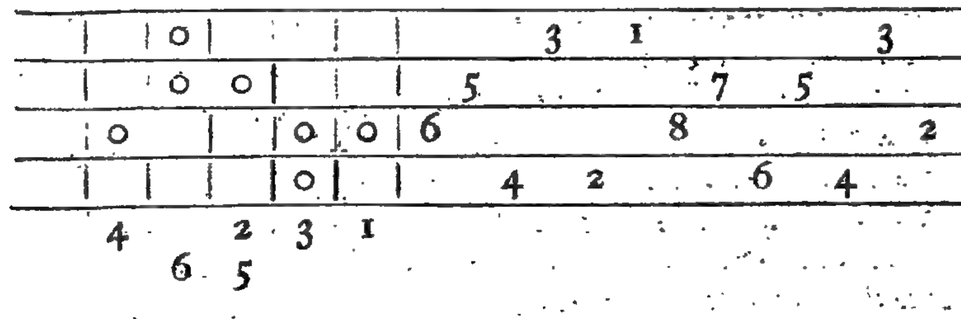


No. 6.—Velvet Tuft.

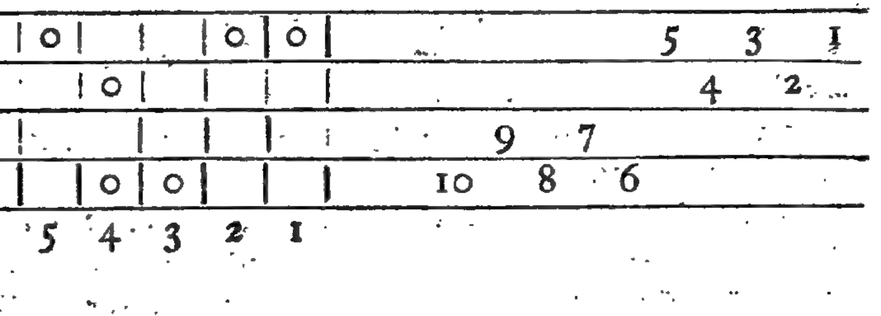


Theſe are further ſpecimens of what may be, and is, executed with four leaves, and in both examples five treddles are uſed. With two other ſpecimens we ſhall conclude our examples of this deſcription of work, and ſhall then add a very few ſpecimens of the more extenſive kinds.

No. 7.—Cord and Velveret.

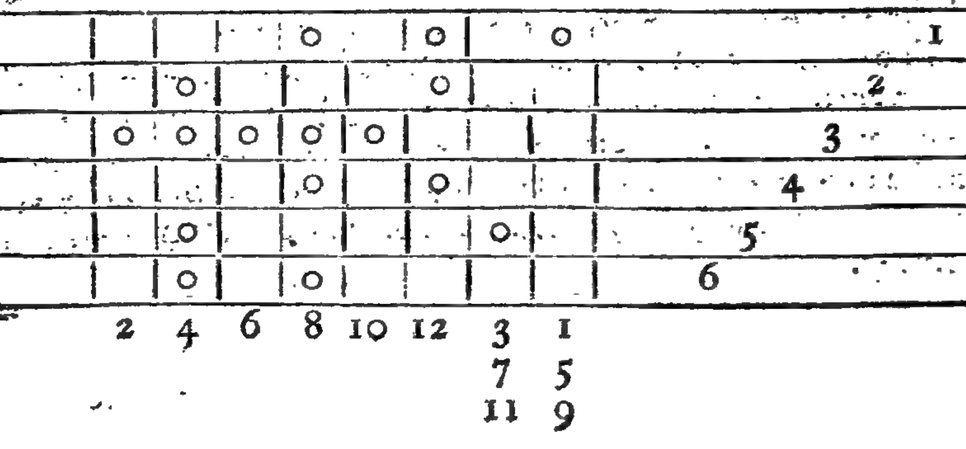


No. 8.—Thickſett Cord.

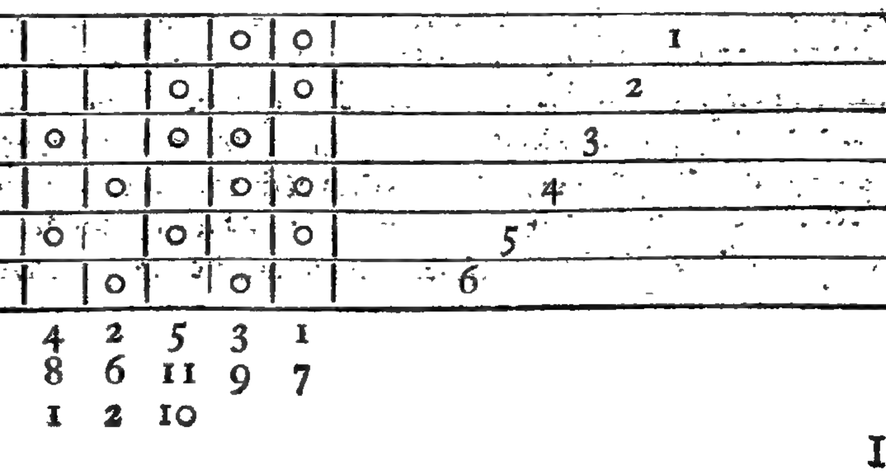


In theſe the ſucceſſion of drawing and working are marked like the former. The next are examples of patterns wrought with ſix leaves. No. 9. has eight, and No. 10. five heddles.

No. 9.—Double Corduroy.



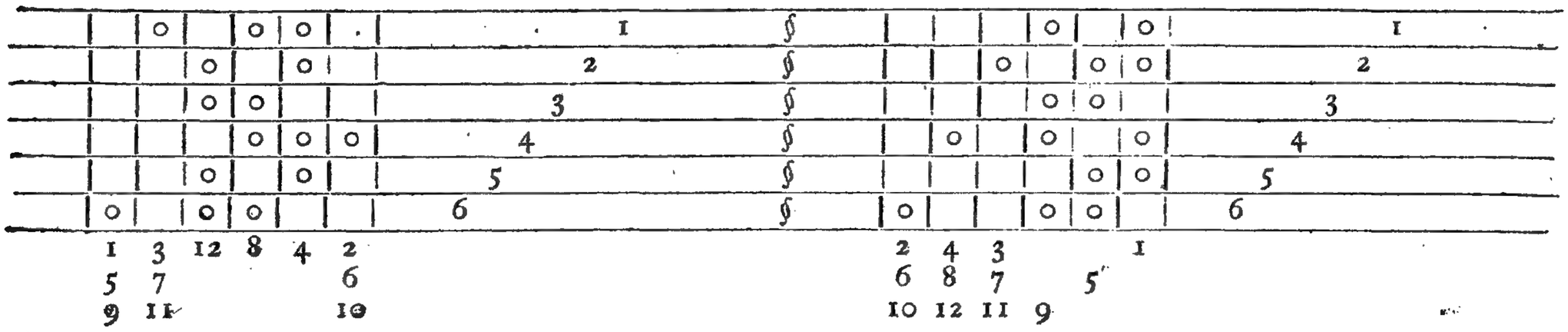
No. 10.—Genoa Thickſet.



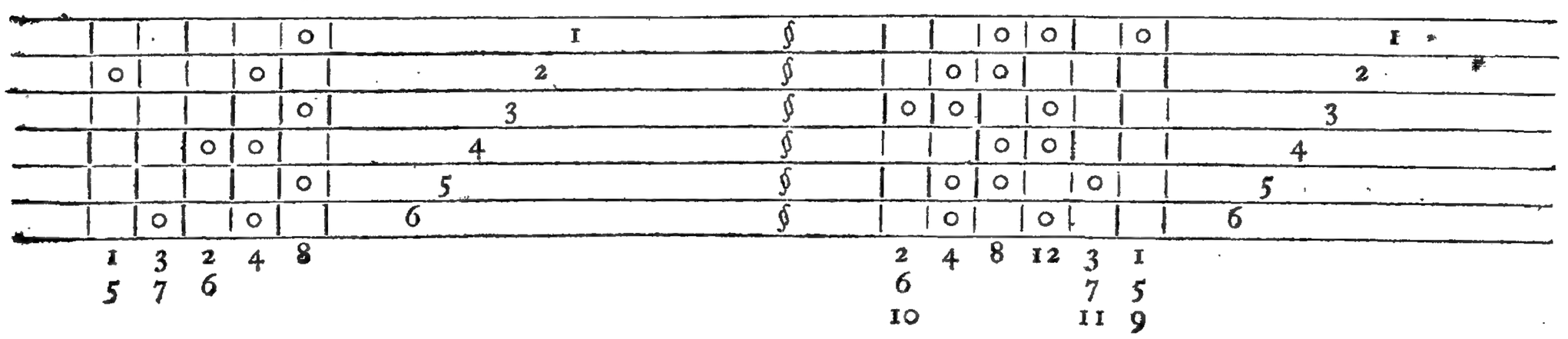
In

In both theſe the warp is inſerted into the heddles the ſame way. The difference is entirely in the application of the cords and in the ſucceſſion of preſſing down the treddles. We now give four ſpecimens of the ſpecies of fluſhed and cut work, known by the name of velveteen. They are alſo upon ſix leaves, and the difference is ſolely in the cording and in the treading.

No. 11. Queen's Velveteens. No. 12.



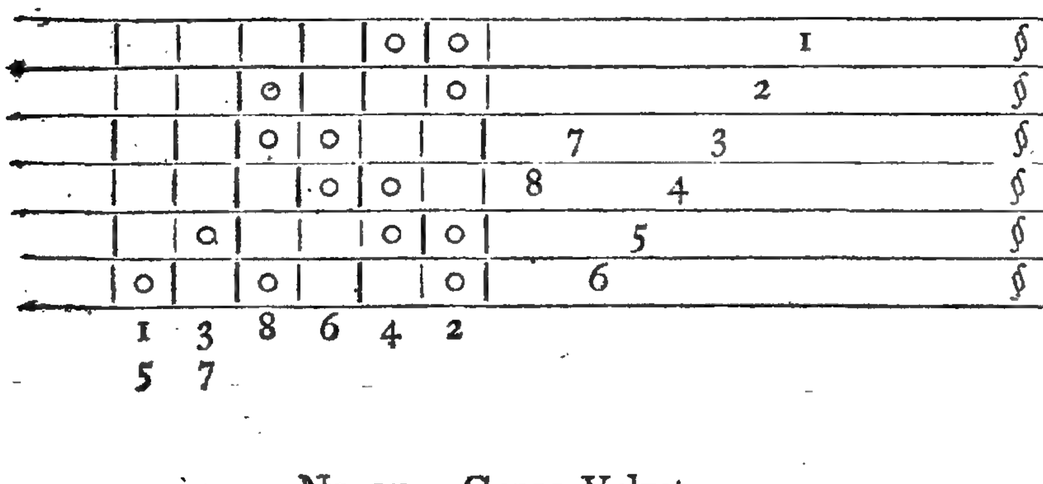
No. 13.—Plain Velveteen.



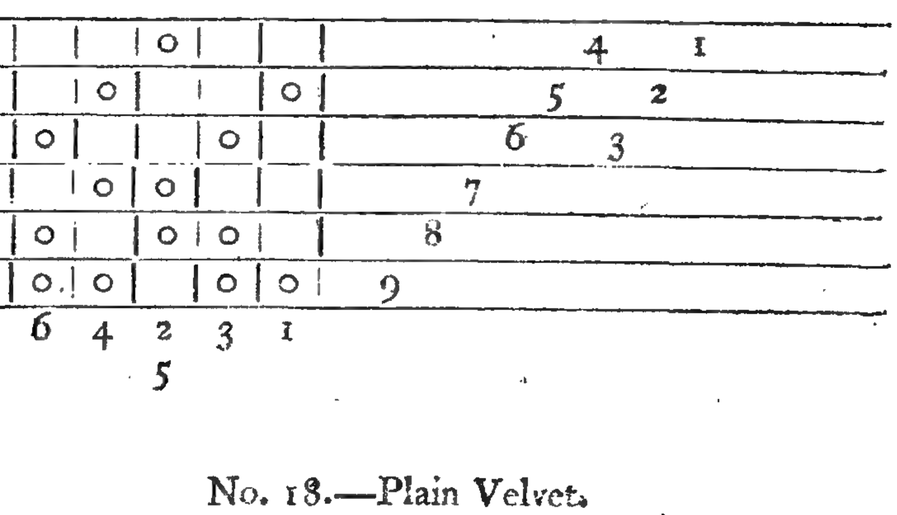
No. 14.—Genoa Velveteen.

The additional varieties of figure which might be given are almoſt endleſs, but the limits of this article will not admit a further detail. Thoſe already given are the articles in moſt general uſe. The varieties of fancy may be indulged to great extent, but it is univerſally found, that the moſt ſimple patterns in every department of ornamental weaving, are thoſe which attract attention and command purchaſers. We ſhall therefore only add two examples of king's cord or corduroy, two of Genoa and common velvet, and two more of jean. Theſe will be found below.

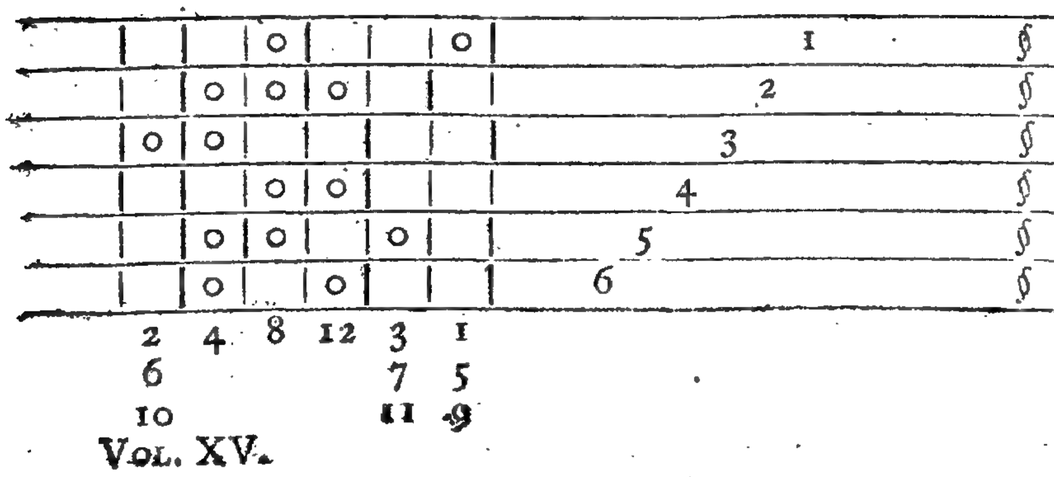
No. 15.—King's Cord.



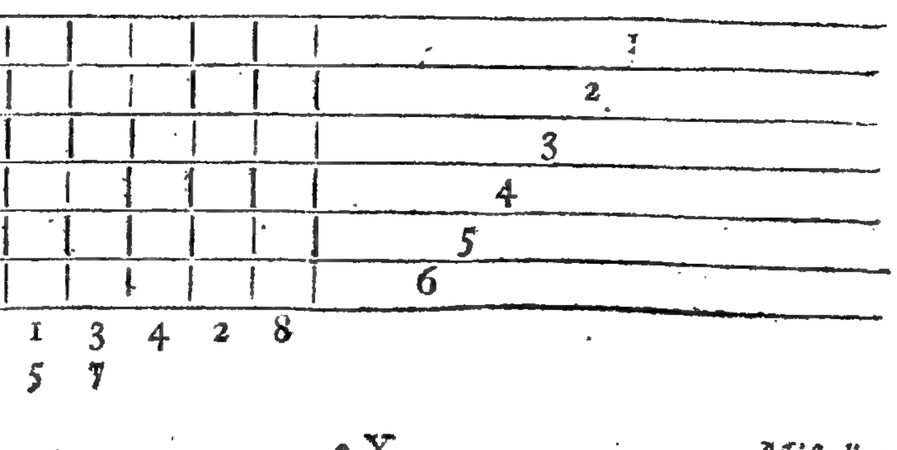
No. 16.—Dutch Cord.



No. 17.—Genoa Velvet.



No. 18.—Plain Velvet.



Miſcellaneous Remarks.—In the manufacture of cloth it is difficult to fix upon any generic term for a variety of articles which, however, bear a very near analogy to each other, and are only diſtinguiſhable either by a difference in the material of which they conſiſt, or ſome ſmall variation in the proceſs of manufacture. In this article the word fuſtian has been uſed as the generic term, and examples have been given of the moſt common fabrics of the fanciful varieties of this article. Dr. Johnſon contents himſelf with deſcribing fuſtian merely as a kind of cotton cloth, which although probably very juſt, conveys no impreſſion whatever to the mind, excepting, that in its raw ſtate it is a vegetable ſubſtance, found in moſt of the tropical climates, and that when manufactured it ſerves as a covering for the human body, or for ſome other domeſtic purpoſe.

The examples, ſhort as the article is, will be found to contain an abſtract of moſt of the articles known by the various names of fuſtian, jean, corduroy, thickſet, velveret, velveteen, &c. in the cotton manufacture: of plaiding, blanketing, kerſeymere, plum ſerge, &c. in the woollen, and of ſatin, &c. in the ſilk. Of velvet there are properly only two kinds, that with a plain and that with a tweeled, or, as it is here called, a Genoa ground or back. When the material is ſilk, it is called velvet, when cotton, velveteen, and this is the ſole difference. In the ſame way a common tweeled cloth, when compoſed of ſilk, is called ſatin, when of cotton, fuſtian or jean, of woollen, plaiding, ſerge or kerſeymere, and in the linen is diſtinguiſhed by a variety of names according to the quality or fineneſs, or the place where the article is manufactured. It would tend greatly to ſimplify an analyſis of the various manufactures of cloth, were a general nomenclature introduced, as has been ſo ſucceſsfully done, in the more comprehenſive and important ſcience of chemiſtry, and the univerſal uſefulneſs of the art, as embracing a variety of articles of neceſſity to the poor, and of ornamental luxury to the rich, would render the attempt very deſireable in every reſpect. But while the knowledge of the art continues to be confined to operative mechanics and to manufacturers, little diſpoſed to ſtudy ſimplicity or arrange and claſſify ideas, this is rather to be wiſhed for than expected. In all the fanciful branches which form the ſubject of this article, the cloth undergoes a variety of proceſſes after coming out of the weaver's hands. Of theſe, the firſt is cutting the fluſhed warp to raiſe the pile as it is called. This is performed on a flat table with a ſharp pointed knife. It is neceſſary in this to be careful that the knife may only cut the pile without injuring the back or fabric. I am not aware (ſays the writer of this article) that any attempt has ever been made to render this either more ſafe or ſpeedy by the aid of any kind of machinery. It is ſaid, indeed, that in the manufacture of Wilton carpets and hearth rugs, (which are merely worſted velvets,) grooved wires are introduced and cut out in the loom by the weaver, the groove in the wire ſerving as a guide for the knife, to prevent it from injuring the fabric of the cloth. The next operation is that of dyeing, which depending entirely on the chemical proceſſes neceſſary to give the greateſt poſſible brilliancy and durability of colour, to the material of which the cloth is compoſed, forms no part of this article. With little variation in the mechanical part, many kinds of cloth, differing widely in the material and equally ſo in the texture, are made: but the variety is boundleſs.

FUSTIAN, in *Criticiſm*, a word uſed to expreſs bombaſt. See BOMBAST and FRIGID.

FUSTIC, OLD, as it is called in this country, (the *bois jaune* of the French,) is the wood of a large tree, the MORUS *tinctoria*, which grows abundantly in many parts of the Weſt Indies and the American continent. It is of a ſulphur colour, pregnant with colouring matter, which is much more durable than any of the other yellow dyes, ſo that when applied without a mordant, the dye is conſiderably durable, but ſtill more ſo when uſed with the ſame mordants, as weld or quercitron. The decoction of fuſtic in water, when ſtrong, has a deep and ſomewhat dull red yellow, and by dilution becomes orange-yellow. Acids produce in it only a ſlight precipitate, which alkalies rediſſolve, rendering the liquor red. Fuſtic, though valuable on account of the durability of its colour, is ſeldom uſed for the pure yellows, as the colour given by it is dull and muddy. It is chiefly uſed in compound colours, as in forming green with a Saxon-blue baſis; or in producing, with a mixed mordant of alum and iron-liquor, an infinite variety of drab and olive dyes, in which caſe the dullneſs of its colour is of no conſequence. It is chiefly uſed in general dyeing, and ſeldom in printing. It goes much farther than weld.

Young fuſtic, the *fuſtet* of the French dyers, *Rhus cotinus*, or Venice ſumach, is a ſhrub growing in Italy, and the ſouth of France, which gives a fine greeniſh yellow without any permanence, ſo that it is never uſed alone, but merely as an acceſſory colour to heighten cochineal and other dyes, and occaſion their approach to yellow.

FUSTICK WOOD. See MORUS *tinctoria*.

FUSTIGATION, in the *Roman Cuſtoms*, a puniſhment inflicted by beating with a cudgel. This puniſhment was peculiar to freemen; for the ſlaves were ſcourged or laſhed with whips.

FUSTIGATION, *Fuſtigatio*, is alſo a penance enjoined by the Roman inquiſition.

FUSTUARIUM, in *Antiquity*, a Roman puniſhment, the ſame with fuſtigation.

FUSTUC, in *Botany*, a name given by ſome of the old writers to the tree which produces the piſtachia-nuts. The word ſounds ſo like the name of a wood uſed in dyeing, and called at this time *fuſtick*, that it might be ſuppoſed to expreſs ſome tree of the ſame kind; but it is of a very different origin. The Jews and Arabians have called the piſtachia-tree fiſtic and fuſtack, and from thence ſome have written the name fuſtuck or fuſtuc, the Greeks have written it φιστακ, and the barbarous Latin writers *fiſticio*, which ſounds very like the name piſtachio.

FUTAK, in *Geography*, a town of Hungary, on the Danube, oppoſite to Peter-Wardin, ſituated in a plain, 16 miles S.S.E. of Bacs.

FUT-FA, in *Muſic*. See F and CLEF.

FUTTAGUNGE, in *Geography*, a town of Hindooſtan, in Oude; 15 miles S.E. of Fyzabad.

FUTTASING, a circar of Bengal, bounded on the N.E. and E. by Raujeſhy and Kiſhenagur, on the S. by Burdwen, and on the N.W. by Raujeſhy and Birboom; of a triangular form, and about 60 miles in circumference.

FUTTEHPOOR, a town, or rather village, of Hindooſtan, 23 miles from Agra. It is encloſed with a high ſtone wall, of great extent, built by the emperor Akber or Acbar. The ſpace within does not appear to have ever been nearly filled with buildings, and the part now inhabited is but an inconſiderable village. This ſpace is divided by a hilly ridge of conſiderable elevation, which runs nearly from S.W. by W. to N.E. by E., and extends beyond the incloſure, four or five miles on each ſide. Near the centre of the incloſure, on the moſt elevated part of the rock, is built the tomb of Shah Selim Chuſtee, by the efficacy of whoſe devotion, the empreſs of Akber, after remaining for ſeveral years barren, became pregnant, and bare a ſon, named Selim in honour of the ſaint. The approach to this mauſoleum is magnificent,

magnificent, and impreſſes the mind of a ſpectator with ſenſations of ſublimity. On the ſame ridge is an ancient palace of Akber. Mr. Hunter, in his return from Oujein to Agra, viſited this place, and has particularly deſcribed it. Aſiatic Reſearches, vol. vi. p. 75, 8vo.

FUTTIAPOUR, a town of Hindooſtan, in Bahar; 24 miles S.S.W. of Patna.

FUTTIGUR, a town of Hindooſtan, in Oude; 5 miles S. of Furruckabad.

FUTTIPOUR, a town of Hindooſtan, in Oude; 30 miles S.E. of Corah.—Alſo, a town in Bahar; 40 miles N.N.W. of Durbungah.—Alſo, a town of Bahar; 13 miles S.S.E. of Durbungah.—Alſo, a town of Bahar; 18 miles N.E. of Coprah. N. lat. 26 3'. E. long. 83° 8.—Alſo, a town of Allahabad; 27 miles N.W. of Currah. N. lat. 25° 58'. E. long. 81° 13.—Alſo, a town of Bengal; 12 miles N. of Nangora.—Alſo, a town of Bengal; 56 miles N.E. of Purneah.

FUTTOCKS, in a *Ship*, the timbers raiſed over the keel, or the compaſſing timbers which make her breadth.

Thoſe next to the keel are called ground-futtocks, and the reſt upper-futtocks.

Futtock *Shrouds*. See Shrouds.

FUTURE, ſomething to come hereafter.

We ſay a future ſtate, a future contingency; there is none but God to whom future things are preſent.

Future, or Future *Tenſe*, in *Grammar*, denotes an inflexion of verbs, whereby they denote, that a thing will be in ſome time yet to come. As, the laſt day will come; I ſhall ſee an end.

The future time admits of two caſes; either we may intend to expreſs a thing that ſhall come to paſs in a ſhort time; or a thing that ſhall happen in any indefinite time. Thus the Greeks have their *paulo poſt futurum*, μετ' ολιγον μελλων, which marks a thing juſt going to be done; as ποιησομαι; beſide the common indefinite future, ποιησω, *I will do it; ſcribam, I ſhall write.*

In Latin, Italian, French, and even in Engliſh, the future of the indicative expreſſes only the deſign or intention of doing a thing, or ſimply that the thing will be; as, I will praiſe, I will be approved: and the future of the ſubjunctive ſhews, that the thing will be done under certain circumſtances; when I ſhall have ſeen Verſailles, I will tell you. Sometimes the future is expreſſed in Engliſh by the preſent; if I meet your friend, I will ſend him to you; *ſi offendero, ſi incidero*, &c.

Mr. Harris, in his diſtribution of tenſes, reckons three definite future tenſes, beſides the common indefinite future, which he calls the aoriſt of the future, *viz.* the inceptive future, as *ſcripturus ero, I ſhall be beginning to write;* the middle or extended future, as *ſcribens ero, I ſhall be writing;* and the completive future, as *ſcripſero, I ſhall have done writing.* See Tense.

FUTWA, in *Geography*, a town of Hindooſtan, in Bahar, at the union of the Little Pompon with the Ganges; 7 miles S.E. of Patna. N. lat. 25 30'. E. long. 55 28'.

FUUR Land, an iſland of Denmark, in Lymfiord gulf; about 12 miles in circumference, of an irregular triangular form. It contains a town, called "Fuur," and two or three villages. N. lat. 56 50'. E. long. 9° 2'.

FUZE, Fuzee, or *Fuſee*, in the *Ordnance Department*, relates to the device in common uſe of ſupplying a bomb-ſhell, or grenade, with fire, ſo that, on arriving at its deſtination, the gunpowder contained within the cavity of the ſhell may be ignited, and cauſe that dreadful exploſion, which in the aggregate is uſually termed a "bombardment." To effect this purpoſe, a piece of tough wood is bored through for its whole length, and then exteriorly turned to ſuch a diameter as may cauſe it, when driven nearly up to the neck, to ſtop the fuſe-hole, made in every ſhell for the reception of the fuſe, perfectly tight. This requires that the form of the fuſe ſhould be rather conical, and that the thicker end ſhould be farther reinforced by ſuch a ſwell, as ſhould allow its interior to be hollowed out into the form of a cup; whereby a larger ſurface is expoſed to the blaze occaſioned by the diſcharge of the powder by which the ſhell receives its impulſe from the mortar, howitzer, in which it was placed.

It being neceſſary that fuzes ſhould not burn more than two or three ſeconds beyond that time for which their flight is calculated, great nicety is requiſite in the preparation of the materials uſed in their compoſition, which are generally according to the following proportions.

Nitre	3 lbs.	4 oz.	or	13 parts.
Sulphur	1 lb.		—	4 parts.
Mealed powder	2 lbs.	12 oz.	—	11 parts.

Theſe being ſeverally pulverized with the greateſt care, and ſifted into a receiver, wherein they are mixed as they fall in, are blended perfectly, ſo that every part of the maſs may be ſimilarly compoſed. A ſmall quantity is then poured into the woodeu tube, which is placed in a very ſtrong claſp-pillar made of braſs, and ſecured by ſliding rings, ſo as to prevent the wood from ſplitting when the man who has to "drive the compoſition," ſtrikes the metal rod with much force; thereby occaſioning the compoſition to occupy very little ſpace, and to become extremely hard. In this manner, little by little, the tube is filled. It requires, however, great experience and judgment to fill every part of the tube with equal compactneſs, and to make any number of fuzes all of equal hardneſs, in order that their duration may correſpond exactly according to their reſpective lengths. It is evident that ſuch compoſition as is looſely rammed will burn out rapidly, while ſuch as is rammed too hard, will burn ſo very ſlowly as to give time for the eſcape of thoſe near whom a ſhell may fall; or even for their knocking the fuze out altogether.

The following table will ſhew the ſeveral proportions of fuzes, and their appropriate ſizes to various claſſes of mortars, &c.; it will be ſeen that a well-made fuze ſhould burn at the rate of one quarter of an inch for every ſecond of time.

Nature of the mortar, &c.	Diameter of the fuze.			Compoſition.			Number of fuzes drove by one man in a day.
	Below the cup.	At the bottom.	At the cup.	Diameter.	Length.	Time it burns.	
Inches.	Inches.	Inches.	Inches	Inches.	Inches.	Seconds.	Number.
13	2.1	1.575	2.49	.5	8.4	35	25
10	1.8	1.35	2.13	.438	7.2	33	25
8	1.3	1.25	1.78	.375	6.37	29	30
5½	1.1	.825	1.3	.275	4.4	18	50
4⅕	1.0	.75	1.18	.25	3.5	15	700
Grenade	0 8	.6	.9	.2	2.25		1000

The diameter within the cup ſhould be equal to three diameters of the bore; the depth of the cup ſhould be 1½ diameter of the bore; and the thickneſs of wood at the bottom of the bore ſhould be equal to two diameters. Fuzes ſhould be painted over entirely to preſerve the compoſition;

and, when intended for field ſervice, ſhould be marked by narrow black lines, into ſeconds and half ſeconds, ſo as to be promptly cut to any duration of flight.

FUZEE, in the *Manege*, two dangerous ſplents, joining from above downwards: commonly a fuzee riſes to the knee and lames the horſe.

Fuzees differ from ſcrews or thorough ſplents in this, that the latter are placed on the two oppoſite ſides of the leg. See SPLENT.

FUZILEERS. See FUSILIERS.

FUZIR, in *Geography*, a town of Hungary; 12 miles S.S.E. of Caſchau.

FUZZEN, in *Rural Economy*, a provincial term ſometimes employed to ſignify the natural juice or nouriſhment of a ſubſtance, or the ſtrength of it. It is occaſionally written *fuzen*.

FYEL. See FAYAL.

FYEN. See FUNEN.

FYERS. See FOYERS.

FYGAREERA, a town of Hindooſtan, in the circar of Aurungabad; 10 miles S. of Jaſſierabad.

FYKI, a town of Japan, in the iſland of Niphon; 40 miles N.E. of Jedo.

FYNIAL, the finiſhing ornament of a pediment or canopy, or of a pinnacle, in the pointed order of *Architecture*. The term is now generally confined to the carved trefoil, or other ornament at the top of thoſe members; but in the will of Henry VI. in which he provides for the building of his chapel at Cambridge, it is taken for the whole crocketted pinnacle which was ſet upon each buttreſs.

FYOT, DE LA MARCHE, CLAUDE, in *Biography*, count de Bosjan, a French eccleſiaſtic, was born at Dijon in the year 1630. He was educated among the Jeſuits, and on occaſion of one of their public days, Fyot was honoured by having Lewis XIV. among the number of his auditors, who was ſo much pleaſed with the performance, that in the year 1662 he nominated him abbot of the collegiate church of St. Stephen, at Dijon. The monarch alſo created him his almoner, and prior of Notre Dame, at Portarlier, on the Saone. He roſe to ſtill higher honours in the church and ſtate, and, at length, in 1668, the king gave him the rank of honorary counſellor of the parliament of Dijon; and, in the following year, a brevet of counſellor of ſtate. He died at Dijon in 1721, at the great age of ninety-one. He eſtabliſhed and endowed a ſeminary for the education of young eccleſiaſtics, and was himſelf a munificent benefactor to it. He publiſhed, in 1696, "A Hiſtory of the Abbey of St. Stephen," which is held in high eſtimation on account of the profound and curious reſearches which it contains relating to the antiquities of the city of Dijon. Beſides this he was author of ſeveral pious and devotional treatiſes. Moreri.

FYTHA-EL-BOTHNA, in *Geography*, a town of Africa, in the country of Sahara; ſo called, as Dr. Shaw ſuppoſes, from the number of turpentine trees which grow there; 34 miles S.W. of Booſerjoone.

FYTT, JOHN, in *Biography*, an eminent painter of animals, fruit, and flowers, born at Antwerp in 1625. He was an artiſt of very uncommon powers; who, having paid the cloſeſt attention to the productions of nature, imitated them with great ſpirit, truth, and accuracy. His colour is very rich and agreeable, his touch firm and animated; he generally worked with a full body of colour, and great readineſs and freedom of hand is exhibited in his works, which render them eaſily cognizable.

His choice of ſubjects was among the brute and the vegetable creation, whoſe character he rendered with great fidelity; deſcribing ſometimes in his more laborious works the hairs and plumage of his beaſts and birds. He frequently painted pictures conjointly with Rubens and Jordaens, and completely unites with their extraordinary effects his own peculiar labours.

FYVIE, in *Geography*, a town of Scotland, in the county of Aberdeen, near the Ythan, in the road from Aberdeen to Bamff; 25 miles N. of Aberdeen.

FYZABAD, a town of Hindooſtan, and till of late the capital of Oude, ſeated on the river Gogra, a very large river from Thibet, and about eighty miles E. of Lucknow, and 360 from Calcutta. It is a very large city, and though for many years the capital of the nabobs of Oude, inconveniently ſituated, even before the Rohilla conqueſt. Nearly adjoining to it is the very ancient city of Oude or Ajudiah. This place was founded by Sadatkhan, a Perſian, who was 40 years governor of the province. He firſt built a palace, to which he annexed extenſive gardens, and made this the place of his reſidence; he then added many houſes, till it became a large city, and the capital of the province; it was defended with a fortreſs, a ditch, tower, ramparts, &c. N. lat. 26° 45'. E. long. 82° 24'.

G.

G, The ſeventh letter of our alphabet, and the fifth conſonant; though in the alphabets of all the oriental languages, the Hebrew, Phœnician, Chaldee, Syriac, Samaritan, Arabic, and even Greek, G is the third letter.

The Hebrews call it *ghimel*, or *gimel*, q. d. *camel*; becauſe it reſembles in its form the neck of that animal; and the ſame appellation it bears in the Samaritan, Phœnician, and Chaldee: in the Syriac it is called *gomel*, in Arabic *gim*, and in Greek *gamma*.

The letter G is of the mute kind, and cannot be any way ſounded without the help of a vowel. It is formed by the reflection of the air againſt the palate, made by the tongue, as the air paſſes out of the throat; which Martianus Capella expreſſes thus, G ſpiritus cum palato; ſo that the G is a palatal letter.

G in Engliſh has two ſounds, one from the Greek Γ, and the Latin, which is called that of the hard G, becauſe it is formed by a preſſure, ſomewhat hard, of the fore-part of the tongue againſt the upper gum; which ſound it retains before *a*, *o*, *u*, *l*, *r*; as *gate*, *go*, *gull*. At the end of a word it is always hard, as *ring*, *ſing*, &c. The other ſound, called that of the ſoft G, reſembles that of *j*, and is commonly, though not always, found before *e* and *i*, as in *gem* and *gibbet*. To this rule, however, there are many exceptions; G is often hard before *i*, as *give*, &c. and ſometimes before *e*, as *get*, &c. It is alſo hard in derivatives from words ending in *g*, as *ſinging*, *ſtronger*, &c. and generally before *er*, at the end of words, as *finger*. G is mute before *n*, as *gnaſh*, *ſign*. *Gh* has the ſound of the hard G in the beginning of a word, as *ghoſtly*; in the middle, and ſometimes at the end, it is quite ſilent, as *right*, *though*. At the end of a word *Gh* has often the ſound of *f*, as *laugh*. Johnſon.

The Latins took the liberty to drop the letter G at the beginning of words, before an *n*; as in *gnatus*, *gnoſco*, *gnobilis*, *gnarrat*, &c. which they ordinarily wrote *natus*, *noſco*, *nobilis*, &c. They alſo frequently changed it into *c*; as *gamelus*, into *camelus*; *gragulus*, *graculus*; *quingentum*, *quincentum*, &c. Sometimes it was put inſtead of *n*, before a *c*, and for another *c*; as *Agchiſes*, *aggora*, *agguilla*, &c. for *Anchiſes*, *ancora*, *anguilla*, &c. And inſtead of *p*; as *magalia*, for *mapalia*, &c. G is alſo uſed inſtead of *q*, and *q* inſtead of G, as in *anquina*, *angina*, *anguina*, &c. inſtead of *r*, as in *aquagium*, for *aquarium*; *agger*, for *arger*, &c. And inſtead of *s*, as in *ſpargo*, *ſparſi*, *ſparſum*; or rather it is retrenched from thoſe laſt words to avoid the cacophony of *ſpargſi*, or *ſparcſi*. G is alſo put for *c*; as in *Cneius*, for *Gneius*; *Caius*, for *Gaius*; *Gaeta*, for *Caieta*; and for *v*; as in *figere*, for *fivere*. See N, P, &c.

The northern people frequently change the G into *v*, or *w*; as in *Gallus*, *Wallus*; *Gallia*, *Wallia*, *Vallia*, &c. For in this inſtance it muſt not be ſaid that the French have changed the *w* into G; becauſe they wrote *Gallus* long before *Wallus*, or *Wallia*, were known; as appears from all the ancient Roman and Greek writers.

And yet it is equally true, that the French change the *w* of the northern nations, and *v* conſonant, into G; as *Williel-mus*, *William*, into *Guillaume*; *Wulphilas*, into *Gulphilas*; *Vaſco*, into *Gaſcon*, &c.

Diomed, lib. ii. cap. de Litera, calls G a new letter; his reaſon is, that the Romans had not introduced it before the firſt Punic war; as appears from the roſtral column, erected by C. Duilius, on which we every where find a *c* in lieu of G. It was Sp. Carvilius who firſt diſtinguiſhed between thoſe two letters, and invented the figure of the G; as we are aſſured by Terentius Scaurus. The *c* ſerved very well for G; it being the third letter of the Latin alphabet, as the G or γ was of the Greek.

The G is found inſtead of *c* on ſeveral medals: Vaillant, Num. Imperat. tom. i. p. 39. M. Beger produces a medal of the Familia Ogulnia, where GAR is read inſtead of CAR, which is on thoſe of M. Patin. But the *c* is more frequently ſeen on medals in lieu of G; as AUCUSTALIS, CALLAECIA, CARTACINENSIS, &c. for AUGUSTALIS, &c. Not that the pronunciation of thoſe words was altered, but only that the G was unartfully or negligently cut by the workmen; as is the caſe in divers inſcriptions of the Eaſtern empire; where AUC, AUCC, AUCCC, are frequently found for AUG, &c.

The form of our G is taken from that of the Latins, who borrowed it from the Greeks; the Latin G being certainly a corruption of the Greek gamma, Γ, as might eaſily be ſhewn, had our printers all the characters and forms of this letter which we meet with in the Greek and Latin MSS. through which the letter paſſed from Γ to G.

As to the gamma of the Greeks, it is manifeſtly the ג of the Hebrews or Samaritans. All the difference between the gamma and ghimel conſiſts in this, that the one is turned to the right, and the other to the left, according to the different manners of writing and reading, which obtained among thoſe different nations; ſo that all the pains Salmaſius has taken on Solinus, to prove that the G was derived from the Greek kappa, is loſt.

G, as a Roman abbreviature, has various ſignifications. It denotes *gratis*, *gens*, *gaudium*, &c. G. V. ſignifies *genio urbis*, and G. P. R. *gloria populi Romani*.

G has alſo been uſed as a numeral letter, ſignifying 400, according to the verſe,

"G quadringentos demonſtrativa tenebit."

When a daſh was added at the top, $\overline{G}$, it ſignified forty thouſand.

G, in *Chronology*, is the ſeventh dominical letter.

G, on the French *Coins*, denotes the city of Poitiers.

G, in *Muſic*, is the loweſt ſound of the ſcale of Guido, in which it is called *Gammut*; which ſee. The octave above

gammut, in the ſame ſcale, is called *ut*, or G *ſol-re-ut*. It is called *ut*, or *do*, as the firſt note of the *durum hexachord*. (See HEXACHORD.) It is called *ſol*, as 5th of the natural hexachord of C; and *re*, as the 2d of the molle hexachord of F. G gives a name to the clef in which almoſt all treble parts are written for inſtruments; as the violin, flute, clarinet, and hautbois: it is called by the Italians *chiave di violino*, and is placed on the ſecond line thus:

During the 17th century, and part of the laſt, the French placed this clef on the firſt line, and uſed no other treble clef; whence it was called the French clef. Geminiani, in his firſt book of ſolos, has uſed it, to ſave leger lines, in very high paſſages.

The key of G, with a minor or flat third, is called by the Italians G molle.

GA-BOAT, in *Engineery*, is the name of a ſort of veſſels which navigate the Clyde river.

GAANA, in *Ancient Geography*, a town of Aſia, in Coeleſyria. Ptolemy.

GAARDE, in *Geography*, a town of Norway, in the dioceſe of Aggerhuus; 56 miles N.W. of Chriſtiania.

GABA, in *Ancient Geography*, a town of Paleſtine, in the tribe of Benjamin. Joſh. xviii. 24.—Alſo, a town of Judea, in the tribe of Zabulon; ſituated, according to Joſephus, at the foot of mount Carmel, between Ptolemais and Cæſarea.

GABADANIA, a country of Aſia, in Cappadocia, ſituated at the foot of mount Taurus, and adapted merely to paſture.

GABAE, a country of Aſia, ſituated between the Maſſagetæ and Sogdiana. Arrian.

GABALA, a town of Phœnicia, ſituated 18 miles from Laodicea, on the ſea-coaſt, at the foot of mount Caſius.—Alſo, an epiſcopal town of Aſia, in Lydia.

GABALA, in *Geography*, a town of Arabia Felix; 64 miles N.N.E. of Aden.

GABALÆCA, in *Ancient Geography*, a town of Hiſpania Tarragonenſis, at ſome diſtance from the ſea, in the country of the Varduli. Ptolemy.

GABALE, a Mediterranean town of Media. Ptol.

GABALE, in *Mythology*, a deity worſhipped at Heliopolis, under the figure of a lion, with a radiant head; and it is thus repreſented on many medals of Caracallus.

GABALI, or GABALLI, in *Ancient Geography*, a people of Gaul, who belonged to Aquitania Prima.

GABARA, one of the three principal towns of Galilee; the other two were Sephoris and Tiberias.

GABARDINE, from the Italian *gavardina*, has been ſometimes uſed to denote a coarſe frock, or mean dreſs. In this ſenſe it is uſed by Shakſpeare in his Tempeſt and Merchant of Venice, and by Butler in his Hudibras, book i.

GABARON, in *Geography*, a bay on the S.W. of Louiſburg, on the iſland of cape Breton.

GABARRET, a town of France, in the department of the Landes, and chief place of a canton, in the diſtrict of Mont-de-Marſan, ſeated on the Geliſe; 24 miles E. of Mont-de-Marſan. The place contains 605, and the canton 7882 inhabitants, on a territory of 480 kiliometres, in 19 communes.

GABASALKI, a town of Ruſſia, in the government of Viborg, or Wiburgh; 36 miles N. of Serdopol.

GABBARA, a name which the Egyptians gave the dead bodies which they kept by them, inſtead of burying them.

That people, out of a cuſtom which they had received from their anceſtors, and which aroſe, in ſome meaſure, from the poſition of their country, which is expoſed to the inundations of the Nile, uſed to wrap up the bodies of perſons of eminence, particularly thoſe of ſaints and martyrs, in a great number of linen cloths, with balms and ſpices; and inſtead of interring them, they preſerved them in their houſes: thinking that thereby they did them much more honour. (See EMBALMING, and MUMMY.) And theſe, St. Auguſtine tells us, were what they called gabbaras. Sermon cxx. de diverſis, cap. 12.

Pliny makes mention of the ſame thing, lib. vii. cap. 16. where he relates, that in the time of Claudius, a gabbara was brought from Arabia, almoſt ten feet long.

The word is Arabic, Syriac, and Hebrew, formed of גבר, *gaber*, *a man*, and denotes an embalmed body.

GABBIANI, ANTONIO DOMINICO, in *Biography*, a painter of hiſtory and portraits, born at Florence in 1652. He began his career under the tuition of Soutermans, and Vincenzio Dandini, and acquired all the freedom of execution and deſign, together with the weakneſs and defects of ſtyle which thoſe maſters exhibited in their works. He was highly patronized and encouraged by the grand duke Coſmo III., who ſent him to Rome, to ſtudy in the Florentine academy there, under the direction of Ciro Ferri. He excelled moſt in ſubjects of a light and agreeable nature; yet he had a large ſhare of more ſerious employment, and painted many altar-pieces. They are not in a ſtyle ſuited to their importance, when compared to the fine works of a better period. His moſt famed work is the cupola of Coſtello, which was never completed, as he fell from a ſcaffold, and was killed during the time he was working upon it in 1726.

GABBRONITE, in *Mineralogy*, a new mineral ſubſtance, firſt diſcovered in Norway, and deſcribed by profeſſor Schumacher of Copenhagen, who applied the above name to it, derived from its reſemblance in point of colour and fracture to ſome varieties of the ſerpentine rocks, called *gabbro* by the Italians.

Its colour is blueiſh or greeniſh-grey, rather tending to leek-green, and alſo greyiſh mountain green. It has been found maſſive and diſſeminated. Luſtre faintly glimmering, or dull; not greaſy to the touch. Fracture cloſe, even, or flat conchoidal, ſometimes ſplintery, in the manner of hornſtone. Fragments indeterminately angular, with pretty ſharp and ſtrongly tranſlucent edges.

It gives no ſparks with ſteel, and though it ſcratches glaſs, is likewiſe ſcratched by this latter, and by the knife. It is not eaſily frangible: when triturated it yields a white powder. Specific gravity 2.947.

Before the blow-pipe it immediately loſes its colour and becomes white: and farther urged by the heat of the flame, it fuſes without ebullition into a white opaque or faintly tranſlucent pearl. With borax it yields a clear but rather veſicular pearl.

The blueiſh-grey variety, which is found in the Kenlig mine at Arendal in Norway, is accompanied by black, maſſive, fine-grained, common hornblende, and reddiſh-grey ſcaly lime-ſtone. That of greyiſh mountain green colour occurs at Friedrickſvärn in Norway, diſſeminated in a rock compoſed of common hornblende, common and labrador feldſpath. It is alſo accompanied by ſpecular iron and talc.

This ſubſtance, not being analyſed, its nature is not yet exactly known. Some mineralogiſts ſuſpect it to be nearly allied to that kind of meagre nephrite, called *feldſpath tenace* by Haüy.

GABBULA, in *Ancient Geography*, a town of Aſia,

in Syria, ſituated N.E. of a Salt-lake, E. of Chalcis, and S.E. of Chalybon.

GABE, a town of Syria, called by Joſephus Gaba, and by Pliny Gabba. The latter of whom intimates that it was one of the tetrarchies, which adjoined to the towns of the Decapolis.—Alſo, a ſmall town of Paleſtine, 16 miles from Cæſarea; probably the ſame with the preceding.

GABEL, or GABELLE, in the *French Cuſtoms*, a duty or impoſition on ſalt.

Etymologiſts are divided as to the origin of the word. Some derive it from the Hebrew *gab*, a *preſent*; others from קבל, *to deliver*; others from קבלה, *kabbalah*, *receipt*; others from *ghauel*, or *gabe*, *unjuſt law*; and others from the corrupt Latin *gabella*, or *gablum*, *tribute*.

The gabel is let out to farm; and formed, before the revolution in France, the ſecond article in the king's revenue.

There were three farms of gabels: the firſt comprehended the greateſt part of the kingdom; the ſecond was that of the Lyonnois and Languedoc; and the third that of Dauphiné and Provence. There were ſeveral provinces exempt from the gabel, having purchaſed that privilege of Henry II.

This duty is ſaid to have had its riſe in France, in 1286, under Philip the Fair. Philip the Long took a double per livre on ſalt, by an edict in 1318, which he promiſed to remit when he was delivered from his enemies; which was renewed by Philip de Valois in 1345; and the duty was raiſed to four deniers per livre; king John reſumed it in 1355, and it was granted to the Dauphin in 1358, to ranſom king John. It was continued by Charles V. in 1366; after his deceaſe it was ſuppreſſed, but revived again by Charles VI. in 1381. Louis XI. raiſed it to twelve deniers per livre; and Francis I. in 1542, to twenty-four livres per muid; and it has been conſiderably augmented ſince that time; ſo that a minot of ſalt paid a duty of 52 livres, 8 ſols, and 6 den. Philip de Valois firſt eſtabliſhed granaries and officers to the gabelles, and prohibited any other perſons from ſelling ſalt; from which time the whole commerce of ſalt, for the inland conſumption, lay wholly in the king's hands, who ſold and diſtributed every grain thereof by his farmers, and officers created for the purpoſe.

The produce of this impoſt was ſo conſiderable, that it was computed to make one fourth of the whole revenue of the kingdom.

GABEL, or *Gable*, is alſo uſed, in ſome of our *Ancient Writers*, for any ſort of tax, or impoſition: as gabel of wines, of ſilks, &c.

GABEL, or *Gablona*, in *Geography*, a town of Bohemia, in the circle of Boleſlaw; 45 miles N. of Prague. N. lat. 50° 44′. E. long. 14° 54′.

GABELLUS, in *Ancient Geography*, *La Secchia*, a river which commenced on the confines of Apuani, in Liguria, and diſcharged itſelf into the Padus.

GABENA, a town of Aſia, in Media. Ptol.

GABERSTORF, in *Geography*, a town of Stiria; 10 miles W.S.W. of Gnaa.

GABIANA, in *Ancient Geography*, a province of Aſia, near Suſiana, which belonged to the Elymæans, according to Strabo.

GABIÆI, a town of Italy, in Latium; nearly E. of Rome.

GABIN, in *Geography*, a town of the duchy of Warſaw; 40 miles W. of Warſaw.

GABINDA, or KAPINDA, a town of Africa, in the kingdom of Loango.

GABINIA TOGA. See TOGA.

GABINIAN LAW, in *Roman Antiquity*, a law, ſo called from Gabinius, tribune of the people, who, at the inſtigation of Pompey, propoſed it for clearing the ſeas of the pirates, whoſe number and power were daily increaſing. Theſe robbers fitted out at firſt but a ſmall number of light veſſels; but upon their being protected by Mithridates, who, during his war with Rome, took them into his ſervice, they equipped 1000 gallies, and exerciſed a kind of ſovereignty over all the coaſts of the Mediterranean. They ſpared not one temple that was famous for its riches on the coaſts of Italy, Greece, and Aſia. All the country-ſeats on the ſea-ſhore fell a prey to them. They took ſlaves without number; blocked up all the ports of the republic, pillaged the city of Caieta; ſunk part of a conſular fleet at Oſtia; and having made a deſcent near Miſene, carried away the daughter of the old conſul Antonius, with ſeveral other perſons of diſtinction. They committed a variety of other depredations; and therefore Gabinius, who propoſed the above-mentioned law, was applauded for his zeal; though he had nothing in view but to procure new honours for Pompey, who had reſtored the college of tribunes to their former authority. In virtue of this law the perſon to whom the Roman people and ſenate ſhould commit the management of this war was to have a power without reſtriction, his authority was to extend over the ſeas within the ſtraits, or the pillars of Hercules, and over the countries for the ſpace of 400 furlongs from the ſea. He was alſo impowered by this law to raiſe as many mariners and ſoldiers as he ſhould think fit, to take any ſums at pleaſure out of the treaſury, and to chooſe out of the ſenate fifteen ſenators to be his lieutenants. This arbitrary and unbounded authority was to continue three years, and of courſe it occaſioned much uneaſineſs to the ſenate, who ſaw through the tribune's deſign, and ſeveral ſenators reproached Pompey with aiming at the ſovereignty of Rome. After much oppoſition, Gabinius's motion was agreed to by a great majority, and Pompey was appointed to make war upon the pirates with the title of proconſul, B. C. 66. A. U. C. 682. Pompey, in virtue of this law, was furniſhed with 500 ſhips, 120,000 foot, and 5000 horſe; and he conducted the expedition with ſo much prudence and vigour, that he cleared the ſea in four months, after having taken or ſunk 1300 according to ſome, or according to others, 846 of their veſſels, deſtroyed 10,000 of the pirates, and reduced 120 towns or caſtles on the coaſts, which they had ſeized. In this expedition the proconſul ſet at liberty an incredible number of captives, and took above 20,000 priſoners, whom he ſent to people the deſerted cities of Cilicia, *viz.* Mallus, Adena, Epiphania, and Soli, which latter he called from his own name Pompeiopolis.

GABINIUS, AULUS, in *Biography*, an ancient Roman commander, who began his public career under the dictator Sylla about the year B. C. 82. He arrived at the high honour of the conſulate in 58, and in the following year obtained the government of the rich province of Syria. Here he carried on his oppreſſions with a heavy hand; made war againſt Alexander in Judea, whom he quickly reduced to ſue for peace; re-eſtabliſhed Hyrcan in the dignity of pontiff, and ſet the government of that country upon a new ſyſtem. He then undertook, for a large ſum, to replace Mithridates on the throne of Parthia, whoſe intereſts he readily abandoned when a ſtill larger bribe was offered him by Ptolemy Auletes, king of Egypt, to aſſiſt in re-eſtabliſhing him on his throne, which had been uſurped by his ſon-in-law Archelaus. Gabinius, for the ſtipulated ſum of ten thouſand talents, half of which was paid when the agreement was made, proceeded with his army into Egypt, though it was contrary to an expreſs law for a governor to march out

of his province, or engage in a new war without the consent of the senate. He secured the passes by the horse under Marc Antony, and following immediately into the heart of the country, gave Archelaus a total defeat, and took him prisoner, but for another bribe he suffered him to escape. The ambition of Archelaus induced him again to take up arms, till at length he was slain, and Ptolemy was quietly seated on his throne. Gabinius was accused at Rome of high crimes and misdemeanors, and Cicero was employed to conduct the prosecution. Such was the indignation excited against him, that he would have been condemned in his absence, had he not been supported by the consuls Pompey and Crassus. In the year 54 he was impeached of high treason, and acquitted by a small majority: he was next tried upon two actions for corruption and extortion, and though now defended by Cicero, he was sentenced to perpetual banishment. He was obliged to expend his ill-gotten wealth in bribes to his judges, and lived abroad in poverty and obscurity, till the breaking out of the civil war between Cæsar and Pompey. Under the former he acted in the capacity of lieutenant, and marching through Illyricum, he was defeated with great loss by the people of the province, and compelled to take refuge in Salona. He did not long survive this disaster. Rom. Hist.

GABIONS, in *Fortification*, &c. are large cylindric baskets, open at both ends, made of ozier twigs, about three feet high, and as much in diameter; having nine or ten stakes, about an inch and a half in diameter, which exceed the basket-work above five or six inches, and are pointed. These serve in sieges to carry on the approaches under cover, when they come pretty near the fortification.

They are commonly used in batteries to screen the engineers, &c. in order to which one is placed on either side each gun, only leaving room for the muzzle to appear through.

There is also a smaller sort of gabions, about one foot high, twelve inches in diameter at the top, and from eight to ten at bottom, used on parapets, in trenches, &c. to cover the musketeers; being placed so close as that a musket can but just peep through.

They also serve as a parapet on lines, lodgments, &c. where the ground proves too hard to dig into.

GABIONS, *Stuffed*, are five or six feet long, and as much in diameter, filled with branches and small wood, and serving to roll before the workmen in trenches, and to cover them in front against musket-shot. See MANTLET.

To render the gabions useless, they endeavour to set them on fire, by throwing pitched faggots among them.

GABISE, in *Geography*, a town of Asiatic Turkey, in Natolia; 28 miles S.E. of Constantinople.

GABLE, in *Architecture*, is a vertical triangular plane wall, generally surmounting the flank walls, and terminating an end of the roof, which either covers the gable, or the coping of the gable runs parallel to the plane of the roof, and covers the ends of the slating or covering. The difference between a gable and pediment is this; a gable has no cornice, but a pediment is surrounded with cornices, one of which is horizontal, and the other two equally inclined to it. See PEDIMENT.

GABLE *Land* See LAND-*gable*.

GABLE *End Foreland*, in *Geography*, a cape on the E. coast of the northern island of New Zealand, in the South Pacific ocean. S. lat. 38° 15'.

GABLENZ, a town of Saxony, in the circle of Erzgeburg; 6 miles N.N.W. of Zwickau.

GABLOCK, in *Mining*, is a large iron crow or bar, used for raising large stones in a mine or quarry.

GABLOCKS, the artificial spurs of a game-cock.

GABON, in *Geography*, a river of Africa, which runs into the Atlantic, near Cape St. Clara, and gives name to a country through which it passes.

GABOONG, a small island in the East Indian sea, near the S.W. coast of the island of Palawan. N. lat. 8° 9'. E. long. 117° 20'.

GABORI, a bay on the S.E. coast of Cape Breton island; its entrance is not more than 20 leagues from the isles of St. Pierre, and lies between islands and rocks, about a league in breadth. The bay, which is two leagues deep, affords good anchorage.

GABOU, or JABOU, a country of Africa, between Benia and Dahomy, about 150 miles from the coast; the chief trade consists in slaves.

GABRANTUICI, *Bay of*, in *Ancient Geography*, is Burlington bay, on the coast of Yorkshire. Ptolemy.

GABRES, or GAVRES, a religious sect in Persia and India; called also *Gebres*, *Geures*, &c. See MAGI.

The Turks call the Christians Gabres, q. d. infidels, or people of a false religion; or rather, as Leunclavius observes, Heathens, or Gentiles: the word Gabre, among the Turks, having the same signification as Pagan, or Infidel, among the Christians; and denoting any thing not Mahometan.

In Persia the word has a more peculiar signification; wherein it is applied to a sect dispersed through the country, and said to be the remains of the ancient Persians, or followers of Zoroaster, being worshippers of fire. See FIRE, *everlasting*.

They entertain the most profound veneration for this ancient philosopher, whom they consider as the great prophet sent by God to communicate his law, and to instruct them in his will.

They have a suburb at Ispahan, which is called Gaurabad, or the town of the Gaurs, where they are employed in the meanest and vilest drudgery: some of them are dispersed through other parts of Persia; but they principally abound in Kerman, the most barren province in the whole country, where the Mahometans allow them liberty, and the exercise of their religion. Several of them fled many ages ago into India, and settled about Surat, where their posterity remain to this day. There is also a colony of them at Bombay. They are a poor, ignorant, inoffensive people, extremely superstitious, and zealous for their rites, rigorous in their morals, and honest in their dealings. They profess to believe a resurrection and a future judgment, and to worship only one God. And though they perform their worship before fire, and direct their devotion towards the rising sun, for which they have an extraordinary veneration, yet they strenuously maintain that they worship neither, but that these are the most expressive symbols of the Deity; and for this reason they turn towards them in their devotional services. See Thevenot's and Tavernier's Voyages, and Hyde's Rel. Vet. Pers. cap. xxiv.

However, some have supposed that these are Persians converted to Christianity, who, being afterwards left to themselves, mingled their ancient superstitions with the truths and practices of Christianity, and so formed for themselves a religion apart: and they allege that, throughout the whole of their system of doctrine and practice, we may discern the marks and traces of Christianity, though grievously defaced; the annunciation, the magi, the massacre of the infants, our Saviour's miracles, his persecutions, ascension, &c.

GABRI, in *Ancient Geography*, a people of Sarmatia, near the Palus-Mæotides. Pliny.

GABRIEL,

G A B

GABRIEL, St. in *Geography*, an iſland in the great river La Plata, S. America, diſcovered by Sebaſtian Cabot in the year 1526.

Gabriel, *St.* a Spaniſh miſſion and ſettlement in New Albion, firſt formed in 1773; 12 miles N. E. of Point Laſuen—Alſo, a town of Mexico, in New Biſcay; 170 miles S. S. W. of Parral.

GABRIELI, Andrea, in *Biography*, an eminent performer on the organ, maeſtro di cappella of St. Mark's cathedral at Venice in the 16th century, and a voluminous compoſer. In 1589, he publiſhed "Ricercari a quattro," the precurſors of *Fantaſie*, which ſee. Padre Martini, in the firſt vol. of his "Storia della Muſica," gives the following liſt of his vocal compoſitions; Miſſar. 6. voc. lib. i. Ven. 1570. Trelibridi Madrig. a 3. 6. voci. Ven. 1580, 1582, 1583. Mottecta 5. voc. lib. i. Venet. 1584. Pſalmi Penitent. 6. voci. Venet, 1583. Canzoni alla Franzeſe per l'Organo, Ven. 1605.

GABRIELITES, in *Eccleſiaſtical Hiſtory*, a ſect of anabaptiſts that appeared in Pomerania in 1530. They derive their name from Gabriel Scherling, who, after having been for ſome time tolerated in that country, was obliged to remove, and died in Poland.

GABRIELLI, Giovanni, in *Biography*, engaged in the ſervice of the republic of Venice, publiſhed, in 1587, Concerti Muſic di Chieſa, e Madrigali a 6, 7, 8, 10. 12. 16. voci. lib. i and ii. Intonationi d'Organo, lib. i. Ven. 1593.

Gabrielli, Catterina. Nothing having happened ſince the 4th vol. of the Gen. Hiſt. of Muſ. was publiſhed to change our opinion of the talents of this female ſinger, we ſhall extract the article from that work.

The moſt memorable muſical event of the ſeaſon of 1775 and 1776, was the arrival in London of the celebrated Catterina Gabrielli, called early in life La Cuochetinæ, being the daughter of a cardinal's cook at Rome. She had, however, no indications of low birth in her countenance or deportment, which had all the grace and dignity of a Roman matron. The firſt time her name appears in the "Indice de' Spettaccoli Teatrali," ten years before ſhe came to England, when ſhe ſung at Turin; to her name is added, *braviſſima*, and her reputation was ſo great before her arrival for ſinging and caprice, that the public, expecting perhaps too much of both, was unwilling to allow her due praiſe in her performance, and too liberal in aſcribing every thing ſhe ſaid and did to pride and inſolence. It having been reported that ſhe often feigned ſickneſs, and ſung ill when ſhe was able to ſing well, few were willing to allow ſhe could be ſick, or that ſhe ever ſung her beſt while ſhe was here; and thoſe who were inclined to believe, that ſometimes ſhe might perhaps have exerted herſelf, in pure caprice, thought her voice on the decline, or that fame, as uſual, had deviated from truth in ſpeaking of her talents. Her voice, though of an exquiſite quality, was not very powerful; and her chief excellence having been the rapidity and neatneſs of her execution, the ſurprize of the public muſt have been diminiſhed on hearing her after Miſs Davies, who ſung in the ſame ſtyle many of her ſongs, with a neatneſs ſo nearly equal, that common hearers could diſtinguiſh no difference. There were, however, a few fair and diſcriminating critics, who diſcovered a ſuperior ſweetneſs in the natural tone of the Gabrielli's voice; an elegance in the finiſhing her muſical periods or paſſages; and an accent and preciſion in her diviſions, not only ſuperior to Miſs Davies, but to every ſinger of her time. As an actreſs, though of low ſtature, there were ſuch grace and dignity in her geſtures and deportment, as caught every unprejudiced eye; indeed, ſhe filled the ſtage and occupied the attention of the ſpectators ſo much, that they could look at nothing elſe while ſhe was in view. Her freaks and *ſpi gleries*, which had fixed her character, ſeem to have been very much ſubdued before her arrival in England. In converſation ſhe ſeemed the moſt intelligent and beſt bred virtuoſa with whom we had ever converſed; not only on the ſubject of muſic, but on every ſubject concerning which a well educated female, who had ſeen the world, might reaſonably be expected to have obtained information. She had been three years in Ruſſia previous to her arrival in England, during which time no peculiarities of individual characters, national manners, or court etiquette, had eſcaped her obſervation. In youth, her beauty and caprice had occaſioned a univerſal delirium among her young countrymen, and there were ſtill remains of both ſufficiently powerful, while ſhe was in England, to render credible their former influence. With reſpect to the rapidity of her execution, it was never ſo exceſſive as to ceaſe to be agreeable; in ſlow movements her pathetic powers, like thoſe in general of performers the moſt renowned for agility, were not ſufficiently touching or effectual to occaſion diſputes concerning her *genre*. Soon after ſhe quitted England, ſhe retired to Bologna, where, if ſtill living, we hope ſhe reſides in private tranquillity, after all the ſtorms which her beauty and talents had occaſioned, while ſhe remained in the ſervice of the public.

GABRIEL-SIONITA, a learned Maronite who flouriſhed in the ſeventeenth century, was profeſſor of the Syriac and Arabic languages at Rome. From this city he went to Paris, to take a part in editing the Polyglot bible, publiſhed by M. Le Jay, and carried with him ſome Syriac and Arabic verſions tranſcribed by himſelf from MSS. The Latin tranſlations which accompany theſe verſions, excepting thoſe of the book of Ruth, were furniſhed by Sionita. After this he was appointed profeſſor royal of the Syriac and Arabic languages at Paris, and was highly eſteemed and much employed as a tutor in them. He died in the year 1648. Walton, in the Engliſh Polyglot, has copied the verſions introduced into Le Jay's by Sionita. This learned man publiſhed tranſlations of other Arabic works, and among theſe was an Arabic geography, entitled "Geographia Nubienſis." Moreri.

GABRINI, Nicholas, better known under the name of Rienzi, an extraordinary political character, was born in the fourteenth century at Rome. His father was a tavern keeper of the lower order, and named Lorenzo, which being contracted to Rienzo, the ſon was called Nicolo or Cola di Rienzo. He received an excellent education, the advantages of which he knew well how to eſtimate. He was never ſatiated with reading the beſt Roman authors, nor with ſearching into the reliques of antiquity diſperſed through his native city. He ſoon became celebrated, and the common people, who do not readily give all the credit due to a literary character, were accuſtomed to regard him as an extraordinary perſon, and to look up to him as one deſtined to redreſs thoſe wrongs of which they were deeply ſenſible; and the higher orders of the citizens viewed him with reſpect, on account of his acknowledged learning and talents. His firſt poſt was that of a public ſcribe or notary, and, in 1346, we find him joined in a deputation from the Romans to the new-elected pope Clement VI. at Avignon, for the purpoſe of exhorting him to bring back the papal court to its original ſeat. He ſpoke on this occaſion with ſo much force and real eloquence, and painted in ſuch ſtrong colours the inſolences and oppreſſions of the nobles, that high ideas were excited of his character; the pope created him an apoſtolic notary,

notary, but gave no explicit reply to the deputies. Upon his return he entered upon the exercise of his office, which he discharged with diligence and great probity, but at the same time he was attentive to foment the discontents of the people by harangues against the nobility, and against the abuses in the public administration. When men's minds were prepared for a change, he summoned his friends, and having made an energetic speech, describing the wretchedness and degradation into which the Christian capital was fallen, and from which nothing but the efforts of its own citizens could raise it, he caused them to subscribe an oath for the establishment of the "Good Estate." He had the address to gain over the pope's vicar; and at a second meeting in the capitol, he produced fifteen articles as the basis of the "Good Estate," which were unanimously approved, and the people conferred upon him the title of tribune, with the power of life and death, and all the other attributes of sovereignty. The governor of the city, Colonna, who had been absent some time, returned, and at first threatened him with punishment, but quickly found that the power of the state was taken out of his hands, and that he himself must seek for security by flight. Rienzi banished him with the principal noble families of Rome, and some, who had been convicted of great oppression, were put to death. In the first exercise of his authority he seems to have had no other view than the promotion of the public good; he chose honest and honourable men at the head of the administration, and he purged Rome of those enormities that had long prevailed in it. His power was sanctioned by the pope, and his reputation was soon extended through the whole of Italy; the messengers whom he sent to propose to the different states a general league, were every where received with high respect, though unarmed, and only distinguished by a silver wand, and honourable embassies were sent to him in return. The king of Hungary and the emperor solicited his friendship, and it was imagined, by his more eager partizans, that he was to be an instrument in the hands of providence, for restoring the ancient grandeur of Rome and Italy. Among the most eager of his friends was the celebrated Petrarch, who had contracted an admiration for his character, when joined with him as one of the deputies to the pope; by the poet he was exhorted to proceed in his glorious undertaking, but his success was more than he could bear. He assumed a variety of titles, issued a letter declaring Rome the head of the world, and he even ventured to cite the two rival emperors, Charles and Lewis, and the electors, to appear before him, and justify their several pretensions. He dismissed the pope's legate, reduced the nobles to a state of humiliation, and established a reign of terror. He now found, that those who had been most friendly to his cause, while he acted with prudence and moderation, were the first to desert his standard, when that standard was attempted to be reared on the rights of the people. Finding that he had lost the affection and confidence of the people, he withdrew from Rome, and, in the beginning of the year 1348, took refuge in the kingdom of Naples, and was obliged to live concealed in a hermit's cell till the commencement of 1350. He now took advantage of the jubilee to return secretly to Rome, where being discovered, he withdrew to the king of the Romans at Prague. After this he fell into the hands of pope Clement at Avignon, who threw him into prison, and appointed a commission of three cardinals to try him; but upon the death of that pope, his successor, Innocent VI. released him from confinement, and sent him to Rome, in order to oppose an insurgent who had seized the government of that capital. The Romans received him again with great demonstrations of joy, and he even recovered his former authority, which, however, he held but a short time, when the nobles found means to excite a sedition against him, in which he was massacred, in October 1354. His dead body was treated with the greatest indignity by the people; and "his end," observes the biographer, "adds one more example, to the many recorded by history, of the usual fate of popular leaders and reformers." He possessed an union of fanaticism with artifice; and was more courageous in speech and council than in action. His original intention was unquestionably good, but neither his temper nor understanding was adequate to the greatness of his enterprize. He wanted presence of mind in emergencies of danger, and he is said to have betrayed a shameful timidity in the last scene of his life.

GABRIS, in *Ancient Geography*, the name of two towns in the interior of Media. Ptolemy.—Also, a place in Gaul, which lay, according to the tables of Peutinger, in the route from Cæsarodunum to Avienum. M. d'Anville refers it to Chabris, N. W. of Bourges.

GABRITA, or GABRETA, a forest, between which and the mountains of the Sarmatians lay the Hercynian forest, which see.

GABRITA, *Sylva*, a forest which lay on the S. W. of Bohemia, where a chain of hills now divides it from Bavaria.

GABS, a town of Africa, in the S. E. part of Tunis, in a bay of the Mediterranean, called the Lesser Syrtis, anciently called "Tacape," and by Scylax "Epichus," of which ancient city a heap of ruins still remains, with some beautiful granite pillars, square, and about 12 feet in length. The old city, where these ruins are found, was built upon a rising ground, at half a mile's distance from the new, having been formerly washed by the sea, which here formed itself into a bay of nearly half a mile in diameter. But at present the greatest part of this bay is filled up, and gained from the sea, which, from the great shallowness of it and daily reception of mud and roots from the river, will easily submit to such alterations and encroachments. At Gabs are several plantations of palm-trees. The chief branch of trade at present consists in the Al-hennah, which is plentifully cultivated in all their gardens; this beautiful, odoriferous plant grows 10 or 12 feet high, putting out its flowers in clusters, which yield a smell like camphor; the leaves are used by the African ladies to tinge their hair, hands, or feet of a tawny saffron colour, by them esteemed beautiful. Gabs lies at the distance of 170 miles S. from Tunis. N. lat. 34. E. long. 10° 2'. Shaw's Travels, p. 113.

GACE', a town of France, in the department of the Orne, and chief place of a canton, in the district of Argentan; 13 miles E. of Argentan. The place contains 1186, and the canton 7640 inhabitants, on a territory of 152½ kiliometres, in 18 communes.

GAD, TRIBE OF, in *Scripture Geography*, a district of Palestine, which lay on the north side of Reuben, having the Jordan on the west, the Ammonites on the east, and the half tribe of Manasseh on the north, reaching from 32° 5' to 32 50' of latitude, and from 36 15' to almost 37° east longitude. It was no less rich and fertile than that of Reuben, especially in pasture grounds. Its chief towns were Mahaneim and Penuel, both so named by Jacob, Succoth, where he built his booths, Mispha, or Maspha-Rabba, the metropolis of Bashan, since called Ribboth, and more lately Philadelphia, Ramoth-Gilead or high lands of Gilead, Rogelim, the native place of good old Barzillai, Thishbi, Sharon, Sophar, Armon, Mogesh, Debbir or Dabbir,

Dabbir, Aſhtaroth, Jazer or Jahſor, Dibbon, Aroer, Beth-Haran, and Enon, the place where John baptized; which laſt was on the eaſt bank of Jordan, between that and Salim, about eight miles S. of Scythopolis.

GAD, in *Mining*, an inſtrument uſed to dig out the ore. It is a ſmall punch of iron with a long handle of wood. One of the miners holds this in his hand, directing the point to a proper place, while the others ſtriking it with a large ſledge hammer, drive it into the vein.

The working by this inſtrument is thence called gading.

GAD, in *Rural Economy*, a term uſed to ſignify a rod with a leathern thong applied to the end of it, and which was formerly much employed in driving ox teams. In ſome caſes it had likewiſe a prick fixed in the contrary end of it, in order to force the animals more powerfully in their work.

GAD-*fly*, in *Entomology*. See OESTRUS.

GADAMIS, or GHEDEMES, in *Geography*, a country of Africa, W. of Fezzan and 100 leagues from the Mediterranean; it is ſaid to contain 92 villages. The capital bears the ſame name. N. lat. 30° 40'. E. long. 10° 25'.

GADARA, in *Ancient Geography*, a town of Paleſtine, in the half tribe of Manaſſeh, on the other ſide of Jordan, 60 ſtadia from the lake of Tiberias. It was the capital of Peræa, and regarded, according to Polybius, as the ſtrongeſt town of the country. Epiphanius mentions its warm baths.

GADDESDEN, JOHN OF, in *Biography*, a phyſician, who lived in the early part of the fourteenth century, and appears to have had very extenſive and lucrative practice. He was the firſt Engliſhman who was employed as a phyſician at court, being appointed to that office by Edward II.: before his time the king's phyſicians had been excluſively foreigners. The ignorance, ſuperſtition, and low quackery, however, which appear throughout his practice, and which are painted with much life and humour by Dr. Freind, do no great honour to the character of the profeſſion in that age. Nevertheleſs, he came forward as an univerſal genius; beſides aſſuming the characters of philoſopher, philologiſt, and poet, he undertook every thing that lay within the circle of phyſic and ſurgery. He talks of his experience in manual operations, pretends to be very expert in bone-ſetting, and profeſſes himſelf a great oculiſt. He alſo acquaints us with his great ſkill in *phyſiognomy*; "and did deſign, if God would give him life and leiſure, to write a treatiſe of *chiromancy*;" but to our unſpeakable grief, this excellent comment upon fortune-telling is loſt. He was a great dealer in ſecrets, and ſome he had which were the moſt ſecret of ſecrets, and did miracles. But his chief ſtrength lay in receipts, and without giving himſelf much trouble in forming a judgment reſpecting the nature of the caſe, he ſeemed to think that, if he could muſter up a good number of theſe, he ſhould be able to encounter any diſtemper. He ſeems to have neglected no ſtratagems, by which he might ſurpriſe and impoſe on the credulity of mankind, and to have been very artful in laying baits for the delicate, the ladies, and the rich (pro delicatis, pro dominabus, pro divitibus). When he was employed in attending the king's ſon, in the ſmall-pox, in order to ſhew his ſkill in inflammatory diſtempers, he, with a proper formality, and a countenance of much importance, ordered the patient to be wrapped up in *ſcarlet*, and every thing about the bed to be of the ſame colour. This, he ſays, made him recover without ſo much as leaving one mark in his face; and he commends it for an excellent mode of curing. Nevertheleſs this man was praiſed by Leland, Ovaringius, and others, as a profound philoſopher, a ſkilful phyſician, and the brighteſt man of his age.

His only work, which he produced while reſident at Merton college, Oxford, is the famous "Roſa Anglica," which compriſes the whole practice of phyſic; collected indeed chiefly from the Arabians, and the moderns who had written in Latin juſt before him, but enlarged and interſperſed with additions from his own experience. Its title is "Roſa Anglica quatuor Libris diſtincta, de morbis particularibus, de Febribus, de Chirurgia, de Pharmacopœa." Dr. Freind obſerves, that John ſeems to have made a collection of all the receipts he had ever met with or heard of; and that this book affords us a complete hiſtory of what medicines were in uſe, not only among the phyſicians of that time, but among the common people in all parts of England, both in the empirical and ſuperſtitious way. Dr. Aikin remarks that the method of producing freſh from ſalt water by *ſimple diſtillation* ("in an alembic with a gentle heat") is familiarly mentioned by this author, even at ſo remote a period.

Although devoted to the practice of his profeſſion, he was prebendary of St. Paul's, in the ſtall of Ealdland. It ſeems probable from this and other inſtances, that the procurement of a ſinecure place in the church was a method in which the great ſometimes paid the ſervices of their phyſicians. See Freind, Hiſt. of Phyſic, part ii. Aikin, Biograph. Mem. of Med. p. 9.

GADDI, TADDEO, an hiſtorical painter, who flouriſhed at a very early period of the reſtoration of the art. He was born at Florence in 1300, and became a diſciple of Giotto, whoſe manner he imitated, and to which he ſuperadded improvement in colouring. He poſſeſſed very conſiderable talents as a man of learning; and was highly reſpected. His productions were very numerous. The moſt conſiderable of them is the altar piece in the church of Spirito Santo at Arezzo; where he painted in freſco the Crucifixion of our Saviour. He died of a fever in 1350.

GADE, in *Geography*, a river of England, which riſes in the north part of Hertfordſhire, and runs into the Coln, near Rickmanſworth.

GADEBUSCH, a town of Germany, in the duchy of Mecklenburg; 16 miles W.N.W. of Schwerin. N. lat. 53° 45'. E. long. 11° 14'.

GADELONITIS, in *Ancient Geography*, a country of Aſia, on the other ſide of the mouth of the river Halys, according to Strabo.

GADEN, in *Geography*, a town of Auſtria, 10 miles S.W. of Vienna.

GADENI, in *Ancient Geography*, a people of the Britiſh iſland of Albion, according to Ptolemy; and ſuppoſed by Camden to have poſſeſſed Tiviotdale, Twedale, Mers, and the Lothians. It is, however, more probable, that they were a ſmall nation, inhabiting the more deſert and mountainous parts of Tiviotdale and Northumberland. Baxter imagines that their name was derived from the Britiſh word "Gadaii," which ſignifies to fly.

GADEROW, in *Geography*, a town of Hindooſtan, in Guzerat; 42 miles E. of Junagur.

GADEROWS CHOULTRY, a town of Hindooſtan, in the Carnatic; 17 miles S.S E. of Tanjore.

GADERSLEBEN, a town of Germany, in the principality of Halberſtadt; 20 miles E. of Halberſtadt.

GADES, in *Ancient Geography*, *Cadiz*, a town of Spain, at the mouth of one of the arms of the river Boetis. This town ſeems to have exiſted before the eſtabliſhment of the Phœnicians, and to have been enlarged by them, and rendered a flouriſhing place of commerce. Its firſt name, given to it by the Celtes, the natural inhabitants of Spain, previouſly to the arrival of colonies of ſtrangers, is ſaid to have been "Cotinuſa;" but when the Phœnicians eſtabliſhed

bliſhed themſelves in this town, more than 1500 years before the vulgar era, they called it "Gaddir," an encompaſſed place, with reference probably to a wall which ſurrounded and defended it. According to Pliny and Strabo there were in this place two iſlands; one, in which was ſituated "Gades," and called by its name, and the other denominated "Erithia" and "Aphrodiſias," or the "iſle of Juno." Some authors have ſuppoſed that this place was alſo called "Tarteſſus;" but others, among whom is M. D'Anville, have been of opinion that Tarteſſus or Tarteſſa was the name of the country, or at leaſt of an iſland formed by the Guadalquivir near its mouth. The town of Gades was alſo called in later times "Auguſta urbs Julia Gaditana;" and towards the end of the republic it was very populous, inſomuch that it vied with Rome in reſpect of number of inhabitants. L. Cornelius Balbus, who was of this town, contributed very much to the aggrandizement of it, and conſtructed an arſenal for it on the continent. When the Carthaginians made themſelves maſters of a great part of Spain, the town of Gades was ſubjected to their dominion; and Livy expreſsly ſays, that Aſdrubal, in the year of Rome 545 or 546, retired hither in order to avoid falling into the hands of Scipio. After the death of the two Scipios, L. Marcius Septimius, having been made general by the choice of the ſoldiers, concluded a treaty of alliance with the inhabitants of Gades, or the Gaditani, who had afforded very conſiderable ſuccours. Gades has furniſhed a great number of medals.

The Tyrian Hercules had a magnificent temple at ſome diſtance from this city, on the eaſt of the iſland, near the main land. This temple was very famous; its ſituation in ſo remote a place, its antiquity, the incorruptible timber of which it was conſtructed, its pillars enriched with ancient inſcriptions and hieroglyphics, the labours of Hercules, which were there repreſented; Geryon's trees, which, according to Philoſtratus, diſcharged blood; the old ceremonies that were practiſed; all theſe made it very celebrated, and Gades thought itſelf ſecure under the protection of ſo great a heroe. Accordingly, as Theron, the king of Spain, was coming to rifle this temple, a panic terror diſperſed his ſhips, upon the ſudden appearance of fire from ſome unknown cauſe. See HERCULES.

GADIAG, in *Geography*, a town of Ruſſia, in the government of Tchernigov; 112 miles S.E. of Tchernigov. N. lat. 50° 24'. E. long. 33°.

GADIBUNDA, a town of Hindooſtan, in Myſore; 13 miles N. of Chinna Balabaram,

GADITCH, one of the 11 diſtricts of the government of Tchernigov in Ruſſia, ſituated on the Pſol.

GADOLINITE, in *Mineralogy*, a foſſil thus named in honour of profeſſor Gadolin, who diſcovered in it the exiſtence of a new earth, called Yttria.

Its colour is an intenſe black, which more or leſs inclines to browniſh black.

It occurs maſſive and diſſeminated, as alſo, though rarely, in a regular form. Haüy ſuppoſes its fundamental form to be a rhomboidal oblique priſm; which is a primitive form different from that of any other mineral ſubſtance.

The ſecondary form, from an incomplete cryſtal, appeared to the ſame celebrated author to be a ten-ſided priſm, terminated by three planes.

Internally it is ſhining, and its luſtre is perfectly reſinous. Fracture more or leſs conchoidal. Fragments indeterminately angular, with ſharp, ſcarcely tranſlucent edges. Its hardneſs is nearly that of quartz. It is brittle. Specific gravity 4.04.

Gadolinite manifeſts a conſiderable action on the magnetic needle. Before the blow-pipe it decrepitates; but if gradually expoſed to the heat thus produced, ſmall fragments will remain entire, and undergo partial fuſion. Glaſs of borax is coloured yellow by it.

When reduced to powder, and heated with nitric acid, it is converted into a yelloviſh grey gelatine.

The proportions of its conſtituent parts are differently ſtated by Eckeberg, Vauquelin, and Klaproth.

Eckeberg.	
Yttria	47.5
Silica	25.0
Iron	18.0
Alumina	4.5
Loſs	5
	100

Vauquelin.	
Yttria	35.
Silica	25.5
Iron	25.0
Oxyd of manganeſe	2.0
Lime	2
Water and carb. acid	10.5
	100

Klaproth.	
Yttria	59.75
Silica	21.25
Black oxyd of iron	17.50
Alumina	0.50
Water	0.50
Loſs	0.50
	100

Prof. Eckeberg has ſince repeated his experiments, and is ſaid to have found the reſults ſtill more diſcordant. But fortunately the external and phyſical characters of this ſubſtance are ſufficiently marked to diſtinguiſh it from any other that might be miſtaken for it.

It is found at Ytterby, in the diſtrict of Roſlagen, in Sweden, imbedded in feldſpath, with mica; and is accompanied by yttro-tantalite, another ſubſtance of which the yttria above-mentioned forms a conſtituent part.

GADOU, GADOUA, or GADUA, in *Geography*, a country of Africa, on the S. ſide of the river Senegal, containing mines of gold, iron, and ſalt-petre. N. lat. 12° 10' to 13° 10'. W. long. 7° to 9°.

GADUS, in *Ichthyology*, a genus of the Jugular tribe, the head of which is ſmooth; gill-membrane with ſeven ſlender rays; body oblong, covered with deciduous ſcales; all the fins covered with a common ſkin; dorſal generally more than one; the rays unarmed; ventral fins ſlender and ending in a point.

The ſpecies are divided into three ſections according to the number of the dorſal fins, and the preſence or abſence of the beards at the mouth.

* *Dorſal fins three, mouth bearded.*

CALLARIAS. Colour various; tail equal; upper jaw longer. Gmel. *Gadus balthicus, Torſk*, It. Oel. *Gadus callarias balthicus*, It. Scan. *Aſellus varius vel ſtriatus*, Jonſt. *Baltic Torſk, or Dorſe.*

Inhabits the Baltic, and other ſeas in the north of Europe. Like moſt others of the genus, it feeds on ſmaller fiſhes, crabs, and worms, in purſuit of which it ſometimes enters the mouths of rivers. Otto Fabricius found in the ſtomach of this ſpecies the ſea ſcorpion (cottus ſcorpio), and the ſand launce (ammodytes tobianus) beſides crabs, and various kinds of ſea-worms. Commonly this fiſh weighs about two pounds, or rather leſs; near Rügenwalde they have been taken from ſeven to eight pounds in weight, and

ſometimes

ſometimes even twelve or fourteen pounds. Schoneveld ſpeaks of one four feet long.

The ſpawning ſeaſon is in January and February. The fleſh is white, tender, and well flavoured. The Icelanders take it in great plenty, and ſalt and dry it as an article of commerce. When thus prepared they give it the name of *Titteling*. This fiſh is known under various denominations in the north of Europe; in Germany it is called *Dorſch*, in Sweden *Torſk*, and in Denmark *Sma-Torſk*; the Pruſſians call it Pamuchel, and at Hamburgh it is known by the name of Scheibendorſch; the Norwegian name is Tare-Torſk, and the Lapland Tare-Torſk, and Rod-Torſk.

The general colour of this fiſh is cinereous above, and white beneath, the former ſpotted with brown, and ſometimes in the young fiſh with orange; the upper jaw is longer than the lower, and the tip of the lower jaw furniſhed with a beard or cirrus.

Morhua. Tail ſomewhat equal; firſt anal ray ſpinous. Linn. *Cabliau*, Ström. *Gadus ſquamis majoribus*, Bloch. *Morhua*, Bellon. *Molva vel morhua*, Rondel. *Cod, cod-fiſh*. Will. Ray. Donov. Br. Fiſhes.

The cod attains to the length of four or five feet, and ſometimes rather more. The body is of moderate thickneſs, with the abdomen prominent; the head of middling ſize, with the opening of the mouth large, and the jaws and palate armed with numerous ſharp teeth. The colour of the body variable, according to the age of the fiſh, in general cinereous on the back and ſides, and ſpotted more or leſs conſpicuouſly with dull yellow. The lateral line broad and whitiſh.

Smaller fiſhes, crabs, and worms, of various kinds, are the chief food of the cod: it is a creature of moſt voracious appetite, frequently preying on its own ſpecies, and its digeſtion ſo powerful, as to diſſolve many of the harder ſubſtances which it devours. Stones or pebbles are frequently found in its ſtomach; and theſe it is ſuppoſed to ſwallow to allay hunger, by retaining the ſtomach in a diſtended form. It is a highly prolific fiſh, nearly a million of eggs being ſometimes contained in a ſingle roe.

This well-known ſpecies occurs in immenſe abundance throughout all the northern ſeas of Europe, in the vicinity of the polar regions, from whence they migrate towards the ſouth, at particular ſeaſons, in queſt of food. Though there are many extenſive fiſheries of cod in the north of Britain and Ireland, the principal are thoſe carried on upon the banks of Newfoundland, the concerns of which are truly prodigious. They are taken only with the hook and line; and being cured, or ſalted, and dried upon the ſpot, are thence tranſported to the continent of Europe. See *Cod* Fishery.

Æglefinus. Whitiſh; tail forked; upper jaw longeſt. Linn. *Gadus kolja*, It. Scan. *Æglefinus*, Bellon. *Aſellus major*, Aldrov. *Haddock*, Will. Donov. &c.

The haddock is a general inhabitant of the northern ſeas of Europe, and grows to the length of three feet; it ſeldom, however, exceeds half that length, or about ſeven pounds in weight. The head is cuneated, and the mouth narrower than in others of its tribe; the eyes large, with black pupil and iris ſilvery. Its colour is pale-greyiſh, tinged with brown above, and ſilvery-white beneath; the lateral line nearer the back, and of a black colour, and the fins partaking of a tinge of blueiſh-grey. There are three fins on the back of this fiſh; the firſt containing about fourteen rays, the ſecond twenty-ſix rays, and the third eighteen; in the firſt of the two anal fins twenty-two rays, in the ſecond twenty, and in the tail from thirty to forty.

At certain ſeaſons of the year, the haddocks aſſemble together in immenſe ſhoals in the northern ſeas, preparatory to their annual migration to the ſouthward, in the courſe of which they viſit the coaſts of the Britiſh iſles. Some time after their appearance in the German ſea, they are equally abundant upon the coaſt of Sweden, Denmark, and Holland, and on the ſhores of Britain; but after paſſing down the channel to the ſouthward, as far as the coaſt of France, it is not certain that they proceed any further in that direction. It has been obſerved, that in thoſe periodical migrations which take place in the winter ſeaſon, about the end of November, or beginning of December, it never enters the Mediterranean; neither does it appear in the Baltic, or even paſs the ſound towards that ſea: Copenhagen, and other markets on the coaſt of the Baltic, and alſo Hamburgh, being ſupplied with the haddock by the fiſhermen, who take them in vaſt quantities in the ſea, off Heligoland.

The haddocks are in full roe at the time of their arrival on our coaſt in December, nature having directed them to ſeek a milder region than that which they inhabit in ſummer, as the winter approaches, in order to depoſit their ſpawn. The old fiſhermen affirm, that the females appear in ſhoals upon the coaſt, which, after laying their eggs, are followed to the ſame places by ſhoals of the males, who fecundate the eggs depoſited by the former.

Haddocks of a large ſize are only eſteemed good for the table during the winter; thoſe of a ſmall ſize, before they begin to breed, are conſidered in perfection at all times; but theſe even are beſt in winter. The fleſh of this fiſh, when boiled, is not ſo firm as that of the cod, to which it muſt alſo yield in the excellence of flavour; though ſome, however, think it preferable. When ſalted and cured, like the cod, the haddock is by no means indifferent eating.

Upon the firſt approach or appearance of a ſtorm, the haddocks ſink to the bottom of the ſea, to ſeek ſhelter till the danger is over; and when they again appear near the ſurface, on the return of fine weather, they are obſerved to have their backs ſoiled with mud, or ſea-weeds, and other marine refuſe lodged at the bottom of the water. In the north ſeas the fiſhermen are moſt ſucceſsful in their fiſheries for the haddock during the night-time, theſe fiſhes lurking at the bottom of the ſea in the day time, but riſing near the ſurface, as the evening cloſes, in queſt of food.

Bloch is of opinion, that the black, or duſky colour of the lateral line, in addition to the little cirrus, or beard, at the lower jaw, is a ſufficient ſpecific criterion of the haddock. There is alſo another very remarkable character of the haddock, a large ſquare, or duſky ſpot, on each ſide of the body, near the head, or a little below the firſt dorſal fin, from whence, in the legends of credulous devotion, it has been admitted to be the ſame fiſh as St. Peter caught with the tribute money in its mouth. The two ſpots are conſidered as the mark of St. Peter's thumb and finger, which has ever ſince remained impreſſed on the ſides of the whole race of haddocks, to perpetuate the circumſtance. But it may be added, that the haddock is not without a rival in the reputed proof of ſanctity, the ſides of the dory being even more diſtinctly marked than thoſe of the haddock. Donov. Brit. Fiſhes, pl. 59.

Barbatus. Lower jaw with ſeven punctures each ſide. Linn. *Gadus corpore lato*, Bloch. *Aſellus latus Liſteri*, Will. *Whiting pout*, Donov. Br. Fiſhes, &c.

A marine fiſh, confined to the northern parts of Europe, and which rarely exceeds the length of eighteen inches. The body is white; the back tinged with brown; the head ſmall; mouth large; upper jaw longer; teeth very ſmall, and in both jaws; lips cartilaginous, and connected by a

common

common contractile ſkin; tongue ſhort, thick; rough on the poſterior part; the back much arched; vent nearer the head.

Luscus. Firſt ray of the ventral fin ſetaceous. Linn. *Bib*, Donov. Brit. Fiſhes.

The body of this fiſh, like that of the whiting pout, is deep, and the ſides compreſſed; the colour along the back olive; the ſides beautifully gloſſed with a tinge of golden hue, and the lower part pure ſilvery-white. The eye is protected by means of a looſe membrane, which the creature can blow up at pleaſure like a bladder. All the fins, except the ventral, are duſky, the latter white. In the firſt dorſal fin are about thirteen rays, in the ſecond twenty, and in the third nineteen; in the pectoral fins ſixteen; ventral five; firſt anal twenty-three, ſecond anal twenty, and tail thirty-three.

This ſpecies is a native of the European ſeas, and rarely exceeds the length of ten or twelve inches: it appears to be more abundant on the Britiſh ſhores, and ſtill higher northern latitudes than towards the ſouth.

Minutus. Vent in the middle of the body. Müll. *Merlangus*, Bellon. *Anthiæ ſecunda ſpecies*, Geſn. *Aſellus mollis minor*, Will. *Poor*.

Native of the European and Mediterranean ſeas; length ſix or ſeven inches, and of a ſomewhat elongated form; the body ſilvery, ſpotted with black; back browniſh-yellow, and gill-covers punctured; the lower jaw is ſhorter, with fewer rows of teeth; the eyes round and ſilvery, and pupil black; the lateral line narrow and ſtraight; and the tail forked. The abdomen perfectly black within, being lined with a ſkin of that colour.

The appearance of this little fiſh in the Mediterranean excites great joy among the fiſhermen, as it announces an abundant fiſhery, the ſhoals of the poor being immediately followed by an immenſe multitude of the voracious fiſhes, among which the cod, the dorſe, and the haddock, are the moſt conſiderable. It is known at Marſeilles, where, at certain ſeaſons, it occurs in amazing plenty, by the name of *capelan*, or *officier*. The ſpecies feeds on ſmall fiſhes and crabs, and lives, for the moſt part, in deep waters of the ſea: the fleſh is white and well-taſted.

Saida. Fourth ray of the firſt dorſal fin, and fifth ray of the firſt anal fins longer than the reſt; ſecond ray of the ventral fin ending in a long briſtle. Lepechin. *Saida gadus*.

Deſcribed as a new ſpecies in the Tranſactions of the Royal Society of Peterſburg, by Lepechin, who informs us that it inhabits the White ſea. The length is eight inches; the head of a ſomewhat compreſſed form in front, and rounder behind. The crown black; jaws armed with ſharp, ſetaceous teeth, which are barbed backwards, the upper more obtuſe, the lower more pointed, and a little longer. The eyes are large, with whitiſh pupil, and blueiſh iris; gill-covers ſilvery, ſpotted with black, and compoſed of three laminæ, the loweſt of which is lunate, the next elliptical, the third triangular, and bicuſpidate. The back of the fiſh is convex, ſlightly channelled on the fore part, and of a dirty white colour, with a few confluent blackiſh ſpots; ſides blueiſh, and belly white. The lateral line is ſtraight, and nearer the back; dorſal fins triangular, brown, with whitiſh rays; anal oblong and triangular, with the fore-part of the baſe duſky blue; ventral whitiſh at the baſe, and tail forked. The fleſh is often eaten though dry and tough.

Blennoides. Ventral fins bifid. Pallas. *Blennoid gadus*.

Native of the Mediterranean ſea. The length of this ſpecies is nine inches; the body thick, ſoft, convex, compreſſed, and covered with ſmall ſcales; ſilvery white, and grey towards the back. The head is thick, conic and obtuſe; lips fleſhy, and doubled; teeth minute, unequal, and thoſe in the upper jaw hardly viſible; tongue fleſhy, pointed, prominent, and acute at the edge; palate longitudinally ſtriated; eyes large, with ſilvery iris; gill-covers ſoft; lateral line arched on the fore-part; fins yellowiſh, with very ſmall rays, the dorſal and anal reclined; firſt dorſal fin narrow, and triangular; ſecond narrower; third rather broader and ſhorter; pectoral fins narrow, ſub-falcate, very thin; firſt ray of the ventral fins long, very thick, and bifid; firſt anal fin rounded, ſecond triangular, and tail forked.

** *Dorſal fins three; mouth without beards.*

Virens. Back greeniſh; tail forked. Linn. *Le gade ſey*, Boſc. *Green pollack*.

Gadus virens cloſely reſembles the common pollack, from which it differs in being of a greeniſh colour above, in having the jaws equal; the lateral line ſtraight, and the tail forked. The ſpecies is figured in the work of Aſcanius (p. 3. pl. 21.) This fiſh was long confounded with the common pollack: it is abundant in the northern ſeas, and is known on the coaſt of Norway by no leſs than five different appellations, in its various ſtates of growth. The firſt dorſal fin uſually contains about thirteen rays, the ſecond twenty, and the third nineteen; the pectoral ſeventeen; ventral ſix; firſt anal twenty-four, ſecond twenty, and tail forty.

Merlangus. White; back browniſh; upper jaw longeſt. Donov. Brit. Fiſhes. *Gadus merlangus; albus, maxilla ſuperiore longiore*, Linn. Fn. Suec. *Aſellus mollis*, Jonſt. *Whiting*.

A ſpecies abundant in all the temperate parts of Europe. It is found in the Baltic, Mediterranean, and Northern ſeas, although leſs frequently than in the ſeas that waſh the ſhores of Holland, France, and England, where, at moſt ſeaſons of the year, it is found in great plenty. One circumſtance is worthy of obſervation; the fiſheries for the whiting commence upon the coaſt of France as early as January or February, but on thoſe of Holland, and our own country, not before April or May.

The whiting preys on the ſprat, and the young of the herring, and other fiſhes, crabs, and worms. The ſpawning ſeaſon is in the beginning of the winter, and the young fry make their appearance ſhortly after; theſe increaſe rapidly in ſize till they become ten or twelve inches in length; after which the progreſs of their growth is obſerved to be much ſlower. There are conſiderable whiting fiſheries on the weſtern coaſt of Britain; but the largeſt whitings brought to our markets are thoſe caught in the Dutch ſeas, off the Dogger bank, theſe weighing from four to five pounds, or, ſome ſay, even eight.

The general form of the whiting is ſo well known, as to render its deſcription ſuperfluous. The dorſal fins are three in number, the firſt of which contains about fifteen rays, the ſecond twenty, and the third twenty-one. In the pectoral fin are ſeventeen rays, and in the ventral ſix. In the firſt of the two anal fins are thirty-two rays, in the ſecond twenty, and in the tail thirty-three. Brit. Fiſhes, pl. 36.

Pollachius. Lower jaw longeſt; lateral line bent. Gmel. *Aſellus huitingo-pollachius*, Will. *Whiting pollack*, Ray. Donov. Brit. Fiſhes.

Frequent on ſeveral of the rocky coaſts of Britain, and other parts of Europe. They migrate in large ſhoals, and feed on ſmaller fiſhes, eſpecially the ſand launce. The whiting pollack ſeldom exceeds the length of eighteen inches.

Its

Its head is narrow on the fore part, the eyes large and ſomewhat prominent; the body ſub-olivaceous above, becoming gradually white or ſilvery on the belly; the fins rather duſky, except the ventral and pectoral, which incline to yellowiſh, and the tail in a ſlight degree forked. It is a fiſh in much eſteem for the table.

Carbonarius. Lower jaw longeſt; lateral line ſtraight. Gmel. *Callarias imberbis*, Klein. *Aſellus niger ſive mollis nigricans*, Ray. *Le gade colin*, Buff. *Coal-fiſh*, Penn. Donov. Brit. Fiſhes, &c.

The coal-fiſh is an inhabitant of many of the rocky coaſts of Britain, and is eſpecially abundant towards the northern parts of the iſland, as it is alſo throughout the North and Baltic ſeas, and even according to Gmelin in the Pacific ocean. In different ſtages of growth the colours of this fiſh vary rather conſiderably. When young, a certain duſkineſs prevails in the colours, which becomes darker as the fiſh grow older; and when they have attained their full ſize, which is from about two to three feet, the back, noſe, dorſal fins and tail oftentimes appear of a deep black. Under the pectoral fins is a black ſpot: the mouth is alſo of the ſame colour, and the tongue ſilvery.

According to Mr. Pennant, the young of this ſpecies ſwarm about the Orkneys and the coaſt of Yorkſhire; in the former of which they conſtitute the chief ſupport of the poor: and the ſame writer further ſtates that the fry is known by different names in different places; at Scarborough they are called parrs, and when a year old, billets. Though this information may be correct, we cannot avoid expreſſing our ſuſpicion that it is the fry of the ſalmon and not the coal-fiſh to which Mr. Pennant alludes in detailing the hiſtory of the latter ſpecies. Nothing at leaſt can be more evident than that the *parr* of this author, and to which he refers as the young of Gadus carbonarius, is no other than the fry of the ſalmon. Vide Brit. Zool. Deſcription of the *Parr*, No. 78, and figure of the *Parr*, plate 66. No. 78.

The Linnæan character of the fiſh is conciſe; Bloch conceives the blackneſs of the mouth and ſtraightneſs of the white lateral line ſufficient to diſcriminate the ſpecies. The ſkin of the coal-fiſh is covered with very ſmall oblong ſcales. It has three dorſal fins, in the firſt of which are about fourteen rays, in the ſecond eighteen, and in the third twenty; in the pectoral fin eighteen; ventral five; firſt anal fin twenty-ſix; ſecond twenty, and in the tail thirty-three, beſides ten very ſhort ones on each ſide; the tail is broad and forked. Donov. Brit. Fiſhes.

Merluccius. Beardleſs; the lawer jaw longeſt. Linn. *Aſellus*, Plin. *Aſellus primus*, Will. *Hake*, Penn. Donov. Brit. Fiſhes.

The hake is a native of the North and Mediterranean ſeas. It is of the migratory kind, frequenting our ſhores in immenſe ſhoals during the mackarel and herring ſeaſons, appearing for the firſt time in June, and then again in September, in purſuit of thoſe fiſhes. The fleſh of the hake, though firm and white, is in little eſteem for its flavour, and is ſeldom eaten except by the lower orders of people. They are caught on our coaſts chiefly for the purpoſe of ſalting and drying them for exportation. Vaſt quantities, it is ſaid, are ſent every year to the port of Bilboa, and other parts of Europe. When cured it is well known by the name of Poor John, or ſtock-fiſh.

On the coaſt of France, the hake is alſo taken in great abundance, and is cured, as in England, for exportation. By one of the French writers it has been remarked, that ſince the great naval engagement in 1759, between the French and Engliſh, the hake has been found in vaſt numbers at all ſeaſons of the year, in the ſea that waſhes the ſhores of Belleiſle; and he conjectures that they were firſt attracted to that ſpot in particular by the number of dead bodies that were here committed to the deep on that memorable occaſion. Some of the hake on that coaſt we are told meaſure ſix or ſeven feet in length.

The hake is a moſt voracious fiſh, and beſides feeding, as before obſerved, on the mackarel and herring, preys alſo on other ſmall fiſh, crabs and worms. For its carnivorous mode of life its teeth are perfectly well adapted, for theſe are numerous, ſtrong, ſharp, and much recurved, which give it no ſmall degree of advantage in ſecuring its prey. The eggs found in the body of the female are of an orange colour, and about the ſize of a grain of millet.

The form of this fiſh is not inelegant: the head is long and rather depreſſed. In the firſt dorſal fin are nine rays, in the ſecond thirty-eight; pectoral fin fifteen rays; ventral eight; anal thirty-ſix; and in the tail eighteen.

Molva. Mouth bearded; upper jaw longer. Linn. *Gadus longa*, It. Wgoth. *Gadus droſo dipterygio, maxilla ſuperiore longiore*, Bloch. *Enchelyopus*, Klein. *Aſellus longus*, Will. *Ling*, Donov. Brit. Fiſhes, &c.

A northern fiſh, bearing a remote reſemblance to the common cod fiſh, from which it is diſtinguiſhed by its more elongated form, and in having only two dorſal fins inſtead of three. Its food conſiſts of ſmaller fiſhes, worms, crabs and other ſimilar marine productions. In the months of February, March, and April, or even as late as May, it is in ſeaſon for the table; in June it viſits the ſhores to depoſit its ſpawn, and is not in perfection after that time till the enſuing ſpring. The prevalent colour is whitiſh, with the back pale-browniſh. The head is large, and obtuſe; eyes with black pupil and white iris; mouth large; tongue white and thin; body round, and covered with very thin ſcales; fins (except the anal, which is cinereous,) blackiſh, edged with whitiſh, and a black ſpot towards the end of the dorſal fins. The ling grows to the length of ſix or ſeven feet, and is taken in abundance in the north, where it is cured with ſalt, and forms an article of exportation to the more ſouthern parts of Europe, which the ling does not inhabit.

Albidus. Chin with a cirrus; ventral fins long, and bifid. Brünn.

A ſpecies about four inches in length, of a whitiſh colour, ſoft, oblong, and ſlightly compreſſed. The head is pale ſanguineous, above flattiſh, with the ſides compreſſed, and two ſpines behind the eyes. The lower jaw ſhorter, with ſeven punctures beneath each ſide; teeth ſmall, ſharp, and crowded; eyes large with the iris white; lateral line ſtraight; firſt dorſal fin ſmall and blackiſh at the tip; hinder whitiſh, ſpotted with black, the edge and hind part black; anal whitiſh, the poſterior part black; tail rounded and blackiſh. A native of the Mediterranean.

Tau. Bearded; gill-covers three-ſpined; firſt dorſal fin with three rays. Gmel. *Gadus tau; cirris plurimis*, Bloch.

Deſcribed by Dr. Garden as a native of Carolina, and where, according to that obſerver of nature, it is called the toad-fiſh. The body is ſmooth and mucous, above brown, beneath whitiſh; back and fins ſpotted with white, and covered with ſoft, thin, very ſmall, brown ſcales of a rounded form, and edged with white. The head is large and broad; the eyes vertical and large, with the pupil black and iris golden; and on each ſide a double row of ſmall tubercles: between them and the nape a cavity and tranſverſe yellow ſtreak; palate each ſide with a double row of teeth, upper jaw with many, lower only two rows of ſharp uneven teeth; cirri numerous, on the lower jaw only, and diſpoſed in a ſemilunar manner. Gill-covers of two pieces, the membrane large and looſe. The pectoral and ventral fins are pointed,

the

the firſt ray of the poſterior one ſtrong, rigid, and very long. Tail rounded with the rays forked.

Lota. Bearded; jaws equal. Linn. *Silurus cirro in mento unico*, Art. *Botlatriæ, Triſeus*, Salvian. *Leta*, Rondel. *Burbot*, Donov. Brit. Fiſhes.

The burbot inhabits freſh waters in many parts of Europe and Siberia; feeds on ſmaller fiſhes, and grows to the length of two, or even three feet. As an article of food the fleſh is eſteemed delicious. The head of the burbot is large, and rather broad; the eyes ſmall, with blueiſh pupil, and yellow iris; mouth large; jaws with ſeven rows of ſharp teeth. The lower jaw has a ſingle beard, the noſe two; the tongue, and alſo the gill-membrane broad; lateral line ſtraight; dorſal and anal fins long and narrow; and the vent in the middle of the belly.

Mustela. Five beards; firſt dorſal fin obſolete. Gmel. *Five-bearded cod*, Donov. Brit. Fiſhes.

The greateſt length of this ſpecies is mentioned as nineteen inches, and it rarely attains to near that ſize. It feeds on crabs, worms, and ſmall teſtaceous animals, and though not apparently common inhabits moſt of the European ſhores. The colour of this fiſh is olive, or olivaceous on the back and whitiſh beneath, with the fins pale brown, except the pectoral, which are tinged with yellowiſh, and the ventral, which are white at the baſe, and towards the tip roſy. The firſt dorſal fin conſiſts of one ſmall diſtinct ray, and many very obſolete; the ſecond of forty-nine rays; the pectoral of fourteen; ventral ſix; and tail of twenty-four.

Tricirratus. Three beards; firſt dorſal fin obſolete; body ſpotted. Donov. Brit. Fiſhes. *Gadus muſtela β*, Gmel. *Muſtella vulgaris*, Rondel. *Sea loche*, Ceſtriæ. *Whiſtle fiſh*, Cornubiæ, Will. *Rockling*, Jago. *Three-bearded cod*, Penn.

Bloch and Gmelin have followed Willughby in making this a mere variety of the Gadus muſtela, or five-bearded cod; an idea certainly founded in error, the two fiſhes exhibiting characters ſo entirely diſtinct that it is impoſſible they can be of the ſame ſpecies. This ſubject is diſcuſſed, and the point as it is preſumed determined, in a ſatisfactory manner from an attentive compariſon of the two fiſhes in diſpute in "Donovan's Hiſtory of Britiſh Fiſhes." It is there obſerved that the number of beards or cirri in the ſpotted kind, or rockling, never exceed three, nor is the number of thoſe on the true muſtela ever leſs than five. This alone would be in our opinion ſufficiently demonſtrative of a ſpecific difference, but they are furthermore diſtinguiſhed by other peculiarities no leſs deciſive. There is, for inſtance, a diſſimilarity in the form, and alſo in colour, the five-bearded cod being thicker in proportion to its length, and with the colour above olivaceous, beneath whitiſh; while on the contrary a general hue of orange prevails in the other, and this in a remarkable degree on the abdomen, the head, and ventral fins. The body of the latter is alſo ſpotted in an elegant and conſpicuous manner with fuſcous, no trace of which is perceptible in G. muſtela. For theſe and other reaſons the author of the above mentioned work deſcribed the two kinds as diſtinct, and aſſigned the hitherto ſuppoſed variety of muſtela the following new ſpecific character under the title of *Gadus tricirratus*; cirris tribus, pinna dorſali priore exſoleta, corpore maculato.

The three-bearded cod, or rockling, appears from our own reſearches to be moſt common on the rocky ſhores of the weſtern counties of Britain. Its length is from twelve to eighteen inches. The firſt ray of the anterior dorſal fin is ſmall, yet diſtinct, from the reſt which are minute and numerous. The ſecond dorſal fin conſiſts of fifty-four rays; pectoral fin twenty; ventral fins fleſhy, with the ſecond ray longeſt; anal fin with forty-ſix rays, and the tail twenty-four.

Dr. Wallbaum deſcribes another fiſh (a native of Ruſſia) as a variety of muſtela under the name of *ruſſicus γ cirro unico*. Gmelin alſo ſeems to doubt whether the ſpecies Mediterraneus deſcribed by Linnæus from the Muſ. Ad. Fr. and referred by that writer to the ſection with only one dorſal fin, may not be another variety of the ſame fiſh.

Cimbrius. Cirri four; firſt dorſal fin obſolete, the firſt ray ſpear-ſhaped. Gmel. *Le Cimbre*, Boſc. *Cimbrian gadus*.

Deſcribed as a native of the Northern and Atlantic ſeas, and as bearing a cloſe affinity with the ſpecies muſtela, from which it is ſaid to differ chiefly in having the firſt ray of the anterior dorſal fin divided at the tip in the form of the letter T, or rather in two filaments diſpoſed horizontally. There is a ſingle beard on the upper, and another on the lower lip, beſides two over the noſtrils.

** * * Dorſal fin only one.*

Mediterraneus. Upper jaw with two cirri; lower with one. Linn.

Native of the Mediterranean. Lacépede refers it to the Blennius genus, as there are only two rays in the ventral fins.

Brosme. Lower jaw longeſt; tail round, and with the dorſal and anal fin edged with white; ventral fins fleſhy with five cirri. Donov. Brit. Fiſhes. *Gadus Broſme*; mouth bearded; tail oval and pointed. Gmel. *Broſme*, Ström. *Torſk*, Penn.

So much obſcurity has hitherto prevailed over the hiſtory of this curious fiſh, that we ſhall be readily excuſed by the curious reader for entering on this ſubject at ſome length. "The torſk of the Norwegians, Swedes, and Danes (as we have before obſerved in another place) is a very different fiſh from that known in Scotland under the ſame name; a circumſtance that has given riſe to much miſunderſtanding among Engliſh writers reſpecting thoſe two fiſhes. The torſk, or dorſk of the north of Europe, with the exception of Scotland only, is the gadus callarias of Linnæus, a fiſh diſtinguiſhed in a particular manner from the Scotch torſk, by having three fins on the back as we find in our common cod-fiſh and haddock, while the latter is furniſhed with only one dorſal fin: they are alſo materially diſtinct in other reſpects; but theſe are the moſt deciſive and unerring characters that prevail in thoſe two ſpecies.

"The ſame name being common to both thoſe fiſhes in different countries, it was long ſuppoſed, and admitted without farther inveſtigation, that they muſt be of the ſame ſpecies. Pennant was led into this error through that circumſtance: he had learnt that there exiſted a fiſh called the torſk, in the Orkneys, and northern parts of Scotland, and not having ſeen it, concluded it to be of the ſame kind as Linnæus deſcribes under that name in his Fauna Suecica. At a ſubſequent period this miſtake was corrected on the information of Mr. Low, who ſent Mr. Pennant the deſcription and drawing from which the plate was engraven, that appears in the laſt edition of the Britiſh Zoology. Mr. Low was enabled, from his own immediate obſervations, to determine, that the torſk of the Swedes is not the torſk of the Scotch, which renders his account not a little intereſting. The torſk it ſeems, from his account, or as it is called in the Shetlands *tuſk* and *briſmak* (perhaps corrupted from broſme, its Norwegian name) is a northern fiſh, which as yet has not been diſcovered lower to the ſouthward than the Orkneys, and is even there rather ſcarce. In the ſeas about Shetland it ſwarms, and forms either dried or ſalted and packed in barrels a conſiderable article of commerce.

"Ström, a Norwegian clergyman, in his hiſtory of Sondmör, ſpeaks to the ſame effect; he informs us in the north it is called broſme, and being found in great plenty in the ſeas adjacent to Sondmör, there conſtitutes an article of extenſive trade either ſalted, and barrelled, or dried. His ſpecific deſcription of broſme is in Latin gadus monopterygius, ore cirroſo, cauda ovali acuta; and a figure of the fiſh, very well agreeing with this deſcription, is given in the miſcellaneous plate that accompanies the firſt volume.

"There are three different varieties of the Daniſh torſk, in the works of Aſcanius, all which agree with the Linnæan deſcription of gadus callarias. According to Aſcanius all theſe are well known to the Daniſh fiſhermen by the name of torſk, and to the Germans by that of dorſk; they are taken in abundance in the ſea between the iſland of Bornholm, and the north of Bergen, in the Categat, and the Baltic. This writer alſo figures, and deſcribes the broſme (Ic. pl. 17.) in a manner ſo far correct at leaſt as to leave no doubt of its being the ſame as the torſk of Scotland; the latter ſpecies he obſerves connects the gadus with the blennius genus, and is, from its reſemblance to the blenny, called broſme by the fiſhermen: that being the name by which the blenny is diſtinguiſhed amongſt them. We have alſo the authority of Bloch to ſhew, that the gadus callarias is the torſk of the Baltic, and the broſme a different fiſh.

"The reſult of theſe remarks will be ſufficient to prove that the torſk of Scotland agrees in no reſpect, except in name, with the torſk of the other northern parts of Europe, and that the Scotch torſk is beyond doubt the broſme of thoſe countries." *Donov. Brit. Fiſhes.*

In addition to the above extracts the following more general obſervations may with propriety be ſelected.

There can be no diſpute that much of the ambiguity, prevalent in regard to this fiſh, may be traced to the very ſimple cauſe of having been ſometimes deſcribed by authors from the dried inſtead of recent ſtate, as in this caſe it certainly does exhibit a very remarkable difference; a fact we have ourſelves obſerved in endeavouring to preſerve an example of the fiſh which we had an opportunity of inveſtigating in its perfect condition, and indeed poſſeſs at this time. This alteration may be explained with little difficulty: the fins and tail, when the fiſh is alive, or recent, are inveſted with ſkin of ſuch a fleſhy nature as to conceal in a great meaſure the number, and even ſituation of the rays that lie within; but in the proceſs of drying this fleſhy ſkin ſhrinks ſo materially as to leave the rays almoſt bare. The tail, thus diveſted of its fleſhineſs, inſtead of retaining its rounded figure as in the living fiſh, aſſumes the more pointed form of the ſkeleton of the tail, for the central rays are in reality longer than the reſt, though they appear ſo only in a very ſlight degree in the recent ſtate. From a due conſideration of this circumſtance we may eaſily reconcile the two characters "cauda ovali acuta," and "cauda rotundata" which have been aſcribed to the torſk, the former being its appearance in the dried, and the other in its recent ſtate. Gmelin adopts the firſt of theſe, and the conſequence has been that in the Engliſh tranſlation of the Syſtema Naturæ, the Scotch torſk is erroneouſly admitted as a ſpecies diſtinct from the gadus broſme, under the name of Scoticus.

Although the broſme or Scotch torſk ſwarms in the north ſeas, it is ſcarcely ever ſeen more to the ſouthward of Britain than Caithneſs in Scotland, and even there very ſeldom. It is ſometimes brought from Shetland to London for ſale with other ſalt-fiſh. In this ſtate it is eaſily diſtinguiſhed by its ſingle dorſal fin which extends from within a ſhort diſtance of the head to the baſe of the tail.

The length of this fiſh is about twenty-five inches; the colour of the body above pale greyiſh, teſtaceous, beneath white: the dorſal, anal, and caudal fin or tail of the ſame colour as the upper part of the body, very prettily ſpeckled with white, and blueiſh, towards the margin blotched with purple, and a fillet of white forming the extreme border. The pectoral fins were fine yellow, and the ventral reddiſh with the tips duſky.

GADWALL, in *Ornithology*, called alſo the *grey*, a ſpecies of the anas, or duck tribe, diſtinguiſhed ſpecifically by having the wing-ſpot rufous, black and white. The bird is about nineteen inches in length, with the bill flat, and of a black colour; the legs tawny; rump black; back brown with pale tranſverſe undulations, and the breaſt and belly grey varied with white. It is a native of northern Aſia and Europe, and ſometimes viſits our coaſts in ſevere winters. The gadwall is anas ſtrepera of Gmelin. Donov. Br. Birds, &c. See DUCK.

GÆA, in *Ancient Geography*, a town of Arabia Felix, placed by Ptolemy in the interior of the country, and called by Ammianus Marcellinus Geapolis.

GÆELÆUM, *earth-oil*, in *Natural Hiſtory*, a name given by ſome of the old writers to the petroleum, or, as we uſually call it, oil of petre.

GAEL, or *Southern Celts*, formed the earlieſt population of Great Britain; and were called "Guydels" by the Welch, who regard them as their predeceſſors, and who remark, that the moſt ancient names, even in Wales, are Guydelic, not Cumraig or Welch. Theſe Gael appear to have proceeded from the neareſt ſhores of France and Flanders. The original Gaelic inhabitants ſeem to have almoſt entirely evacuated the country, and to have retired to Ireland, which was alſo originally peopled from Gaul. There, and in the Highlands of Scotland, to which a Gaelic colony paſſed from Ireland, the Gaelic dialect of the Celtic language ſtill exiſts.

GAELIC, or ERSE. This is the name of that dialect of the ancient Celtic language, which is ſpoken in the Highlands of Scotland. According to the opinion of antiquarians, the Celtic, at the time of the Roman invaſion, was univerſally ſpoken all over the weſt of Europe. Though it is divided into a variety of dialects, yet they all bear the cleareſt internal proofs of their being deſcended from one common origin. The moſt remarkable dialects of the Celtic, ſtill in exiſtence, are the Gaëlic, the Welch, the Manks, the Iriſh, and the Corniſh, the laſt of which appears to be nearly loſt. To this liſt may juſtly be added the dialect, which is ſpoken by the natives of the province of Bretagne in France. The Gaëlic, which, from a variety of cauſes, is preſerved in a conſiderable degree of its original purity, is bold, expreſſive, and copious. It derives no aſſiſtance from the languages either of Greece or Rome, from which it differs in its ſtructure and formation. Having its affixes and prefixes, it greatly reſembles the Hebrew, particularly in the inflexions of its nouns and verbs. Like the modern French it only knows two genders, the maſculine and feminine. If ever the Gaelic poſſeſſed an alphabet peculiar to itſelf, no traces whatever of it now remain. Nor can it boaſt of any original literary production, unleſs the poems of Oſſian be allowed to form an exception.

Of late the ſcriptures and other religious books have been very correctly tranſlated into Gaëlic, from which the inhabitants of the Highlands derive conſiderable advantages. Notwithſtanding every diſcouragement and oppoſition on the part of the Highland proprietors, who conſider, perhaps not without reaſon, the exiſtence of the Gaëlic as operating againſt the general improvement of that part of the kingdom, it is ſo far from being on the decline, that it has actually, within

within the laſt century, in many places, encroached on the Engliſh. Such as would wiſh to arrive at accuracy in topographical knowledge, would do well to ſtudy Gaëlic, as more than two-thirds of the names of places in the united kingdom are evidently of Celtic extraction. Some months ago a chapel has been opened in London, where divine worſhip is performed in Gaëlic according to the forms of the church of Scotland.

GÆRTNER, Joseph, in *Biography*, a botaniſt eminently diſtinguiſhed for his attention to fruits and ſeeds, with a view to the more certain diſcrimination of the genera of plants, was born at Calw in the duchy of Wirtemberg, March 12, 1732. His father, phyſician to the duke of Wirtemberg, and his mother, whoſe maiden name was Wagner, both died in his early youth. He was at firſt deſtined by his ſurviving relations for the church, and received the earlieſt parts of his education at Tübingen and Stutgard; but not proving ſuitable to the profeſſion which had been choſen for him, he was directed, with no better ſucceſs, to the law. Having had an early bias towards the ſtudy of natural hiſtory, he reſorted to phyſic, as moſt congenial to his diſpoſition, and removed to the celebrated univerſity of Gottingen in the 19th year of his age. Here the lectures of the great Haller and others confirmed and inſtructed him in the darling objects of his purſuit, anatomy, phyſiology, and botany, and ultimately decided him to devote himſelf to theſe ſtudies, rather for his own information and amuſement, than as a means of advancement in the practice of phyſic. Thus Gærtner became a profeſſed naturaliſt, and undertook a tour through Italy, France, and England, in the purſuit of knowledge in this line of ſtudy. He, however, took the degree of doctor of medicine on returning to his own country, and publiſhed an inaugural diſſertation on the urinary ſecretion, after which he devoted two years to the ſtudy of mathematics, optics, and mechanics, conſtructing with his own hands a teleſcope, as well as a common and ſolar microſcope. In the ſummer of 1759, he attended a courſe of botanical lectures at Leyden under the celebrated Adrian Van Royen, and formed an intimate friendſhip with David Van Royen, the nephew, and afterwards ſucceſſor, of the former. He had for ſome time acquired the uſe of the pencil, in which he eminently excelled, and which ſubſequently proved of the greateſt uſe to him in enabling him to draw the beautiful and accurate figures of the books he publiſhed. Having beſtowed great attention upon the obſcurer tribes of marine animals and plants, particularly with a view to the mode of propagation of the latter, as well as of other cryptogamic vegetables, he reviſited England, and ſpent ſome time here, as well in ſcrutinizing the productions of our extenſive and varied coaſts, as in converſing with thoſe able naturaliſts Ellis, Collinſon, Baker, and others, who were aſſiduouſly engaged in ſimilar purſuits. He communicated a paper to the Royal Society on the polype called *Urtica marina*, and the *Actinia* of Linnæus, comprehending deſcriptions and figures of ſeveral ſpecies, which is printed in the 52d volume of the Philoſophical Tranſactions; and he prepared ſeveral eſſays on the anatomy of fiſhes, and other obſcure matters of animal and vegetable phyſiology, part of which only has hitherto been made public. Soon afterwards Dr. Gærtner became a member of the Royal Society of London, and of the Imperial Academy of Sciences at Peterſburg. In 1768, he was inſtituted profeſſor of botany and natural hiſtory in the place laſt mentioned, and about a year afterwards he began to plan, and prepare materials for, the great work on which his eminent reputation reſts, the object of which was the illuſtration of fruits and ſeeds, for the purpoſes above mentioned. His ſituation at Peterſburg however ſeems not to have ſuited either his health or diſpoſition. After having performed a journey into the Ukraine, in which he collected many new or obſcure plants, he reſigned his profeſſorſhip at the end of two years, ſteadily refuſing the penſion ordinarily attached to it, and retired in the autumn of 1770 to his native town, where he married a lady of the name of Mutſhelin, and gave himſelf up to domeſtic and ſcientific tranquillity. At the end of eight years he found it neceſſary, for the perfection of his intended work, to reviſit ſome of the ſeats of ſcience in which he had formerly ſtudied, in order to re-examine ſeveral botanical collections, and to converſe again with perſons devoted to ſimilar inquiries with his own. Above all he was anxious to profit by the diſcoveries of the diſtinguiſhed voyagers Banks and Solander, who received him with open arms on his arrival at London in 1778, and, with the liberality which ever diſtinguiſhed their characters, freely laid before him all their acquiſitions, and aſſiſted him with their own obſervations and diſcoveries. A new genus was dedicated to Gærtner by his illuſtrious friends in their manuſcripts; but this being his own *ſphenoclea*, has been ſuperſeded by another and a finer plant; ſee Gærtnera. He viſited Thunberg in his return through Amſterdam, that diſtinguiſhed botaniſt and traveller being then lately arrived from Japan; nor were the acquiſitions of Gærtner leſs conſiderable from this quarter. He further enriched himſelf from the treaſures at Leyden, laid open to him by his old friend Van Royen; and arrived at home laden with ſpoils, deſtined to enrich his intended publication.

Here however his labours and his darling purſuits were interrupted by a ſevere diſorder in his eyes, which for many months threatened total blindneſs; nor was it till after an intermiſſion of four or five years that he was able to reſume his ſtudies.

At length he gave to the public the firſt volume of his long-expected work, *de fructibus et ſeminibus plantarum*, printed at Stutgard in 1788, and containing the eſſential generic characters, with particular deſcriptions of the fruit, of 500 genera, illuſtrated by figures of each, admirably drawn by himſelf, and neatly engraved in 79 quarto plates; a long anatomical and phyſiological introduction is prefixed, in which he defines and explains the nature of the parts of fructification, eſpecially of the fruit and ſeed. In this eſſay he denies the exiſtence of real flowers, and conſequently of proper ſeeds, in *Fungi*, and other cryptogamic vegetables, in which Hedwig and others conceive they had detected the organs of impregnation as well as real ſeeds. Gærtner conſiders the latter as *gemmæ* or buds, and not ſeeds produced by ſexual impregnation. He even denies the celebrated Hedwigian theory of moſſes. He changes the name of *germen*, applied by Linnæus to the rudiments of the fruit in old plants, to the old and erroneous term *ovarium*. (See Germen.) In the detail of his work he often corrects the great Swediſh naturaliſt, with more or leſs juſtice, but not always with candour, and changes his names frequently for the worſe. In ſynonyms he is not always exact, copying them, as it appears, from errors of the preſs occaſionally tranſcribed from other authors, without turning to the books quoted.

In the definition and anatomical elucidation of the parts of the ſeed, Gærtner is truly excellent, though it has been doubted of late whether what he terms *vitellus* has any real exiſtence diſtinct from the cotyledons, and Dr. Smith is of opinion that he has proved the contrary. (See Tranſ. of the Linnæan Soc. vol. 9th 204.) In his deciſions in difficult caſes concerning the eſtabliſhment of particular genera, Gærtner, like all botaniſts whoſe fixed attention is bent upon

upon one part of the fructification in preference to the reſt, ſometimes gives too much importance to that part, loſing ſight of the great maxim, that "the genus ſhould give the character, not the character the genus." Notwithſtanding theſe ſlight defects, the work of Gærtner is one that marks an era in botanical ſcience, not only directing, but even forcing the attention of botaniſts, to parts which the Linnæan ſchool had too much neglected, but which can never in future be overlooked. The ſecond volume of this immortal work appeared in 1791, illuſtrating 500 more genera, on the ſame plan with the former, in 101 plates, in which the compound flowers are treated with peculiar care and ſucceſs. The preface of this volume is dated April 6, 1791, but little more than three months before the death of the author, which happened on the fourteenth of July 1791, in the 60th year of his age. He is ſaid, though ſtruggling for ſome time preceding with debility and diſeaſe, to have finiſhed a deſcription and drawing of the *Halleria lucida* but the evening before his departure. He left one ſon, to whom he gave an excellent education, and who has proved worthy of his diſtinguiſhed father, in publiſhing his inedited works, and continuing with ſucceſs the ſame inquiries. Deleuze in Sims and Konig's Ar- ls of Botany, v. 1. 73.

GÆRTNERA, in *Botany*, in honour of Joſeph Gærtner, M. D. (See the laſt article.) Schreb. 290. Willd. Sp. Pl. v. 2. 550. (Hiptage; Gærtn. v. 2. 169. t. 116. Molina; Cavan. Monad. diſſ. 9. 435. t. 263. Lamarck Illuſtr. t. 349.) Claſs and order, *Decandria Monogynia*. Nat. Ord. *Tribilatæ*, Linn. *Malpighiæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, in five deep, oblong, obtuſe, ſpreading, nearly equal ſegments, permanent. *Cor.* Petals five, roundiſh, large, flattiſh, nearly equal, ſpreading, with very ſhort claws; their margin jagged and fringed. *Stam.* Filaments ten, thread-ſhaped, ſlightly united at their baſe; nine of them more ſlender, nearly erect, ſhorter than the corolla; the tenth thicker, the length of the adjoining petal, incurved at the top; anthers oblong, quadrangular; nine of equal ſize; the tenth, on the longeſt filament, rather the largeſt. *Piſt.* Germen ſuperior, ſmall, three-toothed; ſtyle thread-ſhaped, lateral, incurved, the length of the longeſt ſtamen, permanent; ſtigma acute. *Peric.* Capſule woody, of one cell, without valves, roundiſh, crowned with four lanceolate, obtuſe, unequal, coriaceous wings, of which the largeſt is erect, the two leſſer ſpreading, and the leaſt aſcending. *Seed* ſolitary, roundiſh, deſtitute of albumen.

Eſſ. Ch. Calyx in five deep diviſions. Petals five, fringed and jagged. One ſtamen longer than the reſt. Capſule with four unequal wings, of one cell, without valves.

1. G. *racemoſa*. Vahl Symb. faſc. 3. 58. Roxb. Coromand. v. 1. 19. t. 18. Andr. Repoſ. t. 600. (Banniſteria benghalenſis; Linn. Sp. Pl. 611. B. tetraptera; Sonnerat. Ind. Orient. v. 2. 238. t. 135. Sida Pou; Rheede Hort. Mal. v. 6. 109. t. 59.)—Native of the Eaſt Indies, and the only ſpecies known. The *ſtem* is woody and climbing. *Leaves* oppoſite, ſtalked, laurel-like, elliptic-oblong, ſmooth and entire. *Cluſter* terminal, erect, of numerous elegant *flowers*, ſomewhat reſembling thoſe of the horſe cheſnut, their petals being white, and one of them eſpecially broadly marked with yellow. This ſhrub flowers in India during the cool and rainy ſeaſon, and, according to Dr. Roxburgh, is cultivated throughout the coaſt of Coromandel, on account of the beauty and fragrance of its bloſſoms. That gentleman ſent a plant to the late lady Amelia Hume, in whoſe garden it flowered in the ſpring of 1810, for the firſt time probably in Europe.

GÆSATI, in *Ancient Geography*, a warlike people among the Gauls, who are deſcribed by Polybius as ready to fight for any nation which would pay them; accordingly their name denotes "hirelings."

GÆSUM, or GÆSUS, a river of Aſia Minor, which ran between Miletus and Prienè, and diſcharged itſelf into a marſh, and from thence into the ſea.

GÆTA, in *Geography*, a ſea-port town of Naples, in the province of Lavora, anciently "Cajeta," ſo called, according to Virgil, from Æneas's nurſe. It is ſituated on the point of a promontory, and joined to the continent by a narrow iſthmus northward, the reſt being ſurrounded by the ſea, ſo that it forms a peninſula. Ferdinand II. of Aragon, appriſed of its importance, fortified it with good walls and a citadel; and to theſe other fortifications have been ſince added, which, together with its ſituation on a rock, renders it very difficult of acceſs. The ſea flows into its moats, which are both broad and deep, ſo that its entrance is defended by armed veſſels, and its citadel, built on an eminence, commands the city. Its harbour, anciently repaired by Antoninus Pius, is good and ſecure, and its gulf abounds with fiſh particularly ſturgeons, of which the cavear is made. The town is not large, the ſtreets are narrow, and the houſes are built on porticoes.

It is the ſee of a biſhop, ſuffragan of Capua, which was transferred thither after the Saracens had ruined Nola in the year 956. Its vicinity is pleaſant, and the ſoil very fertile. 40 miles N.W of Naples. N. lat. 41° 15'. E. long. 13° 28'.

GÆTANO, ST., a town of New Navarre; 60 miles S. of Caſa Grande.

GÆTULIA, in *Ancient Geography*, a country of Africa, the ſituation and limits of which are not accurately aſcertained; and, indeed, they do not ſeem to have been always the ſame. In Pliny's time, the Gætulians poſſeſſed a conſiderable part, at leaſt, of Tingitania. Feſtus Avienus fixed their eaſtern boundary not far from the weſtern confines of Marmarica. Strabo intimates that the Gætulians formed a large nation, taking up a conſiderable part of Libya Interior, and poſſeſſing ſome territories in the neighbourhood of the Syrtes. Pliny maintains that Gætulia was terminated on the ſouth by the river Nigris, called by Ptolemy Niger, which, according to him, ſeparated it from Ethiopia. The northern limits of this undefined country ſeem to have been contiguous to, and frequently coinciding with, the ſouthern parts of Numidia and the Mauritaniæ, and it could not have extended to any great diſtance in the Sahara. Dr. Shaw (Travels) intimates, that the proper Gætulia did not reach farther to the eaſt than the meridian of Siga, provided that Tackumbreet be the ancient Siga, as he imagines; ſince he affirms that the Mælanogætuli and Garamantes occupied the tract behind Numidia, Africa Propria, and the Regio Syrtica, from that meridian to Cyrenaica. In another place, however, he fixes ſome Gætulian tribes in the remoteſt part of the diſtrict of Zaab, and meridian of Conſtantina, above ſix degrees more to the eaſtward than Siga. We may here obſerve that Guzula, or Gezula, a province of the kingdom of Morocco, at the foot of Mount Atlas, has preſerved ſome traces of the ancient Gætulia. As the Gætulians, before the time of Jugurtha, led their flocks from paſture to paſture, living generally in tents, without any fixed habitation, their country will not preſent to view many towns. Philoſtratus ſays, that they inhabited the interior part of mount Abinna, or Abyla; and conſequently by intermixing them with the Mauruſii, allows ſome of them to have dwelt in towns. Pliny alſo intimates, that they poſſeſſed in his time great part of Maſſæſylia; and Apuleius aſſigns them ſome diſtricts at leaſt of Numidia Propria; but Pliny and Ptolemy

render it indiſputable, when they mention the cities of Autolala and Talubath, as appertaining to the Gætulians. The principal tribes of Proper Gætulia were the Baniuræ, Darræ, and Autololes. The Baniuræ, probably, bordered upon Tingitania, as the Darræ did upon the Ethiopians, called Perorſi, and the Pharuſii. The Autololes ſeem to have been much the moſt powerful, and to have ſpread themſelves over that part of Tingitania bordering on the coaſt of the Atlantic ocean. Their capital city, Autolala, from which they derived their name, ſtood betwixt the Subus and the Salathus, the only two rivers of note except the Gir and the Nigir, that watered Gætulia. As the Sahara roſe near the ſouthern foot of Mount Atlas, this country was without doubt for the moſt part ſandy and deſert; though it was interſperſed with fruitful ſpots. Mount Sagapole, the limit of Gætulia on the ſide of the Melanogætuli, and containing the ſources of the Subus and Salathus, ſeems to have been the only remarkable mountain in the region we are now deſcribing. The only curioſity worthy of particular notice was the vaſt quantity of the purple-fiſh produced in that part of the Atlantic ocean that waſhed the Gætulian ſhore, with which the rocks on this coaſt were frequently covered.

According to Joſephus and Jerome, Chavilah or Havilah, the ſon of Cuſh, was the father of the Gætulians; and therefore they were called Evilæi or Havilæi. Havilah, or Chavilah, having ſettled in Arabia Felix, gave to his deſcendants the name of Chauletæi and Chauleſii; and hence it has been inferred that Gætulia was firſt peopled from Arabia Felix. The firſt Gætulians, according to the Punic hiſtorians, were ſome of the moſt ancient inhabitants of Africa, extremely rude and barbarous, without any form of government, laws, or manners. They lived upon the fleſh of wild beaſts, eating upon the ground, after the manner of cattle; they roved about the country, lodging wherever the night ſurpriſed them. Some authors, however, believe, that the Gætulians, though rude and barbarous, at leaſt near the Roman times, were under the direction of certain phyllarchs, or heads of Kabyles, as their poſterity are at this day. Their peculiar laws and cuſtoms are now unknown. Their religion probably reſembled that of their neighbours, or of their progenitors, the ancient Arabs; and as they were partly deſcended from the Perſians, or intermixed with them, they might profeſs the Magian religion. Their language muſt undoubtedly have borne a near reſemblance to the ancient Arabic, and other oriental tongues. In the times of Herodotus and Scylax the Gætulians muſt have been an obſcure people, as thoſe writers take no notice of them. The firſt authors that mention them were probably ſome of thoſe old hiſtorians, whoſe works furniſhed Livy with information concerning them; and from whom we learn, that a corps of that people ſerved under Hannibal in the ſecond Punic war. Salluſt informs us, that Jugurtha inſtructed the Gætulians in military diſcipline; and they ſerved that prince more effectually by plundering the allies of the Romans, than by their bravery in time of action; for the army he had raiſed and diſciplined in Gætulia was eaſily routed by Marius under Cirta. That part of Gætulia which was under the dominion of Juba revolted to Julius Cæſar; but when that with Numidia was reduced into a Roman province, we cannot poſitively affirm; eſpecially ſince Auguſtus beſtowed a part of Gætulia, probably this, with the Mauritaniæ, on the younger Juba, as an equivalent for Numidia, his father's kingdom, which, ſays Dio, had before been converted into a province. About the year of Rome 759, the Gætulians rebelled againſt king Juba, maſſacring all the Romans ſettled in his dominions, and committing moſt dreadful ravages in all the provinces ſubject to him. Dio aſcribes this defection to the reſentment of the Gætulians, who were extremely incenſed againſt the Romans for impoſing a prince upon them, and not permitting them to live under the Roman government. However, Cornelius Coſſus ſo completely defeated them, that they were obliged to ſubmit upon the terms which he thought fit to preſcribe. This was eſteemed at Rome ſo ſignal an exploit, that triumphal honours were decreed to him, and he was allowed to aſſume the cognomen Gætulicus. Notwithſtanding this diſaſter, the Gætulians recovered themſelves to ſuch a degree, that in the elder Pliny's time they had ſettlements in Numidia and Tingitania, as we may infer from that author and Philoſtratus.

GÆTULIANS. See GETULIA, ſupra.

GÆTULIANS, *Black*. See MELANOGÆTULI and NIGRITÆ.

GAFERAID, in *Geography*, a town of Aſiatic Turkey, in Caramania; 32 miles S. E. of Cogni.

GAFET, in the *Materia Medica of the Arabians*, a name given by Avicenna and others to the ſarcocolla of the Greeks.

GAFF, in *Sea Language*, a ſort of boom or pole uſed to extend the upper edge of the mizen; the foremoſt or inner extremity of it is furniſhed with two cheeks, forming a ſemi-circle, which incloſe the after part of the maſt, ſo as to confine the gaff cloſe to its reſpective maſt whilſt the ſail is hoiſting or lowering.

GAFFS. See GABLOCKS.

GAFILE, in *Geography*, a town of Sweden, in the lapmark of Aſele, on a river of the ſame name; 25 miles E.S.E. of Aſele.

GAFOLD-LAND, or GAFUL-*land*, *terra ſenſualis*, in our *Old Writers*, land liable to taxes, and rented or let for rent.

GAFORUS, or GAFURIUS, See FRANCHINUS.

GAFSA, in *Geography*, a town of Africa, in Biledulgerid, anciently called *Capſa*, which ſee.

GAG, in *Geography*, one of the iſlands in the oriental Archipelago, adjoining to the main land of Papua or New Guinea, which ſee.

GAGÆ, in *Ancient Geography*, a town of Aſia, in Lycia.—Alſo, a river of Aſia, in Lycia, which furniſhed the ſtone called "Gagates." Pliny. Dioſcorides.

GAGANIGURRA, in *Geography*, a town of Hindooſtan, in Baramaul; five miles E. of Caveripatnam.

GAGARAWAD-BAY, a bay on the N. coaſt of the iſland of St. Vincent.

GAGASMIRA, in *Ancient Geography*, a town of India, on this ſide of the Ganges, (Ptolemy); ſuppoſed to be the modern *Agimere*, which ſee.

GAGATES. See JET.

GAGATUN, in *Geography*, a town of Bengal; twenty-five miles E. of Dacca.

GAGE, in our *Ancient Cuſtoms*, ſignifies a pledge, or pawn, given by way of ſecurity.

The word is only properly uſed in ſpeaking of moveables: for immoveables, the term *hypotheca* is uſed.

If the gage periſh, the perſon who received it is not to anſwer for it, but only for extreme negligence, &c.

GAGE is alſo uſed for a challenge to combat.

In which ſenſe it was a pledge, which the accuſer, or challenger, caſt on the ground, and the other took up, as accepting the challenge: this was uſually a glove, gantlet, chaperoon, or the like.

The Grand Cuſtomary mentions *gages pleiges de duel*.

Theſe were gentlemen of the relations or friends of the combatants. If he who had given the *gages pleiges* was overcome, he was to pay a mulct agreed on.

GAGE is only now retained as a ſubſtantive: as a verb, the *g* is changed into *w*; and of *gage* is formed *wage*. As,

to wage law, to wage deliverance, *q. d.* to give ſecurity a thing ſhall be delivered.

If a perſon who has diſtrained be ſued for not having delivered what he had took by diſtreſs, he ſhould wage, or gage, or gager, deliverance; that is, put in ſurety that he will deliver them.

GAGE, *mort, mortuum vadium*, is that which is left in the hands of the proprietor, ſo that he reaps the fruits thereof: in oppoſition to *vif-gage, vivum vadium*, where the fruits or revenues are reaped by the creditor, and reckoned on the foot of the debt, which diminiſhes in proportion thereto. The ſecond acquits or diſcharges itſelf, and as it ſubſiſts, ſurvives the debt, and is therefore called living pledge; the firſt does not.

Pomey alſo uſes mort-gage for the poſſeſſion of any effects, on condition of ſurrendering them up at the good pleaſure of the perſon who gave them. See MORTGAGE.

GAGE, in *Carpentry* and *Joinery*, is an inſtrument for drawing a line on one of the faces of a piece of ſtuff parallel to another, in order to reduce the ſtuff to a breadth or thickneſs.

Its chief uſe is for gaging of tenons true, to fit into mortiſſes; and for gaging ſtuff of an equal thickneſs.

It is made of an oval piece of wood, fitted upon a ſquare ſtick, to ſlide up and down ſtiffly thereon, and with a tooth at the end of a ſtaff, to ſcore, to ſtrike a line upon the ſtaff at any diſtance, according to the diſtance of the oval from it.

GAGE, in the *Sea Language*. When one ſhip is to windward of another, ſhe is ſaid to have the *weather gage* of her.

The ſeamen alſo call trying how much water a ſhip draws *gaging*, or rather *gauging* of her; and it is done thus: They drive a nail into a pike, near the end, and then put down this pike by the rudder, till the nail catch hold under it; for then, as many feet as the pike is under water is the ſhip's gage, or depth of water ſhe draws.

GAGE, among *Letter-founders*, is a piece of box, or other hard wood, variouſly notched; which is uſed to adjuſt the dimenſions, ſlopes, &c. of the different ſorts of letters. There are ſeveral kinds of theſe gages. See FOUNDERY.

GAGE, in *Pneumatics*, is of various ſorts, according to the purpoſes to which it is applied. Thus.

GAGE *of the Air-pump*. The principle upon which the gage of the air-pump is conſtructed is very obvious; we ſhall here briefly deſcribe thoſe that are in common uſe, and refer to the article AIR-*pump* for the mode of their application. The "ſhort barometer gage" is merely the lower part of a barometer or a tube about eight or nine inches in length, filled with mercury, and immerſed with its aperture into a ſmall quantity of mercury contained in a glaſs-veſſel, which forms the ciſtern. This gage is either placed under the receiver upon the principal plate of the pump, or it is placed under a ſeparate ſmall receiver, upon a ſmall auxiliary plate, which is annexed to ſome air-pumps for this purpoſe. As this gage is not equal to a whole barometer, it will not ſhew the very ſmall degree of rarefaction; but its indications will commence when about three-quarters of the air have been removed from the receiver, that is, when the air has been rarefied till its remaining elaſticity is not able to ſupport that column of mercury. This gage has a ſcale of inches and parts of an inch affixed to the tube, which ſhews the preciſe altitude of the mercury in it. The "long barometer gage" is a tube of about thirty-three inches in length, open at both ends, having its lower end immerſed in a ciſtern of quickſilver, which is fixed on the pedeſtal, or lower part of the frame of the pump; the tube itſelf reaching from that place to the height of the plate. The upper aperture of the tube communicates, by means of a braſs tube, with the inſide of the pump. This is, in reality, an empty barometer, which is filled with quickſilver, by withdrawing the air from it through its upper aperture; and if the pump could produce a perfect vacuum, the mercury in this long gage would riſe as high as it does in the common barometer; but as the pump cannot exhauſt ſo far, therefore the difference of altitude between the mercury of the long gage, and that of a common barometer, ſhews the quantity of air that remains in the receiver. This difference of altitude is indicated by a ſcale of inches and parts of inches, which is always affixed to the long barometer gage. As the altitude of the mercury in a common barometer is to its cotemporaneous altitude in this gage, ſo is the whole quantity of air which was in the receiver before the rarefaction to that quantity which has been drawn out of it. The "ſyphon-gage" differs from the ſhort barometer gage merely in this circumſtance; that inſtead of terminating in a little ciſtern, in this gage the tube is bent and riſes upwards with its aperture, which by means of a braſs tube is made to communicate with the inſide of the pump; ſo that the aſcending leg of the tube performs the office of a ciſtern: hence, in rarefying the air, the mercury deſcends from the cloſed end of the tube, and riſes into the aſcending leg; and conſequently the altitude of it in one leg above its altitude in the other leg, which is in reality the ciſtern, ſhews the degree of rarefaction, and this altitude is denoted by an annexed ſcale of inches and parts of inches.

The gages above-mentioned evidently indicate the elaſticity of the fluid, which remains in the receiver of the pump after a certain degree of rarefaction; and it is immaterial whether that elaſtic fluid be air, or vapour of water, or other elaſtic fluid; but there is another gage, which from its ſhape was called the "pear-gage" by its inventor, Mr. Smeaton, and which ſhews (not at the actual time, but after the re-admiſſion of air into the receiver) how much air was left in the receiver in the preceding rarefaction. This pear-gage conſiſts of a glaſs-veſſel A (*Plate* XIV. *Pneumatics*, *fig.* 4.) which has a ſmall projecting orifice B, and at the other end it is extended into a tube cloſed at D; the capacity of this tube is the 100dth part of the capacity of the whole veſſel. This gage is ſuſpended, with its aperture downwards, to the lower end of a ſlip-wire, or a wire which paſſes through a collar of leather, within a glaſs-receiver of the pump, and exactly under it a ſmall cup, containing quickſilver, is placed upon the plate of the pump. When the pump has been worked to the intended degree, the air in the pear-gage is evidently rarefied as much as it is in the receiver. In that ſtate, by lowering the ſlip wire, the pear-gage is let down till its aperture B has reached the bottom of the mercury. This done, the external air is admitted into the receiver; but it cannot be admitted into the pear-gage, becauſe the aperture B of that gage is now immerſed in the quickſilver; but the preſſure of the atmoſphere on the ſurface of the quickſilver forces that fluid into the pear-gage, and fills it up to a certain degree E; then the upper part D E of the gage will contain all the air or vapour which occupied the whole cavity of the gage during the rarefaction. Annexed to the upper part D E of the gage is a divided ſcale, which ſhews what part of the capacity of the whole gage is filled with air, and of courſe it manifeſts the degree to which the rarefaction of the air had been carried. *E. G.* If we find that the part D E of the gage, which is filled with air above the quickſilver, is the 500dth part of the whole, we may conclude, that the air in the receiver had been rarefied 500 times, &c. But between the indications of this and of the preceding gages, there will

will be a very conſiderable difference. When the receiver contains no other fluid beſides air, then the pear-gage and the other gages indicate the ſame degree of rarefaction; but if the receiver contain the vapour of water or of other liquor, then the pear-gage will indicate a much greater degree of rarefaction than the other gages; becauſe the vapour which has elaſticity ſufficient to ſupply the place of air in the receiver, on the re-admiſſion of air, is condenſed into a ſpace much ſmaller than the ſame quantity of rarefied air can be condenſed into; ſo that the pear-gage ſhews the quantity of *air* alone which had been left in the receiver; whereas the other gages ſhew the quantity of elaſtic fluid which is actually remaining in the receiver.

The extraordinary powers of exhauſtion in Mr. Smeaton's air-pump, as they are indicated by his pear-gage, have been conſidered with peculiar attention by Mr. Nairne, F.R.S. He was led to proſecute a ſeries of experiments on this ſubject, by obſerving the remarkable difference between the indications of exhauſtion and rarefaction by this gage, and by the common barometer-gage. Having uſed every poſſible precaution in preparing his different gages, he nevertheleſs found, that, when they are put under a receiver, placed on a leather dreſſed in alum, and ſoaked in oil and tallow, according to his uſual method, and the pump was worked for ten minutes, the quickſilver in the barometer-gage roſe to within one tenth of an inch of the height of the quickſilver in the ſtandard barometer, which was at that time at thirty inches, and indicated that the air had been rarefied only about three hundred times; whereas Mr. Smeaton's pear-gage indicated a degree of exhauſtion equal to ſix thouſand times; the whole of its cavity, on dipping its open end into the cup of quickſilver, and letting in the air, except a ſix thouſandth part, being filled by the quickſilver. The difference of indications by theſe two gages was found much more conſiderable in ſubſequent experiments. Having an opportunity of repeating ſome of theſe experiments before the honourable Henry Cavendiſh, Mr. Smeaton, and others, in April 1776, Mr. Cavendiſh accounted for the obſerved and aſtoniſhing difference, by referring to ſome experiments of his father, lord Charles Cavendiſh, from which it appeared, that water, whenever the preſſure of the atmoſphere on it is diminiſhed to a certain degree, is immediately turned into vapour, and reduced as ſuddenly to water again on reſtoring the preſſure: the degree of preſſure varies according to the temperature of the water; for when the heat is 72° of Fahrenheit's ſcale, it turns into vapour as ſoon as the preſſure is reduced to that of three quarters of an inch of quickſilver, or about one fortieth of the uſual preſſure of the atmoſphere; but when the heat is only 41°, the preſſure muſt be reduced to that of a quarter of an inch of quickſilver, or to one hundred and twentieth of the uſual preſſure, before the water turns into vapour. According to this theory, whenever the air in the receiver is exhauſted to the above-mentioned degree, the moiſture adhering to the different parts of the machine will be converted into an elaſtic vapour, and ſupply the place of the air, which is drawn away by the working of the pump; and the fluid left in the receiver and pear-gage will be chiefly this vapour. When the air is let into the receiver, the vapour within the pear-gage will be reduced to water, and only the real air will remain uncondenſed; and therefore this gage only ſhews how much real air is left in the receiver, and not how much the preſſure or ſpring of the included air is diminiſhed; whereas the barometer-gage ſhews how much the included fluid is diminiſhed, and that equally, whether it conſiſts of air or vapour. In order to aſcertain the truth of this plauſible theory, Mr. Nairne proceeded to free every part of his apparatus as much as poſſible from any adhering moiſture, concluding that by this means he ſhould be able to bring the two gages to an agreement. Inſtead of placing the receiver on leather, as before, he put it on the pump-plate, made as clean and dry as poſſible, and applied a cement round its edge to exclude the outward air. When the pump in this ſtate was worked for ten minutes, the barometer-gage indicated a degree of exhauſtion nearly equal to ſix hundred; and, on letting the air into the receiver, the pear-gage indicated a degree of exhauſtion little more than ſix hundred alſo. In another experiment he put a piece of the oiled leather above mentioned in the receiver, and found, on working the pump, that the barometer-gage indicated a degree of exhauſtion of nearly three hundred, but the pear-gage indicated a degree of exhauſtion not leſs than four thouſand. But on taking out the piece of leather, and repeating the experiments, the two gages agreed, as before. Having thus concluded, in general, that a conſiderable quantity of vapour aroſe from the compound of leather, alum, oil, and tallow, it was his next object to find out from which of theſe ſubſtances the vapour was principally derived. For this purpoſe he ſeparately and ſucceſſively included in the receiver two ounces of tallow, the ſame quantity of oil and alum, and a piece of leather as it comes from the leather-ſellers, weighing a hundred grains: from theſe experiments he found that the elaſtic vapour, which occaſioned ſo great a difference in the teſtimony of the gages, aroſe chiefly from the leather, and very little from the tallow, oil, and alum. In the experiment with the leather, it ſupplied the place of the exhauſted air ſo faſt, that he could not in ten minutes make the barometer-gage indicate a degree of exhauſtion of more than a hundred and fifty-nine; whereas that of the pear-gage was a hundred thouſand. In order to determine whether the difference in the gages was occaſioned by the moiſture of the leather, Mr. Nairne repeated the experiment with a piece of freſh leather, weighing a hundred grains. The pear-gage indicated a rarefaction of a hundred thouſand, and the leather had loſt two grains of its weight; when the ſame piece of leather was ſo thoroughly dried by the fire till it would loſe no more of its weight, and thus reduced to eighty grains, it gained two grains in the experiment, and the pear-gage exhibited a rarefaction only of two hundred and eighty. The leather was afterwards held in the ſteam of hot water till it had regained its former moiſture and weight, and the degree of exhauſtion indicated by the pear-gage was a hundred thouſand, and the loſs of weight, two grains, as before. In the firſt of theſe experiments, the degree of rarefaction indicated by the barometer-gage was a hundred and thirty-four; in the ſecond, two hundred and ſixty-eight; and in the third, one hundred and forty-ſeven. The effect of the vapour ariſing from ſmall quantities of different fluids, and from other ſubſtances containing moiſture, was tried in a variety of inſtances; and having found that the ſmall quantity of moiſture which exhaled from the ſubſtances under the receiver, prevented the pump from exhauſting to a conſiderable degree, Mr. Nairne ſuſpected that whenever wet leather had been uſed to connect the receiver with the plate, there muſt have ariſen ſo great a quantity of vapour as to have prevented the degree of exhauſtion from being near ſo great as in other inſtances. This led him to another ſet of experiments, in order to aſcertain this fact. Having firſt placed the receiver on the pump-plate, made clean and dry, with only a little oil poured round the outſide edge of it, both gages agreed in indicating a rarefaction of ſix hundred, as before: but when the receiver was ſet on leather that had been ſoaked for two days in water, the rarefaction indicated by the barometer-gage

was

was uniformly fifty-one in three different trials; but the pear-gage exhibited firſt ſixteen thouſand, in the ſecond inſtance fifteen hundred, and in the third one thouſand: when the receiver was placed on a piece of leather, ſoaked in a mixture of water and ſpirit of wine, the barometer-gage in three trials always indicated a degree of exhauſtion equal to forty-ſeven; but the pear-gage was unaccountably various; in the firſt trial being twelve thouſand, in the ſecond, eleven hundred and fifty; and in the third, five hundred. By theſe experiments it ſufficiently appears, that the uſe of leather ſoaked in water, or in water and ſpirit of wine, prevents the pump from exhauſting to any conſiderable degree. By two other experiments, in which water was uſed for ſoftening the leathers of the piſtons of a common air-pump, we find that the higheſt degree of rarefaction that could be procured was thirty-ſeven, according to the barometer-gage; and thirty-eight according to the pear-gage. Mr. Nairne's laſt experiment furniſhes a very extraordinary evidence of the effect of vapour on the barometer-gage: having put a phial of ether under the receiver, in order to produce artificial cold, and working the pump for half an hour, the degree of exhauſtion indicated by the barometer-gage was only ſixteen; though the ſame pump exhauſted above four hundred times before the ether was put under the receiver. The degree of cold produced by means of ether, in the exhauſted receiver, was 48°, below 0 in Fahrenheit's ſcale, or 103 below 55°, which was the temperature of the air in the room where the experiment was made. Phil. Tranſact. vol. lxvii. part ii. art. 32, page 614, &c.

GAGE *of the Barometer*, is a contrivance for eſtimating the exact degree of the riſe and fall of the mercury in the Torricellian tube. It is well known, that whilſt the mercury riſes in the tube, it ſinks in the ciſtern, and *vice verſâ*; and, as the diſtance between the diviſions graduated on the annexed ſcale and the ſurface of the mercury in the ciſtern is not truly ſhewn by the numbers on the ſcale, errors muſt happen in determining the preciſe height of the mercury. To remedy this inconvenience, a line is cut upon a round piece of ivory, which is fixed near the ciſtern: this line is accurately placed at a given diſtance from the ſcale; *e. gr.* twenty-ſeven inches; and a ſmall float of cork, with a cylindric piece of ivory fixed to its upper ſurface, on which a line muſt be cut at the diſtance of two inches, exactly from the under ſurface of the cork, is left to play freely on the quickſilver, and the cylinder works in a groove made in the other piece: from this conſtruction it appears, that if theſe marks are made to coincide, by raiſing or lowering the ſcrew which acts on the quickſilver, then the diviſions on the ſcale will expreſs the true meaſure of the diſtance from the ſurface.

GAGE *of the Condenſer*, is a glaſs tube of a particular conſtruction, adapted to the condenſing engine, and deſigned to ſhew the exact denſity and quantity of the air contained at any time in the *condenſer*, which ſee. For this purpoſe, let *D d e f c*, *Plate* XIV. *Pneumatics*, *fig.* 5. be a ſmall glaſs tube, about one-tenth of an inch in diameter, open at D, but hermetically ſealed at *c*; D E a larger tube, hermetically ſealed at D, and containing at that end a quantity of mercury, which takes up two or three inches in length, and covers the open end of the ſmaller tube; the other end C, of the larger tube, is ſtrongly cemented into the braſs elbow-piece O E *o* at C, *fig.* 6, ſo as not to be quite at right angles with O *o*, but to incline a little downwards, that the mercury at D may not run towards C, and paſs into the condenſing glaſs G B. This gage is ſcrewed on at *o*, and the injecting ſyringe at O, a cock being interpoſed at O or *o*, or not uſed at all, according to the nature of the experiment. Whilſt air is injected into the condenſing glaſs, and the large tube of the gage at the ſame time, the air in the ſmaller tube, which has no communication with the injected air, muſt be rarer and weaker, and, therefore, the mercury at D will enter the tube, and advance in it, in proportion to the condenſation of the air in G B. In *fig.* 5, *d*, *e*, *f*, repreſent three rings of ſpringy wire, at ſuch diſtances as to ſhew, by the motion of the mercury in the ſmall tube, when the denſity of the air is doubled, tripled, or quadrupled; becauſe the air, which at firſt filled the whole ſmall tube, now takes up only the ſpaces *c d*, *c e*, *c f*; or, in Mr. Hawkſbee's ſtyle, one, two, or three atmoſpheres are thrown in.

Another kind of gage may be put within the condenſing glaſs, at the bottom of it, when the uſe of the preceding gage would be inconvenient. This is a ſhort cylinder of wood, *fig.* 7, about an inch thick, with a hole through its middle between *a* and *b*, of about 1½ inch in diameter; the outward diameter of the cylinder muſt be about four inches, ſo that the cylinder may eaſily ſtand within the condenſing glaſs on the plate, ſupporting its bottom at B, *fig.* 6. There is a hole at A of about ¾ of an inch in diameter, and ¾ of an inch deep, filled with mercury; *a c d b* is a ſmall glaſs tube, open at *a*, but hermetically ſealed at *b*, and bent to a right angle at *c*, the middle of the diſtance between *a* and *b*. When the open end, *a*, is immerſed in mercury, and the air on the ſurface of the mercury condenſed, the air in the tube will recede towards the elbow *c*, and the mercury following it, ſhew to what degree it is condenſed. When the mercury is at *c*, then one additional atmoſphere bears upon its ſurface, and two atmoſpheres, if it be come to *d*; which places are marked by rings of ſpringing braſs wire; at *a* and *b*, about an inch of the ends of the tube are bent to a right angle, that the end *b* may go into the wood, whilſt the end *a* goes under the ſurface of the mercury, where it is held by a cork, whilſt air is injected into the condenſing glaſs. Deſaguliers' Exp. Phil. vol. ii. p. 394, &c.

GAGE, *Sea*. See ALTITUDE.

GAGE, *Bucket Sea*, an inſtrument contrived by Dr. Hales, to find the different degrees of coolneſs and ſaltneſs of the ſea, at different depths: it conſiſts of a common houſhold pail or bucket, with two heads. Theſe heads have each a round hole in the middle, about four inches in diameter, covered with ſquare valves opening upward; and that they may both open and ſhut together, there is a ſmall iron rod fixed to the upper part of the lower valve, and the other end to the lower ſide of the upper valve. So that as the bucket deſcends with its ſinking weight into the ſea, both the valves may open by the force of the water, which by that means has a free paſſage through the bucket. But when the bucket is drawn up, then both the valves ſhut by the force of the water at the upper part of the bucket; ſo that the bucket is drawn up full of the loweſt ſea water to which it has deſcended.

When the bucket is drawn up, the mercurial thermometer fixed in it is examined; but great care muſt be taken to obſerve the degree at which the mercury ſtands, before the lower part of the thermometer is taken out of the water in the bucket, leſt it be affected by the different temperature of the air.

In order to keep the bucket in a right poſition, there are four cords fixed to it, reaching about three feet below it; to which the ſinking weight is fixed.

The reſult of ſeveral trials with this gage was, that when it was let down to different depths, from 360 feet to 5346 feet, in lat. 25° 13′ N. and long. 25° 12′ W., it was diſcovered by the thermometer, that the cold increaſed gradually in proportion to the depths, till it deſcended to 3900 feet, *viz.*

near ¾ of a mile, whence the mercury in the thermometer came up at 53 ; and though it was afterwards ſunk to 5346 feet, *i. e.* a mile and 66 feet, it came up no lower: the warmth of the water upon the ſurface, and that of the air, was all that time 84°.

When the water in the bucket was become of the ſame temperature with that on the ſurface of the ſea, equal quantities of both were weighed and tried by the hydrometer: that from below was found to be the heavieſt, and, conſequently, the ſalteſt. See Treatiſe on Ventilators, part ii. p. 122, &c.

Dr. Hales was probably led to the conſtruction of this ſea-gage from an inſtrument invented by Dr. Hook, and deſigned for the ſame purpoſe. This conſiſts of a ſquare wooden bucket C, *Plate* XVI. *Miſcellany*, *fig.* 1, whoſe bottoms are ſo contrived, that, as the weight A ſinks the iron B, to which the bucket C is faſtened by two handles D, D, on the end of which are the moveable bottoms or valves E, E, and thereby draws down the bucket, the reſiſtance of the water keeps up the bucket in the poſture C, whereby the water, whilſt the bucket is deſcending, hath free paſſage through it; whereas, as ſoon as the bucket is pulled upwards by the line F, the reſiſtance of the water to that motion bears the bucket downwards, and keeps it in the poſture G, whereby the included water is kept from getting out, and the ambient water kept from getting in. Phil. Tranſ. N 9, p. 149, and No. 24, p. 447, or abr. vol. ii. p. 260.

Gage, *Aqueo-mercurial*, is the name of an apparatus contrived by Dr. Hales, and applied, in various forms, to the branches of trees, in order to determine the force with which they imbibe moiſture. Let *e r*, *Plate* XVI. *Miſcellany*, *fig.* 2. be a cylindric glaſs, *e. gr.* of an inch diameter within, and eight inches long. Into this glaſs is introduced the branch of a young thriving apple-tree *b*, about three feet long, with lateral branches; the diameter of the tranſverſe cut *i* being ¾ of an inch. Having fitted the joint *r* to the tube at *r*, by folding a piece of ſheep's ſkin round the ſtem, it is cemented with a mixture of bees'-wax and turpentine melted together in ſuch a proportion, as to make a very ſtiff clammy paſte when cold, and over the cement folds of wet bladders are bound firmly with packthread. To the lower end *e* of the large tube, a ſmaller tube *z e* is cemented, being about ¼ of an inch diameter, and eighteen inches long, and in ſubſtance full ⅛ of an inch thick. Theſe tubes are cemented together at *e* with common hard brick-duſt, or powdered chalk cement, and the joint is farther ſecured with the cement of bees'-wax and turpentine, over which a wet bladder is bound. The apparatus being thus prepared, the branch is turned downwards, and the glaſs tube upwards, and then both tubes are filled with water, with the finger applied to the open end of the ſmall tube, it is inverted and immerſed in the glaſs ciſtern *x*, full of mercury and water. In this ſituation the lower end of the branch was immerſed ſix inches in water, *viz.* from *r* to *i*; the water was imbibed by the branch at its tranſverſe cut *i*; and during its aſcent into the ſap veſſels of the branch, the mercury roſe in the tube *e z* from the ciſtern *x*, ſo that in half an hour it was riſen 5¾ inches high, as far as *z*. The height of the mercury indicated, in ſome meaſure, the force with which the ſap was imbibed, though not the whole force; becauſe, while the water was imbibed by the branch, its tranſverſe cut was covered with innumerable little hemiſpheres of air, and many air-bubbles iſſued out of the ſap-veſſels, which partly filled the tube *e r*, as the water was drawn out of it: and, therefore, the height of the mercury could only be proportional to the exceſs of the quantity of water drawn off above the quantity of the air, which iſſued out of the wood. If the quantity of air, iſſuing from the wood, had been equal to the quantity of water imbibed, it is plain that the mercury could not riſe at all, becauſe there would be no room for it in the tube: but if nine parts in twelve of the water be imbibed by the branch, and only three ſuch parts of air iſſue into the tube in the ſame time, the mercury muſt riſe near ſix inches, and ſo proportionably in other caſes. Dr. Hales obſerved, that the mercury roſe higheſt, in moſt caſes, when the ſun was clear and warm, and that it ſubſided three or four inches towards evening, but roſe again the next day as it grew warm, though ſeldom ſo high as at firſt. Dr. Hales adapted the ſize and ſhape of the glaſs apparatus to a great variety of branches of ſeveral ſizes, and of different kinds of trees, and repeated the experiment above deſcribed, *mutatis mutandis*, in a variety of inſtances. See his Vegetable Statics, vol. i. chap. ii. p. 84, &c.

Gage, *Sliding*, is a tool uſed by mathematical inſtrument makers for meaſuring and ſetting off diſtances: it conſiſts of a beam, tooth, ſliding ſocket, and the ſhoulder of the ſocket.

Gage, *Tide*, is the name of an inſtrument uſed for determining the height of the tides by Mr. Bayly, in the courſe of a voyage towards the ſouth-pole, &c., in the Reſolution and Adventure, in 1772, 1773, 1774, and 1775.

This inſtrument conſiſts of a glaſs tube, whoſe internal diameter was ſeven-tenths of an inch, laſhed faſt to a ten feet fir rod, divided into feet, inches, and quarters: this rod was faſtened to a ſtrong poſt fixed upright and firm in the water. At the lower end of the tube was an exceeding ſmall aperture, through which the water was admitted. In conſequence of this conſtruction, the ſurface of the water in the tube was ſo little affected by the agitation of the ſea, that its height was not altered one-tenth of an inch when the ſwell of the ſea was two feet; and Mr. Bayly was certain, that with this inſtrument he could diſcern a difference of one-tenth of an inch in the height of the tide.

Gage, *Water*. See Altitude and Hydrometer.

Gage, *Weather*, in *Sea Language*. See Gage, above.

Gage *Iſland*, in *Geography*, an iſland in Upper Canada, in the county of Ontario, lying off Kingſton in lake Ontario, between Amherſt iſland and Wolfe iſland.

Gage's *Town*, a ſettlement in Sunbury county, New Brunſwick, on the lands amounting to 20,000 acres, on the weſt ſide of John's river on the northern ſhore of the bay of Fundy.

GAGER *de Ley*. See Wager *of law*.

Gager, *and* Gaging, in *Geometry*. See Gauger. Gauging.

GAGES, in *Geography*, a town of France, in the department of the Aveiron; ſix miles N. E. of Rhodez.

GAGLIARDA, *Ital.* Gaillarde, *Fr.* a gay, frolicſome, and riotous old dance; which, like the modern *waltz*, is almoſt always in triple time. Galliarda, *quaſi* valiarda, from the Latin *validus*, ſtrong, ſtout, powerful, briſk, lively.

This dance has been long out of uſe; but there was a time when the galliarda was a favourite movement, not only with dancers, but with performers on the virginal: as in queen Elizabeth's Virginal book, in that of lady Nevil, and in Parthenia, the galliarda generally ſerves as an allegro to Pavana, a ſlow and ſtately dance, in almoſt every ſuit of leſſons in the three collections by Dr. Bull, Bird, Giles Farnabie, Morley, and others. See Pavana and Parthenia.

GAGNANO, in *Geography*, a town of Naples, in Capitanata; 17 miles E. of Lelina.

GAGNEF,

GAGNEF, a town of Sweden, in Dalecarlia; 15 miles S. W. of Fahlun.

GAGNIER, John, in *Biography*, born and educated at Paris, was a diligent ſtudent in the Hebrew and Arabic languages, in which he became a great adept. He was brought up in the Catholic faith, and when his ſentiments changed in this reſpect, he left France and came to England, where he ſoon acquired the friendſhip of many able and very learned men, among whom were archbiſhop Sharp, and the lord chancellor Macclesfield. He graduated at Cambridge, and likewiſe at Oxford, where he fixed his reſidence for the ſake of conſulting the Bodleian library, and he ſupported himſelf by teaching Hebrew. He publiſhed, in 1706, Joſeph Ben Gorion's Hiſtory of the Jews, in the original Hebrew, with a Latin tranſlation and notes, in a quarto volume. In 1717 he was appointed to read the Arabic lecture at Oxford in the abſence of Dr. Wallis, and upon his death was choſen to the profeſſorſhip in his ſtead, which office he filled with great reputation till his death. He publiſhed two valuable works reſpecting the hiſtory of Mahomet: theſe are, "Iſmael Abulfeda de vita et rebus geſtis Mohammedis, &c. Latine vertit, Prefatione et notis illuſtravit Joh. Gagnier:" and "La Vie de Mahomet, traduite et compilèe de l'Alcoran, des Traditions authentiques de la Sonna, et des meilleurs Auteurs Arabes," 3 vols. 12mo.

GAGNOLA, in *Ichthyology*, a name given by the Spaniards to a ſpecies of the acus, or ſyngnathus of Artedi. The particular ſpecies meant by it, is that called by Artedi the hexagonal bodied ſyngnathus with the pinnated tail; others call it the acus Ariſtotelis, or acus ſecunda, and the French the trompette; we call it ſometimes the needle-fiſh, ſometimes the trumpet-fiſh, and ſometimes the tobacco-pipe fiſh. See Syngnathus.

GAGO, in *Geography*, a kingdom of Africa, with a town of the ſame name, in Negroland; fertile and abounding in corn, rice, and mines of gold. N. lat. 12°. E. long. 2°.

GAGRA, a river of Hindooſtan, which riſes in the lofty weſtern mountains of Thibet, and after a courſe of between 600 and 700 miles, nearly parallel on the eaſt with that of the Ganges, pervading the province of Oude, flows into the Ganges near Chupra: it is now called Surjoo.

GAGUIMPAR, a town of Hindooſtan, in Golconda; 15 miles W. S. W. of Hydrabad.

GAGUIN, Robert, in *Biography*, was born at Colines, in the dioceſe of Amiens. He ſtudied at Paris, took the degree of doctor of laws, and was ſoon after made profeſſor of canon law. In 1473, he was elected general of the order of the Mathurins, and on account of his reputation was employed by Charles VIII. and Louis XII. in various embaſſies in Italy, Germany, and England. He died at Paris in the year 1501. He was conſidered one of the beſt Latin writers of his age, yet his ſtyle is defective in purity and elegance. He was author of many works: of theſe the principal are, 1. "Compendium ſuper Francorum geſtis Pharamundo uſque ad annum 1491." 2. "The Chronicle of Archbiſhop Turpin, tranſlated from Latin into French by command of Charles VIII." 3. "Epiſtolæ et Orationes." 4. "De Puritate Conceptionis Virginis Mariæ." He is ſaid to have given a French tranſlation of Cæſar's Commentaries. Moreri.

GAGUL, in *Geography*, a river of Beſſarabia, which runs into the Danube; eight miles E. of Reni.

GAHALA, in *Botany*, a name given by ſome writers to the *colocaſia*, or great Egyptian arum.

GAHARAN, in *Geography*, a town of Algiers; 60 miles W. S. W. of Tubnah.

GAHNIA, in *Botany*, named by Forſter in honour of Dr. Henry Gahn, a Swediſh botaniſt, whoſe inaugural diſſertation is in the *Fundamenta Agroſtographiæ* of Linnæus. Forſt. Gen. t. 26. Linn. Suppl. 31. Schreb. 235. Willd. Sp. Pl. v. 2. 244. Juſſ. 27. Brown Nov. Holl. v. 1. 238. Lam. Illuſtr. t. 263. Gærtn. fil. t. 181. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Calamariæ*, Linn. *Cyperoideæ*, Juſſ.

Gen. Ch. *Cal.* Glumes numerous, imbricated on all ſides, channelled, pointed, the upper, or innermoſt, largeſt, permanent. *Cor.* none. *Nectary*, or briſtles about the baſe of the germen, none. *Stam.* Filaments ſix, rarely but three, capillary, ſhort, greatly elongated after flowering, and permanent; anthers linear, pointed. *Piſt.* Germen oblong; ſtyle thread-ſhaped, erect, longer than the calyx, three-cleft; ſtigmas two to each diviſion, capillary, recurved, rarely ſimple. *Peric.* Nut bony, oblong, angular, ſmooth, encompaſſed with the permanent filaments. *Seed* ſolitary, tranſverſely notched.

Eſſ. Ch. Calyx of numerous imbricated glumes. Filaments elongated after flowering. Style three-cleft. Nut with a ſolitary tranſverſely notched ſeed.

Obſ. We have profited by the remarks of Mr. R. Brown and of Gærtner, aſſiſted by our own examination of the plants of this genus, to render its character more faithful. The corolla and nectary of Linnæus are probably interior more delicate ſcales, found in the flowers of ſome ſpecies, but we ſuſpect not in all. The flowers are truly ſimple and diſtinct, each reſembling a ſpikelet, but conſiſting of a rachis or receptacle clothed with imbricated ſcales and crowned with the organs of impregnation.

1. G. *procera*. Linn. Suppl. 211. Forſt. Prod. 25. Nov. Act. Upſ. v. 3. 178. - Panicles ſpicate, numerous, elongated. Nut priſmatic, oblong.—Native of New Zealand, near Duſky Bay. A hard, rigid, ruſhy plant, three or four feet high. *Leaves* narrow, channelled, rough. *Panicles* ſlender, aggregate, leafy, with blackiſh, broad, long-pointed bracteas, extending beyond the flowers. *Nut* light brown, priſmatic, equally tapering at both ends. *Stigmas* deeply divided, The long, brown, permanent filaments are very remarkable.

2. G. *ſchœnoides*. Forſt. Prod. 26.—Culm zig-zag. Panicles compound, ſpicate, crowded. Nut obovate, obtuſe; priſmatic at the baſe.—Native of Otaheite. *Panicles* more denſe and crowded than in the former, with broader bracteas. The broader blunt fruit at once diſtinguiſhes it. Mr. Brown refers this ſpecies to his new genus *Lampocarya*, in which the ſeed is not tranſverſely notched.

3. G. *pſittacorum*. Billard. Nov. Holl. v. 1. 89. t. 115. Brown. Nov. Holl. v. 1. 238.—Panicle repeatedly compound. Nut nearly globular. Glumes obtuſe. Permanent filaments criſped.—Native of Van Diemen's Land. The *leaves* of this are externally remarkably rough. The large, cloſe, repeatedly branched, black panicle, and ſhining brown fruit, reſemble ſome of the large tropical ſpecies of *Holcus* or *Andropogon*. The *flowers* are very taper at their baſe, with numerous, gradually leſſening, ſcales.

4. G. *leucocarpa*. Brown 239.—"Panicle repeatedly compound. Glumes bluntiſh. Nuts opaque, with an acute withered point."—Native of the ſouth coaſt of New Holland. *Brown*. Of this we have ſeen no ſpecimens.

5. G. *erythrocarpa*. Brown 239.—Panicle repeatedly compound. Glumes all acute. Nuts nearly elliptical, ſhining, and coloured.—Native of New South Wales, about Port Jackſon and Botany Bay. *Herb. Banks.*—Like the third ſpecies, but more ſtriking and beautiful on account of its

its ſcarlet *fruit*, which is ſcarcely half ſo large as in that, and not obovate, but elliptical, inclining to globoſe.

6. G. *melanocarpa*. Brown 239.—Panicles ſpicate, numerous. Glumes all acute. Nuts broadly elliptical, pointed, poliſhed. Stamens three. Stigmas undivided.—Native of New South Wales and Van Diemen's Land. The *panicle* has the habit of the two firſt ſpecies, but is ſmaller and paler. The *fruit* is ſhining and very black. *Leaves* ſmooth at the back. According to Mr. Brown, who has examined the living flowers, their ſtamens are but three, and the ſtigmas are ſimple, yet there can be no doubt reſpecting the genus.

7. G. *trifida*. Billard. Nov. Holl. v. 1. 89. t. 116. (Lampocarya? hexandra; Brown Nov. Holl. v. 1. 238.) Panicles denſe, capitate. Glumes all pointed. Nuts nearly globular, poliſhed. Stigmas undivided.—Native of Van Diemen's Land. Remarkable for the capitate *panicles*. The *fruit* is ſaid to be blueiſh.

GAHNITE, in *Mineralogy*, one of the recently diſcovered Swediſh foſſils, of which Meſſrs. Eckeberg and Vauquelin have given the analyſes. It is found maſſive and in ſmall and middle-ſized octohedral cryſtals, imbedded in a talcoſe rock. The colour is deſcribed as greeniſh-black, greeniſh-brown, and perfect liver-brown in the imperfect ſpecimens we have had an opportunity of examining; nor were we able to diſcover a metallic luſtre as mentioned by Haüy. Internally it is dull. Fracture imperfectly conchoidal. Hardneſs ſufficiently great to ſcratch quartz. It is infuſible before the blow-pipe, except here and there on the ſurface of ſmall fragments, which becomes cracked and white. It does not act on the magnetic needle. Specific gravity, according to Haüy, 4.6969. The conſtituent parts of gahnite are thus ſtated:

Eckeberg.		Vauquelin.	
Alumine	60	Alumine	42
Silica	4	Silica	4
Oxyd of zinc	24	Oxyd of zinc	28
Iron	9	Sulphur	17
Loſs	3	Oxyd of iron	5
	100	Parts not acted on	4
			100

The quantity of this ſubſtance operated on by Vauquelin was not ſufficient to allow him to vary his experiments. He conjectures that the zinc exiſts in it in the ſtate of blende, and thinks it probable that the alumine and ſilica are united with this ſulphuret of zinc.

Haüy refers this ſubſtance, with a query, to his ſpinelle, as ſpinelle zincifère; while Brongmart adds it to the zinc genus, under the name of zinc gahnite. The advantage of giving to new mineral ſubſtances names unconnected with theory and ſyſtem, is illuſtrated by the inſtance of gahnite. While the latter name may be retained, whatever be the place this ſubſtance is to occupy hereafter in the ſyſtem, one at leaſt of the juſt mentioned denominations of the French mineralogiſts muſt contribute to ſwell its ſynonomy, which, conſidering the recency of the diſcovery of this foſſil, is already ſufficiently enriched by the propoſed appellations of fahlun-cryſtals, fahlunite, automalite, and zinciferous corundum, which laſt, by the editor of a French journal, has been converted into corindon ſanguiferè.

GAJA, in *Geography*, a town of Italy, in the department of the Panaro; 20 miles S. of Modena.

GAIANITES, GAIANITÆ, a ſect of ancient heretics, ſprung from the Eutychians.

This ſect was of an older ſtanding than Gaian, a biſhop of Alexandria in the ſixth century, from whom, however, they took their name. They adhered to the opinion of Julian Halicarnaſſeus, the chief of the Incorruptibles and Phantaſtici; and came, at length, to be denominated Gaianites, upon Gaian's putting himſelf at their head. They denied that Jeſus Chriſt, after the hypoſtatical union, was ſubject to any of the infirmities of human nature.

GAJARA, in *Geography*, a town of Hindooſtan, in the circar of Gohud; 12 miles N. of Narwa.

GAICKEN, a town of Pruſſia, in the palatinate of Culm; five miles N. E. of Straſburg.

GAIDEROPSARUS, in *Ichthyology*, a name given by ſome to a fiſh of the truttaceous kind, caught in the Mediterranean, and more uſually called *callarias*.

GAIDRONISI, or GAITHERONESI, *i. e. Aſſes' iſland*, in *Geography*, a ſmall iſland in the Mediterranean, near the ſouth coaſt of Candia; a mere rock, producing only a few branches of thyme, and inhabited only by wild pigeons. It was fortified by Patroclus, and once bore his name, when he was deputed by the Egyptians to aſſiſt the Athenians againſt Antigonus, the ſon of Demetrius. N. lat. 34° 48′. E. long. 25° 45′.

GAJERAM, a town of Hindooſtan, in the circar of Rajamandry; 15 miles N. W. of Rajamandry.

GAIGNY, or GAGNY, JOHN, in *Biography*, was probably born at Paris in the beginning of the 16th century, for in the year 1526 he had taken the degree of bachelor, and held the appointment of *procureur*, or attorney for the French nation in the univerſity. He was afterwards lecturer in theology at the college of Navarre and rector of the univerſity. In 1531 he took his degree as doctor of divinity, and filled the poſt of chancellor of the univerſity from the year 1546 till the cloſe of 1549, when he died. Gaigny was deeply read in the ancient languages, and highly eſteemed as a Latin poet: his ſovereign, Francis I., entertained ſo great a regard for him, that he frequently conſulted him on ſubjects of literature, and made him his firſt almoner. He was author of many works, all of which were more or leſs connected with theology. Of theſe, the moſt important conſiſt of "Commentaries" upon the different books of the New Teſtament, in which he explains the literal ſenſe by a kind of paraphraſe. He is applauded by Dupin on account of his deep learning and ſolid judgment, who, ſpeaking of his writings, ſays, "his notes will be found of admirable uſe to thoſe who deſire to read the text of the New Teſtament, and to comprehend the ſenſe of it without ſtopping at any difficult places, and without having recourſe to larger commentaries." His Scholia on the four evangeliſts and on the Acts of the Apoſtles, are inſerted in the Biblia Magna of Father John de la Haye. Moreri.

GAILDORF, or GAILENDORF, in *Geography*, a town of Germany, in the lordſhip of Limburg, on the Kocher; 38 miles W.S.W. of Anſpach. N. lat. 49°. E. long. 9° 54′.

GAILLAC, a town of France, and principal place of a diſtrict in the department of the Tarn, ſituated on the Tarn, which is here navigable; 27 miles N.E. of Toulouſe. The place, which has conſiderable trade, and furniſhes from its environs good wine, contains 6,465, and the canton 13,364 inhabitants, on a territory of 217½ kiliometres, in 11 communes. N. lat. 43° 53′. E. long. 1° 58′.

GAILLON, a town of France, in the department of the Eure, and chief place of a canton in the diſtrict of Louviers;

viers ; 7 miles S.E. of Louviers. The place contains 980, and the canton 11,966 inhabitants, on a territory of 195 kiliometres, in 35 communes.

GAILNAU, a town of Franconia ; 5 miles S. of Rothenburg.

GAILOVSKI, a fortreſs of Ruſſia, in the government of Caucaſus, on the Ural ; 12 miles N.E. of Uralſk.

GAIMERSHEIM, a town of Germany, in Upper Bavaria ; 2 miles N.W. of Ingolſtadt.

GAIN, the profit, or lucre, a perſon reaps from his trade, employment, or induſtry.

Some derive the word from the German *gewin ;* whereof the Italians had made *guadagno ;* the French and Engliſh *gain.*

There are legal and reputable gains, as well as ſordid and infamous ones. What is gained beyond a certain ſum, by gaming, is all liable to be reſtored again, if the loſer will take the benefit of the law.

GAIN, in *Carpentry*, the ſloping part of the ſhoulder of a tenon, which has an additional ſupport below, projecting as far as the bottom of the ſloping part, in order to ſtrengthen the tenon.

To GAIN *the wind*, in *Sea Language*, is to arrive on the weather-ſide, or to windward of ſome other veſſel in ſight, when both are plying to windward, or ſailing as near the wind as poſſible.

GAINAGE, GAINAGIUM, in our *Ancient Writers*, ſignifies the draught-oxen, horſes, wain, plough, and furniture, for carrying on the work of tillage by the baſer ſort of ſokemen and villains.

Gainage is the ſame with what is otherwiſe called *wainage.* Bracton, lib. i. cap. 9. ſpeaking of lords and ſervants, ſays, " Ut ſi eos deſtruant, quod ſalvum non poſſit eis eſſe wainagium ſuum." And again, lib. iii. tract. 2. cap. 1. " Villanus non amerciabitur, niſi ſalvo wainagio ſuo." For anciently, as it appears both by Mag. Chart. and other books, the villain, when amerced, had his gainage, or wainage, free ; to the end his plough might not ſtand ſtill ; and the law, for the ſame reaſon, does ſtill allow a like privilege to the huſbandman ; that is, his draught-horſes are not, in many caſes, diſtrainable.

GAINAGE is alſo uſed for the land itſelf, or the profit raiſed by cultivating it.

GAINAS, in *Biography*, a ſoldier under the eaſtern emperors, who was, on account of his valour, raiſed by Theodoſius to the command of all the Goths and other barbarians in his ſervice. He attached himſelf to Stilicho, and was employed by him in the maſſacre of the prefect Rufinus : Gainas gave the ſignal of death, and a daring ſoldier plunged his ſword into the breaſt of the guilty prefect, who fell, groaned, and died at the feet of the affrighted emperor. As a reward of this deed, he was created by Eutropius a general of the Roman army, but diſſatisfied with his ſituation, and diſdaining to ſubmit to the orders of a baſe eunuch, he is ſuppoſed to have fomented the revolt of his countryman Tribigild, with whom he was connected by a domeſtic, as well as by a national alliance. He took the command againſt the rebel, but was ſecretly inclined to favour his cauſe, and in a few months openly united his forces to thoſe of Tribigild, and after plundering ſeveral provinces, advanced to Conſtantinople, and Arcadius the emperor reſigned his authority and his perſon into the hands, and upon the faith of the barbarians. The church of Euphemia was ſelected as the place of the interview. Gainas bowed with reverence at the feet of the emperor, but demanded the ſacrifice of his miniſters Aurelianus and Saturninus, and when the axe was lifted up over their bare necks, he declared himſelf contented to commute the capital part of the puniſhment into perpetual exile. In his early youth Gainas had paſſed the Danube as a ſuppliant and fugitive : his elevation had been the work of valour and fortune, and his indiſcreet or perfidious conduct was the cauſe of his downfall. He claimed for himſelf and his Arian followers the poſſeſſion of a peculiar church, but the public toleration of hereſy wounded the pride of the catholics : every quarter of Conſtantinople was filled with tumult and diſorder. The barbarians gazed with ſuch ardour on the rich ſhops of the jewellers, and the tables of the bankers, which were covered with ſilver and gold, that it was judged prudent to remove thoſe dangerous temptations from their ſight. They reſented the injurious precaution, and attempted to attack and deſtroy with fire the imperial palace : in the tumult ſeven thouſand of the Goths periſhed, Gainas was declared a public enemy ; and in a ſhort time afterwards he, and the greater part of his followers, were ſlain in a battle with the king of the Huns. Univer. Hiſt. Gibbon, vol. v.

GAINBATESA, in *Geography*, a town of Naples, in the county of Moliſe ; 18 miles E.S.E. of Moliſe.

GAINING *of a Mine*, or " putting down the foundation," are terms for the ſinking of ſhafts, and, by means of engines or ſoughs, laying the vein or ſtratum dry which is intended to be wrought. See MINING.

GAINING *of Land from the Sea*, is a term for excluding the tide from a tract of flat land on the ſea-ſhore by means of artificial banks, and conſtructing the neceſſary drains and ſluices for venting the ſpring or ſoakage, and the rain waters of ſuch tract, into the ſea at low water, or lifting the ſame by means of fen-mills, engines, &c. (See EMBANKMENT.) By ſtudying attentively the form in which the tides and waves throw up and maintain banks of ſand and ſhingle between low and high-water mark, on the Norfolk coaſt, north of Yarmouth, Mr. William Smith the engineer, a few years ago, ſucceeded in imitating ſuch banks by art without ſide of the principal ſea-walls or mounds, and which outer or break-water banks, though compoſed only of ſand and ſhingle, in the proper ſhape and direction, which is ſomewhat oblique to the line of coaſt, remain and operate effectually in breaking the force of the waves and protecting the ſea-walls from the ravages which they had previouſly experienced on the occurrence of certain winds with the ſpring tides. The Board of Agriculture, and the Society of Arts, annually offer premiums for gaining land from the ſea, and from their communications and tranſactions much valuable information is to be gathered.

The gaining of land from the ſea is ſometimes effected by the operations of nature, with very little or no aſſiſtance from art, as has happened in the neighbourhood of Old Romney, in Kent, and near Sandwich in the ſame county, and numerous other places : while in other, and more numerous inſtances, land is progreſſively loſt by the undermining and waſhing away of matters compoſing the cliffs. (See ENCROACHMENT *of the Sea.*) M. De Sauſſure, in the fifth chapter of his Agenda, or obſervations to be made, as the foundation of a theory of the earth, inſerted in N° 20 of the " Journal des Mines," has enumerated ſome of the principal obſervations to be made relative to the gaining or loſs of land on the coaſts of the ocean, in different countries : a tranſlation of which will be found in the Philoſophical Magazine, vol. iii. p. 40 ; which obſervations, if multiplied, would prove of important uſe in geological inveſtigations. In M. de Luc's Geological Travels, vol. i. pages 350. 393, &c. lately publiſhed, are ſome curious particulars on this ſubject.

GAINSBOROUGH, THOMAS, in *Biography*, a

painter endowed with very extraordinary talents, which he exerciſed in landſcapes and in portraits, to the honour of the country and age in which he lived. He was born in 1727 at Sudbury in Suffolk, and at a very early age diſcovered his propenſity to painting. Nature was his teacher, and the woods of Suffolk his academy. There he would paſs in ſolitude his mornings, in making ſketches of an antiquated tree; a marſhy brook; a few cattle; a ſhepherd and his flock, or any other objects which accidentally preſented themſelves. Before he was twelve years old he had painted many pictures; and about that time went to London, where he ſoon found it neceſſary to try what effect he could produce in portraiture. In this alſo he was ſucceſsful; and acquired very conſiderable practice and reputation; enjoying great favour with the public for many years.

His ſtyle of execution, as well as choice of ſubjects, was original, although conſiderably reſembling that of Watteau, more particularly in his landſcapes. His pictures are generally wrought in a looſe and ſlight manner, with great freedom of hand, and uſing very little colour, with a great body of vehicle; which gives to his works great lightneſs and looſeneſs of effect; properties extremely valuable in a picture, and too eaſily loſt in the endeavour to give more ſtrict and poſitive reſemblance of ſubſtance. Sir Joſhua Reynolds in his fourteenth lecture ſays of this hatching manner of Gainſborough, that his portraits were often little more than what generally attends a dead colour as to finiſhing or determining the form of the features; but as he was always attentive to the general effect, or whole together, I have often imagined (ſays he) that this unfiniſhed manner contributed even to that ſtriking reſemblance for which his portraits are ſo remarkable. At the ſame time it muſt be acknowledged that there is one evil attending this mode; that if the portrait were ſeen previouſly to any knowledge of the original, different perſons would form different ideas; and all would be diſappointed at not finding the original correſpond with their own conceptions, under the great latitude which indiſtinctneſs gives to the imagination, to aſſume almoſt what character or form it pleaſes."—"To ſhew the difficulty of uniting ſolidity with lightneſs of manner we may produce a picture of Rubens in the church of St. Judule at Bruſſels as an example; the ſubject is Chriſt's charge to Peter: which, as it is the higheſt and ſmootheſt finiſhed picture I remember to have ſeen of that maſter, ſo it is by far the heavieſt."—"A lightneſs of effect produced by colour, and that produced by facility of handling, are generally united. A copy may preſerve ſomething of the one, it is true; but hardly ever of the other."—"Gainſborough poſſeſſed this quality of lightneſs of manner and effect, I think, to an unexampled degree of excellence; but it muſt be remembered at the ſame time that the ſacrifice which he made to this ornament of our art was too great; it was in reality preferring the leſſer excellencies to the greater."

In the ſame lecture, which principally treats of the acquirements of Gainſborough and which was delivered at the Royal Academy ſoon after his death, by its truly exalted preſident, it is ſaid of him, "that if ever this nation ſhould produce genius ſufficient to acquire to us the honourable diſtinction of an Engliſh ſchool, the name of Gainſborough will be tranſmitted to poſterity in the hiſtory of the art among the firſt of that riſing name."—"Whether he moſt excelled in portraits, landſcapes, or fancy pictures, it is difficult to determine: whether his portraits were moſt admirable for exact truth of reſemblance, or his landſcapes for a portrait-like repreſentation of nature, ſuch as we ſee in the works of Rubens, Ryſdael, or others of theſe ſchools. In his fancy pictures, when he had fixed upon his object of imitation, whether it was the mean and vulgar form of a wood-cutter, or a child of an intereſting character, as he did not attempt to raiſe the one, ſo neither did he loſe any of the natural grace and elegance of the other; ſuch a grace and ſuch an elegance as are more frequently found in cottages than in courts. This excellence was his own, the reſult of his particular obſervation and taſte. For this he was certainly not indebted to any ſchool; for his grace was not academical, or antique, but ſelected by himſelf from the great ſchool of nature; where there are yet a thouſand modes of grace unſelected, but which lie open in the multiplied ſcenes and figures of life, to be brought out by ſkilful and faithful obſervers.

"Upon the whole we may juſtly ſay, that whatever he attempted he carried to a high degree of excellence. It is to the credit of his good ſenſe and judgment that he never did attempt that ſtyle of hiſtorical painting for which his previous ſtudies had made no preparation."

Nothing could have enabled Gainſborough to reach ſo elevated a point in the art of painting without the moſt ardent love for it. Indeed his whole mind appears to have been devoted to it, even to his dying day; and then his principal regret ſeemed to be, that he was leaving his art, when, as he ſaid, "he ſaw his deficiencies, and had endeavoured to remedy them in his laſt works." Various circumſtances in his life exhibited him as referring every thing to it. "He was continually remarking to thoſe who happened to be about him, whatever peculiarity of countenance, whatever accidental combination of figures, or happy effects of light and ſhadow occurred in proſpects, in the ſky, in walking the ſtreets, or in company. If in his walks he found a character that he liked, and whoſe attendance was to be obtained, he ordered him to his houſe: and from the fields he brought into his painting-room ſtumps of trees, weeds, and animals of various kinds; and deſigned them not from memory, but immediately from the objects. He even framed a kind of model of landſcapes on his table compoſed of broken ſtones, dried herbs, and pieces of looking-glaſs; which he magnified, and improved into rocks, trees, and water: all which exhibit the ſolicitude and extreme activity that he had about every thing relative to his art; that he wiſhed to have his objects embodied as it were, and diſtinctly before him, neglecting nothing that contributed to keep his faculties alive; and deriving hints from every ſort of combination."

He was alſo in the conſtant habit of painting by night, a practice very advantageous and improving to an artiſt, for, by this means, he may acquire a new and a higher perception of what is great and beautiful in nature. His practice in the progreſs of his pictures was to paint on the whole together; wherein he differed from ſome, who finiſh each part ſeparately, and by that means are frequently liable to produce inharmonious combinations of forms and features.

Gainſborough was one of the few artiſts of eminence this country has produced who never was indebted to foreign travel for his improvement and advancement in painting. Some uſe indeed he appears to have made of foreign productions; and he did not neglect to improve himſelf in the language of the art, the art of imitation, but aided his progreſs by cloſely obſerving and imitating ſome of the maſters of the Flemiſh ſchool; who are undoubtedly the greateſt in that particular and neceſſary branch of it. He frequently made copies of Rubens, Teniers, and Vandyke, which it would be no diſgrace to the moſt accurate connoiſſeurs to miſtake for original pictures at firſt ſight. What he thus learned, he did not however ſervilely uſe, but applied it to imitate nature in a manner entirely his own.

The ſubjects he choſe for repreſentation were generally very ſimple, to which his own excellent taſte knew how to give expreſſion and value. In his landſcapes a riſing mound and a few figures ſeated upon, or near it; with a cow or ſome ſheep grazing, and a ſlight marking of diſtance, ſufficed for the objects: their charm was the purity of tone in the colour; the freedom and clearneſs of the touch; together with an agreeable combination of the forms: and with theſe ſimple materials, which appear ſo eaſy as to be within every one's graſp, but which conſtantly elude the deſigner who is not gifted with his feeling and taſte, does he always produce a pleaſing picture. In his fancy pictures the ſame taſte prevailed. A cottage girl; a ſhepherd's boy; a woodman; with very ſlight materials in the background, were treated by him with ſo much character, yet ſo much elegance, that they never fail to delight.

He was an excellent muſician, playing with exquiſite taſte on the violin. His mind and manners were urbane and kind. If he ſelected for the exerciſe of his pencil an infant from a cottage, all the tenants of the humble roof generally participated in the profits of his picture; and ſome of them frequently found in his habitation a permanent abode. His liberality was not confined to this alone; needy relatives and unfortunate friends were further incumbrances on a ſpirit that could not deny; and owing to this generoſity of temper, that affluence was not left to his family which ſo much merit might promiſe, and ſuch real worth deſerve. He died, ſincerely regretted by every lover of art, in 1788, aged 61, leaving behind him a very numerous body of works, both pictures and drawings; which are now ſcattered over every part of this country.

GAINSBOROUGH, in *Geography*, a market town of Lincolnſhire, England, is ſeated on the eaſtern bank of the river Trent, and conſiſts principally of one ſtreet. In the year 1801 the town conſiſted of 1064 houſes, which were occupied by 4506 perſons. The river is navigable to this place for veſſels of 150 tons burthen. By means of this ſtream, which unites with the Humber river, and the Readley and Cheſterfield canals, a conſiderable trade in corn and other commodities is carried on.

According to ancient hiſtory, it is related that king Sweyne anchored near this town with ſeveral Daniſh veſſels, in one of his depredatory expeditions to Britain. Matthew of Worceſter alſo ſtates, that the ſame monarch was murdered at this place. Leland deſcribes an old ſtone-chapel in the ſouth part of the town, wherein, according to tradition, ſeveral Danes were interred. In the time of king Edward I., William de Valence, then lord of the manor, obtained a charter, or grant, from the monarch for holding a fair here. During the civil wars between king Charles and the parliament, this town was much injured by the contending parties.

The church is a modern pile of irregular building. In 1791 a fine ſtone bridge, with three elliptical arches, was raiſed over the river Trent. It is private property, and paſſengers and carriages of all ſorts are ſubjected to a toll for paſſing over. An old hall, commonly called the palace, is a ſingular edifice. It is conſtructed principally of oak timber framing, and forms three ſides of a quadrangular. This building was formerly ſurrounded by a moat, and had large gardens and fiſh-ponds, &c. attached to it. Tradition aſcribes it to John of Gaunt, duke of Lancaſter, but it appears of a later age.

William de Gainſborough was a native of this place. He was an ambaſſador from king Edward I., and for his zealous defence of the pope's infallibility, was, by Boniface VIII. preferred to the ſee of Worceſter, where he died, A.D. 1308. Simon Patrick, biſhop of Ely, was born here in 1626, and died in 1707. About half a mile north of the town are ſome embankments, called "the Caſtle Hills." Theſe are ſaid to have been firſt formed by the Romans, and afterwards altered and enlarged by the Danes. See Beauties of England, vol. ix.

GAIOPHRAGNIA, in *Natural Hiſtory*, a genus of the firſt order of *ſeptariæ*, divided by partitions of earthy matter.

GAIRSA, in *Geography*, one of the ſmaller Orkney iſlands, N.E. of Pomona. N. lat. 58° 51'. W. long 2° 51'.

GAISSERN, a town of the duchy of Stiria; 12 miles E. of Rottenmann.

GAIT, as applied to horſes, is a term that implies their method of going, or what is ſometimes called their action.

GAIT, in *Rural Economy*, is the name of a ſort of open door, made uſe of for forming the entrance into an incloſure, &c. It alſo denotes a by-way acroſs a common field; and the going of a cow, or other animal, in a ſummer paſture. A ſingle ſheaf of corn bound near the top, and ſet upon its butt end to dry, is likewiſe in ſome places called a gait. See GATE and *Harveſting* GRAIN.

GAITERS, a ſort of ſpatter-daſhes, uſually made of cloth, which are either long and reaching to the knee, or ſhort, and only extending juſt above the ankle.

GAL, *St.* See *St.* GALLEN.

GALA WATER, in *Geography*, a river of Scotland, which runs into the Tweed, about 2 miles above Melroſs, in Roxburghſhire.

GALABA, in *Ancient Geography*, a ſmall town of Aſia, ſituated in the mountains, whence the river Calabas ſprung.

GALACTITES, in *Mineralogical Antiquities*, a ſtony ſubſtance differently deſcribed by different authors of antiquity, who ſcarcely agree in any other point reſpecting its characters but that of its producing, when broken and triturated with water, a white fluid, comparable to milk (γαλα). This latter circumſtance has likewiſe given riſe to the appellations of galaxia, leucogæa, leucographa, expreſſive of that quality; and it was alſo called, or rather confounded with, morochtus and ſynophytes. According to Pliny it was found in the Nile, and other rivers, where it ſometimes occurred, marked with red veins. It is recommended for its property of increaſing the milk of nurſes, and hung on the necks of children, for promoting ſalivation and dentition. Sir John Hill, ever ready to deſcribe what had not come under his obſervation, acquaints us that the galactites of the ancient writers is a very hard and dry ſubſtance, like an indurated clay, of a cloſe compact texture, very heavy, and in colour of a pale-grey without the leaſt admixture of any other tinge; that it is of a leſs even ſurface than the morochtus, and leſs hard; that it melts but ſlowly in the mouth, and leaves ſomething of a luſcious ſweetneſs on the tongue; that it does not adhere to the lips, nor ferment with acids, and in burning becomes of a pure white. This deſcription is not applicable, in all its parts, to any one mineral ſubſtance we are acquainted with; while the deſcription which others have given of galactites applies to ſeveral ſubſtances; and, indeed, various ſubſtances endowed with the quality alluded to muſt neceſſarily have been confounded at a period when the ſcience of diſcriminating natural ſubjects was entirely unknown, and when ſimilarity in ſome uneſſential external character was deemed ſufficient to apply one and the ſame name to things not bearing any affinity to each other.

Some of the modern writers on mineralogy have conſidered galactites as the ſame with morochtus, which is ſuppoſed to be the pulverulent variety of carbonate of lime, called mountain-

mountain-milk; but their reaſons for this conjecture are as ill founded as thoſe of others who think the galactites of the ancients to be ſoap-ſtone, lithomarge, jaſper, &c. Fortunately, neither the mineralogiſt nor the phyſician and antiquary have any reaſon to regret the ignorance in which they are kept with regard to the true meaning of the name in queſtion, which ſhould be expunged from the ſyſtems of ocryctognoſy.

GALACTOIDES, Γαλακτοειδης, of γαλα, *milk*, and ειδος, *form*, *milky*, a word uſed by the ancients in two or three different ſenſes. Some uſed it to expreſs tepid, or little warm, with ſuch a heat as that of milk juſt drawn from the cow; others expreſſed by it a white, ſomewhat opaque, or milky-colour; others expreſſed by it only a want of tranſparence in fluids. Galen frequently uſes it in the ſecond of theſe ſenſes, when treating of urines.

GALACTOPHAGI, and GALACTOPOTÆ, in *Antiquity*, perſons who lived wholly on milk, without corn, or the uſe of any other food.

The words are compounded of γαλα, γαλακτος, *milk*; φαγειν, *to eat*; and ποτης, of πινω, *I drink*.

Certain nations in Scythia Aſiatica, as the Getæ, Nomades, &c. are famous, in ancient hiſtory, in quality of galactophagi, milk-eaters. Homer makes their eloge, Iliad, lib. iii.

Ptolemy, in his Geography, places the galactophagi between the Riphæan mountains on one ſide, and the Hircanian ſea on the other.

GALACTO-PHORI DUCTUS, in *Anatomy*, from γαλα, *milk*, and φερω, *I bear*, the lacteals, ſo named from the milky appearance of the fluid (chyle) which they contain. The excretory tubes of the mammary gland are alſo deſcribed under the ſame name. See BREAST.

GALACTOPSIA, a method of curing diſeaſes by drinking milk only. The gout, conſumption, and many other chronical diſeaſes, are by many affirmed to be curable by this means. See Cheyne's Nat. Meth. of curing Diſeaſes.

GALACTOSIS, of γαλακτοσμαι, *to be converted into milk*, the production of milk; or the action whereby the food, or chyle, is converted into milk.

GALACTOSPONDA, Γαλακτοσπονδα, of γαλα, *milk*, and σπονδη, *libation*, in *Antiquity*, a libation made with milk.

GALACUM, in *Ancient Geography*, a place of Britain, marked in the tenth rout of Antonine, and ſuppoſed to be Appleby between Whitley caſtle and Overborough.

GALACZ, or GALATZ, in *Geography*, a town of European Turkey, in Moldavia, on a lake near the conflux of the Prut and the Danube, chiefly inhabited by Greeks; 120 miles S.S.W. of Bender. N. lat. 45° 24'. E. long. 28° 24'.

GALADA, in *Ancient Geography*, a country of Arabia, called by Stephanus *Galadene*, and mentioned by Joſephus, and ſuppoſed to be referred to by Moſes in his account of the treaty between Jacob and Laban.

GALADES, in *Natural Hiſtory*, an epithet given by Rondeletius to a ſpecies of chama, remarkable for its milky whiteneſs. It is derived from the Greek Γαλη, *milk*.

This chama is a very elegant ſhell.

GALAFIGUERA, CAPE, in *Geography*, a cape on the S. coaſt of Majorca. N. lat. 39° 36'. E. long. 2° 27'.

GALAICA REGIO, in *Ancient Geography*, a country of Thrace, in which were ſituated the following towns; *viz.* Sala, Zona, Meſambria, and Stryma; and ſaid by Herodotus (l. vii.) to have been denominated "Regio Britannica."

GALAN, a town of France, in the department of the Higher Pyrenées, and chief place of a canton in the diſtrict of Tarbes; 15 miles E. of Tarbes. The place contains 1294, and the canton 7618 inhabitants, on a territory of 102½ kiliometres, in 10 communes.

GALANGAL, GALANGA, a medicinal root, brought from the Eaſt Indies; the produce of a plant of the ſame name.

Its characters are theſe. It hath a ſingle ſpatha of one leaf; the flower has one petal with a ſlender tube, divided in ſix parts, three of them alternately oval and ſpear-ſhaped, the other oval, and at bottom cut into two parts, which are vertically heart-ſhaped; and it hath one ſtamen which is membranaceous: it has a round germen, ſupporting a ſtyle the length of the tube; which afterwards become a roundiſh three-cornered capſule with three cells filled with ſeeds. We have but one ſpecies of this plant in England, known by botanical writers under the title of *Kæmpferia*, which ſee.

There are two kinds of galangals, the *ſmall* and the *great*. The ſmaller is by far the moſt in eſteem, and is almoſt the only one heard of in preſcription. The *galanga minor*, or leſſer galangal, is a ſmall ſhort root, of an irregular figure, of the thickneſs of a man's little finger, and is ſeldom met with in pieces of more than an inch or two long. It has ſeveral protuberances at its ends, and on its ſurface, and is ſurrounded with many circular rings, that ſtand out a little beyond the reſt of the ſurface. It is of an extremely firm, and compact texture, yet not heavy; it cuts difficultly with a knife, and leaves a poliſhed ſurface. Its colour is a browniſh red on the outſide, and a ſomewhat brighter red within, though ſtill with a conſiderable admixture of brown.

The ſmall galangals are to be choſen full and plump, and of a bright colour, very firm and ſound, and of an acrid and inſupportable hot taſte.

They were formerly in common uſe as warm ſtomachic bitters, and generally made an ingredient in bitter infuſions; but they are now almoſt wholly laid aſide, on account of their unpleaſant flavour. Bitterneſs does not appear to be the proper medical character of this root; the heat and pungency greatly prevailing. A very fiery extract is made from it with rectified ſpirit, and the watery extract is alſo very hot and pungent: in diſtillation with water, it yields an eſſential oil, about a dram in quantity from ſixteen ounces, of little ſmell, and no great pungency: ſo that the pungent matter of the galangal appears to be of the ſame nature with that of pepper, reſiding not in the volatile oil, but in a more fixed matter. Lewis, Mat. Med.

The larger galangal grows chiefly in Java and Malabar, and anſwers pretty much to the above deſcription, only that it is larger in bulk, leſs unequal and tuberous, weaker, and more diſagreeable than the leſſer kind. The galangals are both brought us from the Eaſt Indies, and are the roots of the ſame plant, which is of the number of the *herbæ bulboſis affines* of Mr. Ray. Herman calls that which produces the larger, *bauchale Indorum*; and that which produces the leſſer, *lagoudi Indorum*.

The people of the Eaſt Indies uſe theſe roots by way of ſpice.

GALANT. See GALLANT.

GALANTHUS, in *Botany*, from γαλα, *milk*, and ανθος, *a flower*, alluding to its milky whiteneſs. Snow-drop. Linn. Gen. 160. Schreb. 215. Willd. Sp. Pl. v. 2. 29. Sm. Fl. Brit. 352. Mart. Mill. Dict. v. 2. Lamarck Illuſtr. t. 230. Juſſ. 55. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Spathaceæ*, Linn. *Narciſſi*, Juſſ.

Gen. Ch. *Cal.* Spatha oblong, obtuſe, compreſſed, opening at the flat ſide, permanent, moſtly cloven at the top. *Cor.*

Cor. Petals ſix, oblong, obtuſe; the three outermoſt looſely ſpreading, concave, equal; the three innermoſt about half as long, parallel, emarginate, ſtriated. *Stam.* Filaments ſix, inſerted into the ſummit of the germen, capillary, equal, very ſhort; anthers oblong, cohering, taper-pointed, opening by two pores. *Piſt.* Germen inferior, globoſe; ſtyle thread-ſhaped, longer than the ſtamens; ſtigma ſimple. *Peric.* Capſule nearly globoſe, with three blunt angles, of three cells and three valves. *Seeds* ſeveral, globoſe.

Eſſ. Ch. Corolla ſuperior, of ſix petals; the three innermoſt ſhorteſt, emarginate. Stigma ſimple.

1. G. *nivalis.* Linn. Sp. Pl. 413. Engl. Bot. t. 19. Jacq. Auſtr. t. 313. The common ſnow-drop is the only ſpecies of this genus. It grows wild in rather mountainous or rocky places in Germany, Italy, and other parts of the ſouth of Europe, flowering in the early ſpring. Whether it be truly wild in England is much to be doubted. In gardens the flowers are often double, from a multiplication of the inner petals, which are elegantly ſtreaked with a glaucous green. Mrs. Barbauld has beautifully deſcribed this favourite harbinger of ſpring in the following terms.

"As Flora's breath, by ſome transforming power,
Had changed an icicle into a flower,
Its name and hue the ſcentleſs plant retains;
And Winter lingers in its icy veins."

GALANTHUS, in *Gardening*, comprehends a plant of the bulbous rooted flowering perennial kind, of which the ſpecies is the common ſnow-drop (G. nivalis). It has two varieties, one with ſemi-double, and the other with double flowers. The common ſort comes firſt into flower.

Method of Culture.—All the ſorts of theſe ſmall beautiful plants are capable of being increaſed with little trouble, ſimply by ſeparating and planting out the off-ſets from the old roots, in the latter end of ſummer, as ſoon as their leaves begin to decay, or very early in the autumn, in the ſituations where they are to remain. Care ſhould however be taken that ſuch off-ſets be not taken off more frequently than about once in three or four years. The planting muſt conſtantly be performed in large bunches containing a great number of bulbs, in order that they may produce the better effect when in blow. The different ſorts ſhould be carefully intermixed. They are well ſuited to the fronts of borders, clumps, and ſhady plantations, producing a fine appearance when in flower, which is at a very early period.

GALAPAGAR, in *Geography*, a town of Spain, in New Caſtile; ſix miles E. of Eſcurial.

GALAPAGOS, or TORTOISE *iſles*, a cluſter of deſert iſlands in that part of the Pacific ocean, called by De Broſſes Polyneſia. Theſe iſlands have alſo been denominated the "Enchanted iſlands;" the largeſt being Maſcarin and Tabaco. They are all deſert, though ſituated in a delicious and fertile climate. The largeſt may be 10 Spaniſh leagues or 40 Britiſh miles in length, and 6 leagues in breadth; and they are ſeparated by many channels capable of receiving large veſſels. Capt. Dampier, in the 1ſt volume of his "Voyage round the World," has given the following account of them. The Galapagos are a great number of uninhabited iſlands, lying under, and on both ſides of the equator. The eaſternmoſt of them are about 110 leagues from the Main. They are laid down in the longitude of 181°, reaching to the weſtward as far as 176°, ſo that their longitude from England weſtward is about 68 degrees. Dampier, however, thinks that our hydrographers do not place them far enough to the weſtward. The Spaniards, who firſt diſcovered them, and in whoſe draughts alone they are laid down, report them to be a great number ſtretching N.W. from the line, as far as 5° N.; but Dampier did not ſee above 14 or 15. They are ſome of them, he ſays, ſeven or eight leagues long, and three or four broad. Capt. Vancouver, who paſſed through theſe iſlands without danger or obſtruction, obſerved that they lie from each other N.W. and S.E. at a diſtance of 21 miles, and that the ſouthernmoſt (S. lat. 1° 22'. E. long. 268° 18') did not appear to be above four miles in circumference, and the northernmoſt about a mile and a half. They are of a good height, moſt of them flat and even at the top; four or five of the eaſternmoſt are rocky, barren, and hilly, producing neither tree, herb, nor graſs, except ſome ſhrubs on the ſhore. In theſe iſlands there is water among the rocks in ponds and holes. Some others of theſe iſlands are moſtly plain and low, and the land more fertile, producing trees of different ſorts. Some of the weſternmoſt of theſe iſlands are nine or ten leagues long, and ſix or ſeven broad; the mould deep and black. Theſe produce large and tall trees, eſpecially mammee-trees, which grow in extenſive groves. In theſe large iſlands there are rivers of conſiderable ſize; and in many of the other leſſer iſlands there are brooks of good water. The Spaniards, when they firſt diſcovered theſe iſlands, found a multitude of guanoes, and land-turtle or tortoiſe, and hence named them the Galapagos iſlands. Dampier adds that he thinks no place in the world ſo plentifully ſtored with theſe animals.

GALAPHA, in *Ancient Geography*, a town of Mauritania Tingitana. Ptolemy.

GALARDIA, in *Botany*. See VIRGILIA.

GALARED, in *Geography*, a town of Sweden, in the province of Blekingen; 28 miles N. of Halmſtadt.

GALARIA, in *Ancient Geography*, a town of the iſland of Sicily.

GALARIPS, in *Botany*, a name originally given by Fred. Allamand to the fine South American plant, which Linnæus publiſhed by that of *Allamanda cathartica*.

GALARS, in *Geography*, a town of Tranſylvania; 16 miles S.E. of Hungad.

GALASA, in *Ancient Geography*, a town of Cœleſyria. Pliny.

GALASHIELS, in *Geography*, a flouriſhing little town of Scotland, in the county of Selkirk, on a ſmall river called Gala water, at its union with the Tweed. This town and its environs have long been famous for the manufacture of coarſe woollen cloth called "Galaſhiels grey," of which 50,000 yards have been made annually. The mode of huſbandry alſo in this neighbourhood has been much commended; five miles N. of Selkirk. N. lat. 55° 38'. W. long. 2° 53'.

GALASO, a river of Naples, which runs into the ſea near Tarento.

GALATA, a ſuburb of *Conſtantinople*, which ſee. See alſo PERA.

GALATA, a ſmall iſland in the Mediterranean, near the coaſt of Tunis. N. lat. 38° 15'. E. long. 9° 30'.

GALATEA, in *Mythology*, a ſea nymph, the daughter of Nereus and Doris, thus called on account of the fairneſs and beauty of her complexion. Ovid and Theocritus repreſent Polyphemus, the moſt celebrated of the Cyclops, as in love with Galatea, and the rival of Acis; and that this hideous giant buried the young prince under a rock, and the gods transformed him into a river, or rather into a river-god. Some authors, however, are of opinion, that Acis was a young prince of Sicily, who was in love with the beauteous Galatea; and that in deſpair he threw himſelf into the river, which from that time has borne his name. See NEREIDS and NYMPH.

GALATEO, in *Geography*, a town of Naples, in Calabria Ultra; eight miles E.S.E. of Nicotera.

GALATHEA, in *Natural Hiſtory*, a genus of cruſtacea in the Fabrician ſyſtem, including the Linnæan ſpecies of cancri ſtrigoſus, branchiatus, gregarius, and amplectens. The character of this Fabrician genus conſiſts in having the antennæ of unequal length, the anterior ones pedunculate; poſterior ſeſſile with the laſt joint ſetaceous; tail foliaceous. See article CANCER.

GALATI, a town of the iſland of Sicily, in the valley of Demona; 12 miles S. W. of Patri.

GALATIA, or GALLO-GRÆCIA, in *Ancient Geography*, a province of Aſia Minor, bounded on the E. by Cappadocia, on the W. by Bithynia, on the ſouth by Pamphylia, and on the N. by the Euxine ſea. The Gauls having invaded Aſia Minor in ſeveral bodies, of which Pauſanias (Attic. c. 4.) has given an account, conquered this country, ſettled in it, and called it Galatia, which in Greek ſignifies Gaul, or rather, perhaps, New or Little Gaul. The Gauls were denominated by the Greeks "Celtes" or "Galatæ."

It is not eaſy to aſcertain the epoch of their eſtabliſhment in Galatia. At the death of Alexander, however, in the year 323 B. C. we find that the Gauls of Thrace and Illyria were diſpoſed to join the confederacy of Greece againſt Macedonia; and that they aided Antigonus in the victory which he obtained over Antipater (321 B. C.). Theſe Gauls being afterwards attacked by Caſſander, the ſon of Antipater, and being obliged to retire to mount Hæmus (316 B. C.), were engaged anew in the ſervice of Antigonus by the grant of a conſiderable tract of country to be occupied by themſelves and their families. On this occaſion they extended themſelves into Aſia Minor, and became populous and powerful. This firſt invaſion of Aſia by thoſe Gauls, who attached themſelves to Antigonus, was followed by another ſome time afterwards under the command of Brennus. At the commencement of the campaign Leonorix and Lutarix, otherwiſe denominated Leonorius and Lutarius, ſeparated from him with a body of 20,000 men; and having entered Thrace, made themſelves maſters of the coaſt of the Propontis, and advanced to the Cherſoneſus and the Helleſpont. After having ſurmounted many obſtacles, Lutarix ſucceeded in his progreſs to Aſia; and Leonorix, in order to expedite the paſſage of his troops thither, formed an alliance with Nicomedes, king of Bithynia, who furniſhed him with veſſels for this purpoſe, and enabled him to obtain in that country a conſiderable eſtabliſhment (279 B. C.) Lutarix and Leonorix, who had for ſome time conducted ſeparate expeditions, became again united in this treaty with Nicomedes; and concurred not only in accompliſhing the deſigns of Nicomedes, but in making conqueſts on their own account. About the ſame time Attalus I., king of Pergamus, aſſigned a conſiderable territory to thoſe Gauls who ſerved againſt Antiochus; and it ſeems to have been about this period (278 years B. C.) that they eſtabliſhed themſelves in Aſia Minor. Upon the whole we may obſerve, that theſe ſeem to have been the principal epochas, to which we may refer the paſſage of the Gauls into Aſia. The firſt was that in which the country occupied by the Galatæ or Gauls comprehended only that part of the Helleſpont which was ceded to Leonorix and Lutarix. The ſecond was that in which Attalus (in the year 220 B. C.) aſſigned them a territory in Aſia Minor; and the third was that in which Galatia, ſeparated from the Helleſpont by Epictetus, became extended from the weſt towards the eaſt, or from Phrygia Major to Pontus Polemaicus. Accordingly the firſt eſtabliſhments of the Galatæ were towards the Ægean ſea; in proceſs of time they extended themſelves to mount Taurus; afterwards they obtained a more permanent eſtabliſhment, and gave the name of Galatia to the whole country which extended from the river Sangarius to the Halys.

The preciſe limits of Galatia are not eaſily aſcertained; as they have been various at different periods and variouſly aſſigned by different authors. The extent given to this country by Ptolemy, and ſtated in the beginning of this article, is generally allowed to be much too conſiderable, as it would comprehend the whole of Phrygia, Piſidia, and Lycaonia, and alſo the whole of Paphlagonia. The Galatæ who occupied it were diſtributed into three diviſions of people, each diviſion including others of a ſubordinate kind; theſe were the Tectoſagi, the Trocmi, and the Toliſtoboges or Toliſtoboii. M. d'Anville places the latter to the weſt, the Tectoſagi towards the middle bearing northward, and the Trocmi towards the eaſt. Pliny informs us that Galatia was divided into 195 tetrarchies. From Strabo we learn, that each of the three diviſions of the people already mentioned was divided into four cantons, each of which had a tetrarch; and beſides theſe 12 tetrarchs, there was a general council of the nation, compoſed of 300 ſenators. The tetrarchs were, as ſome ſay, hereditary, but, according to others, elective; but in proceſs of time they underwent a variety of changes. Strabo ſays, that they were at firſt reduced to three, then to two, and at laſt to one, which comprehended all the others, and which was poſſeſſed by Dejotarus. The laſt tetrarch and king of Galatia was Amyntas, who from being ſecretary to Dejotarus I., was made king of Piſidia in the year of Rome 714, and in 718, Marc Antony made him tetrarch of Galatia. After the death of Amyntas, Galatia was ranked by Auguſtus among the Roman provinces, and ſubjected to a proprætor, together with part of Phrygia, Piſidia, &c. but the three principal claſſes of people, above enumerated, retained their peculiar denomination and form of government. The adminiſtration of proprætors continued till the reign of Theodoſius the Great, or of Valens; and under the Chriſtian emperors it was divided into two provinces; Galatia Prima being ſubject to a conſul, and Galatia Secunda or Salutaris to a preſident. The former was ſituated towards the eaſt, contained ſeven towns, and had for its metropolis Ancyra; the ſecond lay to the weſt, and contained nine towns, the capital being Peſſinonte. The religion of the ancient Galatæ was blended with much ſuperſtition; and they are ſaid to have worſhipped the mother of the gods under the name of Agdiſtis. They offered human ſacrifices, devoting to this purpoſe the priſoners whom they took in war. They were a tall and valiant people; their arms were uſually a ſword and buckler, and they commonly fought naked. The impetuoſity of their attack was irreſiſtible, and almoſt always made them victorious. Although the Galatians have been ſometimes reckoned ſtupid and barbarous, it appears, from the teſtimony of different authors, that they applied to eloquence, and that they were fond of muſic. They had a particular inſtrument, which was called "Carnyx." They uſed the bath, and have been commended for their chaſtity and conjugal fidelity. They had ſplendid repaſts and feaſts, in which they covered their tables with bread and fleſh; and theſe ſorts of feſtivals were terminated on the part of the rich by the diſtribution of corn.

It appears from the acts of the apoſtles, that Paul preached ſeveral times in Galatia; firſt, A. D. 51 (Acts, xvi. 6); afterwards, A. D. 54 (Acts, xviii. 23.); and that he

he formed conſiderable churches in this province. He was probably the firſt who preached there to the Gentiles; although it is not unlikely, that Peter had preached there to the Jews, ſince his firſt epiſtle is directed to the Jews, ſcattered throughout Pontus, Galatia, &c. And the Jews converted by Peter probably occaſioned thoſe differences among the Galatian converts, which induced the apoſtle Paul to write his epiſtle, in which he takes pains to eſtabliſh his character of an apoſtle, which had been diſputed by ſome, with a view of placing him below Peter, who preached, generally, to the Jews only, and obſerved the law. For the date and purport of this epiſtle, ſee EPISTLE.

GALATOLA, in *Geography*, a town of Naples, in the province of Otranto; four miles E. S. E. of Nardo.

GALAVA, in *Ancient Geography*, a town of Great Britain, in the 10th rout of Antonine, ſuppoſed to be Old-Town, between Glanoventa or Lancheſter, in the county of Durham, and Alone or Whitley caſtle.

GALAX, in *Botany*, from γαλα, *milk*, on account of the whiteneſs of the flowers. Mitchel, who ſent it to Linnæus, named it *Viticella*, the application of which is not very obvious. Linn. Gen. 109. Schreb. 151. Willd. Sp. Pl. v. 1. 1146. Mart. Mill. Dict. v. 2. Juſſ. 420. (Solenandria; Vent. Malm. 69. Blandfordia; Fraſer in Andr. Repoſ. 343. Erythrorrhiza; Michaux Boreal-Amer. v. 2. 35.)—Claſs and order, *Pentandria Monogynia*. Nat. Ord. uncertain, Juſſ. *Ericæ*, Michaux.

Gen. Ch. *Cal.* Perianth inferior, in five deep, equal, acute ſegments, permanent. *Cor.* Petals five, lanceolate, oblong, equal, notched at the ſummit, ſlightly cohering at the baſe. Nectary tubular, of one leaf, half as long as the petals, in ten ſegments at the top, five of which are dilated, and five alternate ones ſhorter, the latter bearing the anthers. *Stam.* Filaments ſcarcely any; anthers five, nearly ſeſſile on the inner ſurface of the ſhorter ſegments of the nectary. *Piſt.* Germen ſuperior, ovate; ſtyle none; ſtigma fleſhy, of three or four lobes. *Peric.* Capſule of three cells and three valves. *Seeds* numerous, minute.

Eſſ. Ch. Calyx in five deep ſegments. Petals five. Nectary tubular, in ten ſegments, alternately bearing the anthers. Capſule ſuperior, of three cells and three valves. Seeds many.

1. G. *aphylla*. Linn. Sp. Pl. 289. Curt. Mag. t. 754. (Solenandria cordifolia; Vent. Malmais. t. 69. Blandfordia cordata; Andr. Repoſ. t. 343. Erythrorrhiza rotundifolia; Michaux Boreal. Am. v. 2. 35. t 36.)—Native of mountainous places in Georgia and Carolina, flowering in May. Mr. Fraſer firſt brought it to England. The *root* is perennial, compoſed of very red fibres. *Stem* none. *Leaves* radical, heart-ſhaped, doubly crenate, ſmooth, on very long foot-ſtalks. *Flowers* numerous in long-ſtalked ſpikes, reſembling thoſe of a *Clethra*. The Linnæan generic deſcription, chiefly communicated by Mitchel, is ſo very erroneous, that it is no wonder none of the botaniſts who ſaw the plant could determine it, nor could the *Galax* of Linnæus ever have been certainly aſcertained, but by his herbarium, where original ſpecimens are preſerved.

GALAXIA, from γαλα, *milk*, though the application ſeems not very evident, and the name is, beſides, too near *Galax*. Thunb. Nov. Gen. 50. Schreb. 451. Willd. Sp. Pl. v. 3. 583. Juſſ. 57. Mart. Mill. Dict. v. 2. Cavan. Diſſ. 340. Lamarck Illuſtr. t. 568. Gawler in Curt. Mag. 1208. Claſs and order, *Monadelphia Triandra*. Nat. Ord. *Enſatæ*, Linn. *Irides*, Juſſ.

Gen. Ch. *Cal.* Spatha of one or two membranous cloſed leaves. *Cor.* of one petal, ſuperior; tube long, thread-ſhaped, erect, ſlightly dilated at the top: limb in ſix deep regular, obovate, obtuſe, ſpreading ſegments; the three outermoſt having each a nectariferous cavity at its baſe. *Stam.* Filaments three, united into a tube; anthers ovate. *Piſt.* Germen inferior, ſtalked, obtuſely triangular, ſmooth; ſtyle thread-ſhaped, rather longer than the ſtamens; ſtigmas three, divided into numerous ſpreading capillary ſegments, almoſt to their baſe. *Peric.* Capſule oblong, nearly cylindrical, with three furrows, three cells, and three valves. *Seeds* numerous, ſmall, globoſe.

Eſſ. Ch. Spatha of one or two leaves. Corolla regular, of one petal, in ſix deep ſegments, with an elongated tube. Style one. Stigmas three, in numerous capillary ſegments. Capſule inferior, of three cells. Seeds globoſe.

This is a Cape genus, firſt eſtabliſhed by Thunberg, and moſt allied to *Siſyrinchium*. Only two or three ſpecies are known, which are of a diminutive ſtature. G. *ovata* (*Ixia Galaxia*; Linn. Suppl. 93) is figured in Curt. Mag. t. 1208. Andr. Repoſ. t. 94. Jacq. Ic. Rar. t. 291. The *leaves* are ovate and ſhort. *Flowers* occaſionally yellow or purple, very fugacious—G. *graminea*, (*Ixia fugaciſſima*; Linn. Suppl. 94), Curt. Mag. t. 1292, Jacq. Coll. v. 2. 366. t. 18. f. 2, differs chiefly in having narrow linear *leaves*. This genus appears to occupy the ſame ſituations on graſſy hillocks at the Cape of Good Hope, as *Ixia Bulbocodium* does in the ſouth of Europe, with which plant it alſo agrees in general aſpect, as well as in the variable colour and ſize of the bloſſoms. The ſpecies require the ſame treatment as other Cape bulbs, and flower with us in the ſpring.

GALAXIA, in *Mythology*, a feſtival in honour of Apollo, ſo called becauſe they offered in it to that god a ſort of furmety, of barley and milk.

GALAXY, in *Aſtronomy*, the name given to that remarkable zone of light which forms nearly a great circle of the celeſtial ſphere, and which is by us called the *milky way*. It cuts the ecliptic near the two ſolſticial points, and is inclined to it about 60°. It traverſes the conſtellations Caſſiopea, Perſeus, Auriga, part of Orion, Gemini, the Great Dog, and the Ship, where it appears moſt reſplendent in ſouthern latitudes; it then paſſes through the feet of the Centaur, the Croſs, the ſouthern Triangle, and returns towards the north by the Altar, the tail of the Scorpion, the arc of Sagittarius; it then divides into two branches, paſſing through Aquila, Sagitta, the Swan, Serpentarius, and the head of Cepheus, and returns to Caſſiopea. This path is deſcribed in the poem of Manilius, who appears to have been very fortunate in his conjecture as to the cauſe of this light:

> "Anne magis denſâ ſtellarum turba coronâ
> Contexit flammas et craſſo lumine candet
> Et fulgore nitet collato clarior orbis?"

Ariſtotle, almoſt always miſtaken when he gives an opinion on ſubjects of natural philoſophy, ſuppoſes the milky way to be a luminous meteor placed in the middle regions.

Aſtronomers have for a long time been diſpoſed to attribute this phenomenon to a great aſſemblage of ſtars; but the queſtion was firſt put out of doubt by Dr. Herſchel, who completely reſolved the whole maſs into ſeparate ſtars: he has counted 50,000 in a ſpace 15 long by 2 broad.

This, however, is far from ſatisfying the curioſity of philoſophers; an intereſting queſtion immediately ariſes: Why ſhould there be ſuch a zone of ſtars, and what explanation does it admit of? Dr. Herſchel is undoubtedly the aſtronomer who has taken the moſt pains in this inveſtigation, and his theory is extremely plauſible, at leaſt, if not entirely ſatisfactory. He ſuppoſes the ſidereal univerſe to be diſtributed,

into nebulæ and cluſters of ſtars, and the milky way to be that particular cluſter in which our ſun is placed. Under *Nebulæ*, we ſhall enter further into this theory; at preſent we ſhall only add a ſhort extract, in Dr. Herſchel's own words, from the Tranſactions of 1784.

"It is very probable, that the great ſtratum called the milky way, is that in which the ſun is placed, though perhaps not in the very centre of its thickneſs. We gather this from the appearance of the galaxy, which ſeems to encompaſs the whole heavens, as it certainly muſt do if the ſun was in the ſame. For, ſuppoſe a number of ſtars arranged between two parallel planes, indefinitely extended every way, but at a conſiderable diſtance from each other; and calling this a ſidereal ſtratum, an eye placed ſomewhere within it will ſee all the ſtars in the direction of the planes of the ſtratum, projected into a great circle, which will appear lucid on account of the accumulation of the ſtars; while the reſt of the heavens, at the ſides, will only ſeem to be ſcattered over with conſtellations more or leſs crowded, according to the diſtance of the planes, or number of ſtars contained in the thickneſs or ſides of the ſtratum.

"Thus in *fig.* 114. *Plate* XIII. *Aſtronomy*, an eye S, within the ſtratum *a b*, will ſee the ſtars in the direction of its length *a b*, or height *c d*, with all thoſe in the intermediate ſituations projected into the lucid circle A B C D, while thoſe in the ſides *m v*, *n w* will be ſeen ſcattered over the remaining part of the heavens at M V N W.

"If the eye were placed ſomewhere without the ſtratum, at no very great diſtance, the appearance of the ſtars within it would aſſume a form of one of the leſs circles of the ſphere, which would be more or leſs contracted to the diſtance of the eye; and if this diſtance were exceedingly increaſed, the whole ſtratum might at laſt be drawn together into a lucid ſpot, of any ſhape, according to the poſition, length, and height of the ſtratum.

"Let us now ſuppoſe, that a branch or ſmaller ſtratum ſhould run out from the former, in a certain direction, and let it alſo be contained between two parallel planes extended indefinitely onwards, but ſo that the eye may be placed in the great ſtratum ſomewhere before the ſeparation, and not far from the place where the ſtrata are ſtill united. Then will this ſecond ſtratum not be projected into a bright circle, like the former, but will be ſeen as a lucid branch, proceeding from the firſt, and returning to it again, at a certain diſtance, leſs than a ſemicircle.

"Thus, in the ſame figure, the ſtars in the ſmall ſtratum, *p q*, will be projected into a bright arch at P R R P, which, after its ſeparation from the circle C B D, unites with it again at P.

"What has been inſtanced in parallel planes, may eaſily be applied to ſtrata irregularly bounded and running in various directions; for their projections will of conſequence vary according to the quantities of the variations in the ſtrata and the diſtance of the eye from the ſame.

"And thus any kind of curvatures, as well as various different degrees of brightneſs, may be projected in the projections. From appearances, then, as I obſerved before, we may infer that the ſun is moſt likely placed in one of the great ſtrata of the fixed ſtars, and very probably not far from the place where ſome ſmaller ſtratum branches out from it. Such a ſuppoſition will ſatisfactorily, and with great ſimplicity, account for all the phenomena of the milky way, which, according to this hypotheſis, is no other than the appearance of the projection of the ſtars contained in this ſtratum and its ſecondary branch. As a farther inducement to look on the galaxy in this point of view, let it be conſidered, that we can no longer doubt of its whitiſh appearance ariſing from the mixed luſtre of the numberleſs ſtars that compoſe it. Now ſhould we imagine it to be an irregular ring of ſtars, in the centre nearly of which we muſt then ſuppoſe the ſun to be placed, it will not appear a little extraordinary, that the ſun, being a fixed ſtar, like thoſe that compoſe this imagined ring, ſhould juſt be in the centre of ſuch a multitude of celeſtial bodies without any apparent reaſon for this ſingular diſtinction; whereas, on our ſuppoſition, every ſtar in this ſtratum, not very near the termination of its length and height, will be ſo placed, as alſo to have its own galaxy, with only ſuch variations in the form and luſtre of it as may ariſe from the particular ſituation of each ſtar."

In the year 1785, Dr. Herſchel continued his inveſtigations of the form of this ſtratum, and was enabled to give a figure of what he conceived to be a ſection of it. This is repreſented, *fig.* 115. If the celeſtial globe be adjuſted to 55°, and σ Ceti be brought to the meridian, it will have the plane of this ſection pointed out by the horizon. The moſt diſtant ſtar is ſuppoſed to be about 500 times farther from the ſun than Sirius. Light would take 20,000 years to traverſe the whole extent. The interior circle is about 40 times the diſtance of Sirius.

GALBA, SERVIUS SULPICIUS, in *Biography*, a Roman emperor, was conſul under Tiberius, A. D. 33. Caligula gave him the command of the legions in Upper Germany, and with theſe he reſtored the ancient military diſcipline, and repreſſed the inroads of the natives. Upon the death of that emperor, he was urged by his friends to aſſume the imperial authority; but he choſe rather to ſubmit to the government of Claudius, who continued him in his command, and conferred upon him the proconſulate of Africa. In this high office, he conducted himſelf with the greateſt propriety, and his victories were gratified by a public triumph. He afterwards paſſed ſeveral years as a private citizen, till he was nominated by Nero in 61 to the government of a province in Spain. In 68 he was declared emperor, and the death of Nero immediately followed. The new reign was full of troubles, and perſons were found who were perpetually plotting againſt the power of Galba. He puniſhed with great ſeverity all whom he ſuſpected as inimical to his government, and gave his confidence to perſons of bad character. He retained his love of juſtice, but his rigour in various inſtances was carried to the bounds of cruelty; while in others, avarice and favour procured impunity to the moſt guilty. Virtue was, however, predominant in his mind; and the principal cauſe of his ſubſequent fate was a ſentiment worthy of a ſovereign: when urged to beſtow largeſſes upon the ſoldiery, he ſaid, "I have been accuſtomed to levy ſoldiers, not to buy them;" a ſentence which they never forgot. Galba, finding himſelf in difficulties that might probably end in ſome fatal diſaſter, reſolved to adopt a ſucceſſor, and his choice fell upon Piſo Licinianus, a perſon of illuſtrious birth, and of ſtrict moral conduct. The ſenate approved the adoption; but Otho, who laid claim to the honour, immediately began to excite a conſpiracy againſt him. The plan ſucceeded, a revolt broke out, and Otho was declared emperor. Galba attempted to rally his forces, but it was now too late; he was univerſally abandoned, and diſpatched by a multitude of wounds. Such was the miſerable end of this emperor, who was ſlain in the ſeventy-third year of his age, and in the ſeventh month of his reign. The virtues which had ſhone ſo bright in Galba, when in a private ſtation, in many inſtances totally diſappeared when he aſcended the throne; and he who ſhewed himſelf the moſt impartial judge, forgot the duties of an emperor. He is one of many who would have been judged worthy of a crown had he never worn one.

Galba was the laſt emperor who claimed deſcent from the ancient families of Rome.

GALBÆ CASTRUM, or *fortreſs of Galba*, in *Ancient Geography*, a town of Africa, in Numidia.

GALBANETUM, a compoſition, or preparation, of galbanum, formerly preſcribed, but now much out of uſe.

GALBANUM, in *Pharmacy*, a gum, ſuppoſed by Linnæus to iſſue from an inciſion in the root of a ferulaceous plant, called, in Latin, *ferula galbaniflua*, growing in Arabia, Syria, Africa, &c. The word is derived, according to Martinius, from the Hebrew *chelbenah*, *fat*. It is highly probable, that galbanum is obtained from different ſpecies of the Bubon, partly by its ſpontaneous exudation from the joints of the ſtem, but more generally, and in greater abundance, by making an inciſion in the ſtalk a few inches above the root, from which it immediately iſſues, and ſoon becomes ſufficiently concrete to be gathered. For an account of its properties and uſes, ſee BUBON *galbanum*. The compound pills of galbanum are prepared in the following manner: Take of galbanum gum-reſin an ounce, myrrh and ſagapenum, of each 1½ ounce, aſſafœtida gum-reſin half an ounce, and as much ſyrup as is ſufficient. Beat them together till they form an uniform maſs. The doſe is from gr. x. to 3ſs.

The beſt way of purifying it is to include it in a bladder, and keep it in boiling water, till it becomes ſoft enough to be ſtrained, by preſſure, through a hempen cloth: its eſſential oil will be thus preſerved, which is carried off in evaporation both by water and ſpirit. The eſſential oil of galbanum, diſtilled with water, riſes to the ſurface, of a yelloviſh colour, and in quantity about the 20th part of its weight. The empyreumatic oil is of a blue colour, and changes in the air into purple.

The galbanum colour was a prevailing faſhion with the Romans.

"Reticulumque comis auratum ingentibus implet,
Cærulea indutus ſcutulata, aut galbana raſa."
Juvenal, Sat. ii. l. 96.

And Martial, ſpeaking of an effeminate perſon, ſays,

"Galbanos habet mores." Lib. i. Epig. 97.

Commentators differ about the colour of "galbana raſa;" but the galbanum flower is deſcribed to be of a greeniſh yellow. See BUBON.

GALBULA, in *Ornithology*, the name of a bird of the thruſh kind, common in Italy and Germany, very remarkable for the elegant ſtructure and hanging of its neſt; and thence called by ſome *picus nidum ſuſpendens*, and by others *oriolus*, *chlorus*, and *icterus*, being ſuppoſed to be the icterus or jaundice-bird of Pliny, and the old writers. This bird, the loriot of Buffon, the witwall of Willughby, the golden thruſh of Edwards, and golden oriole of Latham, &c. &c. is ſomewhat larger than the common thruſh: its beak is a finger's breadth long, and red; its wing-feathers are black, but ſome are tipped, and others edged with white; others are varied with yellow, and the reſt are an extremely bright and beautiful yellow. The female is leſs beautiful, the yellow being more ſhaded with black and brown. The galbula feeds on inſects, and is in moſt places very much eſteemed at the table, but is no where to be had at all ſeaſons, being a bird of paſſage. See ORIOLUS *Galbula*.

GALBULA is alſo a ſpecies of the *Alcedo*; which ſee.

GALDER, in *Geography*, a town of the iſland of Canary.

GALDETOOR, a town of Hindooſtan, in the circar of Cicacole; 36 miles W. S. W. of Viſigapatam.

GALDHEIM, a town of Germany, in the principality of Wurzburg; ſeven miles E. of Schweinfurt.

GALE, THOMAS, in *Biography*, was born in 1507; and educated under Richard Ferris, afterwards ſerjeant-ſurgeon to queen Elizabeth. He was ſurgeon in the army of king Henry VIII. at Montruil, in 1544; and alſo in that of king Philip at St. Quintin, in 1557. He afterwards ſettled in London, and became very eminent in the practice of ſurgery. He was living in 1586. Biſhop Tanner gives the following liſt of his writings: "The Inſtitution of a Chirurgeon." "An Enchiridion of Surgery," in four books. "On Gun-ſhot wounds." "Antidotarie," in two books. All theſe were printed together, London, 1563, 8vo. "A compendious Method of curing præternatural Tumours." "On the Several Kinds of Ulcers, and their Cure." "A Commentary on Guido de Cauliaco." "An Herbal, for the Uſe of Surgeons." "A brief Declaration of the worthy Art of Medicine, and the Office of a Chirurgeon." "An Epitome of Galen de natural. Facultat." The two laſt were printed with a tranſlation of "Galen de Methodo Medendi." Numerous complaints of the intruſion of illiterate pretenders and empirics into the practice of medicine and ſurgery are interſperſed through theſe tracts; ſome of which are worth notice, as containing curious information reſpecting the ſtate of the profeſſion at that time. Aikin, Biog. Mem. of Med.

GALE, THEOPHILUS, was born at Kings Teinton in Devonſhire in the year 1628. The early parts of his education he received under the roof of his father's houſe, who was vicar of the pariſh; he was afterwards ſent, for improvement, to a grammar ſchool in the neighbourhood, and in the year 1647 he was entered at Magdalen college, Oxford. In 1649 he was admitted to the degree of B. A. before he had attained the uſual ſtanding, at which, according to the ſtatutes of the univerſity, that degree is conferred; and in the following year he was the ſucceſsful candidate for a fellowſhip in his college. In 1652 he took his degree of M. A., became an eminent tutor, and likewiſe a diſtinguiſhed preacher. While he diſcharged the ſeveral duties connected with theſe functions, he applied himſelf to theological ſtudies, and was aſſiduous in collecting materials for his great work, publiſhed many years afterwards under the title of "The Court of the Gentiles." The plan of this publication was laid in early life, upon the firm conviction that it might be made to appear that "the wiſeſt and moſt eſteemed of the pagan philoſophers borrowed the moſt rational of their ſentiments, and were indebted for their moſt ſublime contemplations, from the Scriptures; ſo that how different ſoever they might be in their appearance, not only their theology, but their philoſophy and philology were derived from the ſacred oracles." To the accompliſhment of this plan he devoted a conſiderable portion of many of the beſt years of his life, though he was never negligent of thoſe duties incumbent upon him in the other characters which he ſuſtained. In 1657 he ſettled as a ſtated preacher at Wincheſter, where he acquired univerſal eſteem by his miniſterial ſervices, and by his exemplary life and converſation. Upon the paſſing of the Act of Uniformity, Mr. Gale found himſelf compelled to reſign his living, and he was at the ſame time deprived of his fellowſhip. Under theſe circumſtances, he undertook the tuition of the ſons of lord Wharton, with whom he went to Caen in Normandy, where there was a celebrated ſeminary of learning, under the direction of the moſt diſtinguiſhed profeſſors of the reformed religion in France. In 1665 he returned with his pupils to England, and reſided with them, till September in the following year, at their father's ſeat in Buckinghamſhire. On the firſt of that month he ſet out for

London; but before he reached that city, he beheld the conflagration which deſtroyed ſo large a part of the metropolis of England. This tremendous ſcene would have appalled the ſtouteſt heart; to Mr. Gale it was peculiarly tremendous; the firſt tidings that reached his ears announced the deſtruction of the houſe and property of his beſt friend, and with theſe he had reaſon to fear the loſs of a deſk left in his hands containing all the MSS. which he had been ſo many years in accumulating. Scarcely had he reconciled his mind to the diſtreſſing event, when he met his friend, who aſſured him the deſk and contents were happily ſaved from the flames. He now reſolved to apply all his diligence in completing the work upon which he had already beſtowed ſo much time and labour; and, having finiſhed it, he applied to Dr. Fell, the vice-chancellor of Oxford, for a licence to print it. It was accordingly publiſhed at different periods; the firſt part came out in the year 1669, and was entitled, "The Court of the Gentiles; or, a Diſcourſe touching the Original of Human Literature, both Philology and Philoſophy, from the Scriptures and the Jewiſh Church." This ſpecimen was received with great applauſe both at home and in foreign countries: and Mr. Gale publiſhed the remaining parts in 1671 and 1677. The whole was ſpeedily tranſlated into the Latin language, and the fame of the author was extended over every part of Europe. Mr. Gale had publiſhed, in 1676, "Philoſophia Generalis, in duas partes, &c.;" the grand object of which was the ſame with that in "The Court of the Gentiles," but written in a more conciſe way, and intended for the uſe of perſons engaged in a regular courſe of philoſophical ſtudies. In the beginning of the year 1678, he printed propoſals for publiſhing, by ſubſcription, "Lexicon Græci Teſtamenti Etymologicum, Synonymum ſive Gloſſarium et Homonymum," which was intended as a lexicon and a concordance. The author had made conſiderable progreſs in the work, which was to have been compriſed in one volume folio, when Death ſtopped his career: this happened in 1678, when he was only in the 50th year of his age. Mr. Gale was a man of great learning, talents, and induſtry, his manners were mild and inoffenſive, his moral conduct irreproachable, and his piety towards his maker ardent and cheerful. He was zealouſly attached to what he thought the truth; ſteady in his adherence to the principles of non-conformity; and, having abandoned worldly good and temporal advantages, at the call of his conſcience, he was at all times ready to vindicate his conduct, and give a reaſon of the hope that was in him. He was author of many other works beſide thoſe already noticed. Theſe are enumerated in the Biographia Britannica, to which the reader is referred for further information.

GALE, THOMAS, was born at Scruton, in Yorkſhire, about the year 1635, and was educated in Weſtminſter ſchool. From Weſtminſter he went to Trinity college, Cambridge; where he took his degrees, and of which college he afterwards became a fellow. He was diſtinguiſhed by his exact knowledge of the Greek language, of which he was appointed the Regius Profeſſor. In 1672 he was choſen head maſter of St. Paul's ſchool, and was employed to write the inſcriptions on the monument, erected in memory of the dreadful conflagration in 1666; for which he was preſented with a piece of plate. In 1676 he was collated to a prebend in the cathedral church of St. Paul's, and about the ſame time he was choſen a fellow of the Royal Society, to which he preſented a Roman urn with its aſhes; and about the year 1697 he gave the library of Trinity college a great number of curious Arabic MSS. Having continued 25 years head maſter of St. Paul's ſchool, he was, as a reward for his great merit and inceſſant induſtry in that laborious occupation, promoted to the deanery of York. He died April 8, 1702, in the 68th year of his age, highly reſpected by all who knew him. He was a learned divine, a great hiſtorian and antiquary, and one of the beſt Grecians of his age. He was not only eſteemed by his own countrymen, but kept up a valuable correſpondence with many of the moſt learned men in foreign countries. He publiſhed new editions of various learned works, and likewiſe two volumes in folio of our ancient Engliſh hiſtorians. Biog. Brit.

GALE, ROGER, ſon of the former, a learned antiquarian, was born in 1672, and educated at Trinity college, Cambridge, of which he became fellow in 1697. He was repreſentative of North Allerton, in Yorkſhire, during three parliaments, and he held the office of commiſſioner of the exciſe. He was a fellow of the Royal and Antiquarian Societies, and of the laſt he was vice-preſident and treaſurer. He publiſhed "Antonini Iter Britanniarum Commentariis illuſtratum Thomæ Gale, S. T. P. nuper Decani Ebor Opus poſthumum reviſit, auxit, edidit R. G. Acceſſit Anonymi Ravennatis Britanniæ Chorographia." In the preface to this work, he pointed out what was his father's and what was his own in this edition. Mr. Gale likewiſe publiſhed a work entitled "The Knowledge of Medals," &c. tranſlated from the French of Joubert; "Regiſtrum Honoris de Richmond;" "A Diſcourſe on the four Roman Ways in Britain," and ſeveral papers in the Tranſactions of the Royal and Antiquarian Societies. He bequeathed his MSS. and a cabinet of Roman coins to Trinity college, Cambridge. His brother Samuel publiſhed "The Hiſtory and Antiquities of the Cathedral Church of Wincheſter," which was begun by Henry earl of Clarendon, and continued to the year 1715. Biog. Brit.

GALE, JOHN, born in London in the year 1680, was inſtructed with great care in the learned languages, and in Hebrew, in which he had made a very conſiderable proficiency by the time that he was ſeventeen years of age. At this period he was ſent by his father to the univerſity at Leyden, where his progreſs was ſo great that in leſs than two years he took the degrees of M.A. and doctor of philoſophy. From Leyden Dr. Gale went to Amſterdam, where he purſued his theological ſtudies with great ardour, and having carefully improved himſelf in the knowledge of the Oriental languages, he undertook a critical examination of the Old and New Teſtament in their originals. So great was his reputation for real learning, that the univerſity of Leyden offered him the degree of doctor in divinity, provided he would ſubſcribe to the articles eſtabliſhed by the ſynod of Dort. But he rejected the propoſal, being reſolved never to ſacrifice his liberty for worldly profit or literary honours, and to call none maſter on earth but Chriſt. Dr. Gale had been educated in the principles of the antipædobaptiſts, and in 1705 he was called upon by his friends to juſtify his ſentiments, by anſwering "The Hiſtory of Infant Baptiſm," publiſhed by Mr. Wall, vicar of Shoreham, which hiſtory had been honoured by a vote of thanks of the Houſe of Convocation. He accordingly drew up a ſeries of letters on the ſubject, which were publiſhed in the year 1711, under the title of "Reflections on Mr. Wall's Hiſtory of Infant Baptiſm, in ſeveral Letters to a Friend." In the courſe of theſe letters he vindicated his friend Le Clerc from the imputations of hereſy and impiety caſt on him by Wall and others, on account of his unwillingneſs to admit any human explanation of the doctrine of the Trinity as an article of Chriſtian faith. Dr. Gale, on account of his extreme modeſty, could not be prevailed on to undertake the paſtoral office till he was thirty-five years of age. He then ſettled

with a congregation of baptiſts near Barbican, where he ſoon became a very popular preacher. His doctrines were liberal and ſcriptural, but he thought, that though the ſacred writings were alone authoritative in matters of faith and practice, yet that an accurate acquaintance with the doctrines and diſcipline of the church, in the ages next the apoſtles, was highly deſirable, as affording a view of the ſenſe in which the ſacred writings were then underſtood; with this view he became a member of a ſociety for promoting primitive Chriſtianity, which met weekly at Mr. Whiſton's, for the purpoſe of examining the moſt ancient writers of the Chriſtian church, to determine which of the pieces attributed to them were, and which were not genuine. On all occaſions Dr. Gale proved himſelf a zealous friend to the object of theſe meetings, and exhibited an ardent deſire of diving into the truth: nor was he leſs anxious to extinguiſh all diſputes among Chriſtians. In 1719 a furious controverſy was excited among the diſſenters in the weſt of England, on the ſubject of the Trinity, and reſpecting ſubſcriptions to teſts of orthodoxy: the London miniſters were not neutral in the conteſt; many of them, to their diſgrace, ſanctioned the proceedings of the bigotted, intemperate, and perſecuting party; but Dr. Gale, than whom no one was more reſpectable, was of the majority who ſubſcribed an advice to their brethren in the country not to impoſe unſcriptural ſubſcriptions, in oppoſition to thoſe who ſubſcribed a contrary letter on that ſubject. Dr. Gale's "Reflections on Mr. Wall's Hiſtory" produced an interview between the authors, at Mr. Whiſton's, where the ſubject was diſcuſſed at large, but both parties retired more fully perſuaded that their own doctrines were thoſe of the truth. Mr. Wall drew up a vindication of his "Hiſtory" and opinions, which obtained for him a diploma from the univerſity of Oxford. Dr. Gale ſet about preparing an anſwer to his antagoniſt, but long before it was ready the world was deprived of the benefit of his exertions in the cauſe of religious liberty by his premature death. This event happened in the year 1721, when the doctor was only in the forty-ſecond year of his age. He had, however, lived long enough to attach the friendſhip of many of the moſt eminent characters of the age, and to obtain, on account of the benevolence of his diſpoſition and the mildneſs of his manners, the general reſpect and eſteem of all who knew him. Among his particular friends may be mentioned the lord chancellor King; Dr. Hoadly, biſhop of Bangor, and Dr. Bradford, biſhop of Rocheſter. This worthy man, according to the uſual courſe of events, might naturally have looked to a much farther extenſion of life, and had accordingly projected many valuable deſigns, of which one was an "Engliſh Tranſlation of the Septuagint," according to the edition of Dr. Grabe; and another was "A Hiſtory of the notion of Original Sin," in which he meant to ſhew its total inconſiſtency with juſt and honourable conceptions of an infinitely wiſe and good being. Soon after his death four volumes of his "Sermons" were publiſhed which were diſtinguiſhed by the utility and importance of their ſubjects, and by the ſtrength and clearneſs of the reaſoning contained in them. Biog. Brit.

Gale, or *Gaule*, in *Botany*, a name of Dutch origin applied to the Candleberry Myrtle, *Myrica Gale* of Linnæus. See Myrica.

Gale, in *Geography*, a river of Ireland, in the northern part of the county of Kerry, which flows into the Caſhin.

Gale, in *Rural Economy*, a term ſignifying a bull that has been caſtrated.

Gale, a *Sea Phraſe*, for the blowing of the wind.

When the ſea is not blown ſo hard, but that a ſhip can carry her top-ſails a trip, that is, hoiſted up to the higheſt, they ſay it is a *loom gale*.

When it blows very ſtrong, they ſay it is a *ſtiff gale*, or at leaſt a *freſh gale*; but when it blows ſo hard, and violently, that a ſhip cannot bear any ſail, they ſay it blows a *ſtorm*.

When two ſhips are near one another at ſea, and there being but little wind blowing, one feels more of it than another; they ſay the ſhip *gales* away from the other.

Gale's *Creek*, in *Geography*, a river of North Carolina, which runs into the Atlantic. N. lat. 34° 44'. W. long. 77 12.

GALEA, or Galerus, among the *Romans*, was a light caſque for the head, generally made of the ſkin of ſome wild beaſt, in order to appear the more terrible. Thus Virgil.

"—— fulvoſque lupi de pelle galleros."

The galea was alſo a head-piece, coming down to the ſhoulders, commonly of braſs, and ſometimes of iron; the lower part was called *buccula*, and on the top was the creſt.

Galea, in *Natural Hiſtory*, the name of a genus of the *echinodermata*, or ſea-hedgehogs, whoſe ſhape is that of a large elevated helmet, compoſed of ſeveral tranſverſely-joined plates, or aſſulæ, and covered with very ſmall and rough tubercles, in the ſhape of little granulæ. This genus, when foſſile, is called in Engliſh the helmet-ſtone, and is marked with ten rows of double lines, either crenated, or punctuated, and running from the top to the baſe; the anterior ones being much longer than the reſt.

Of this genus there are three known ſpecies, *viz.* 1. The ſcutated headed one, which has on its ſummit an oblong pentagonal plate like a ſhield. 2. The naked headed one without this ſhield. 3. That with the tæniæ laurated, and ſhewing that they have been once of the variolated kind. Klein's Echinod.

Galea, or *Galiot*, in *Naval Tactics*, a low built veſſel for the conveyance of troops or ſtores, having both ſails and oars.

Galea, in *Surgery*, ſignifies a kind of bandage for the head.

GALEACHABAD, in *Geography*, a town of Hindooſtan, in Allahabad; 3 miles N.W. of Iconpour.

GALEAPOUR, a town of Bengal; 60 miles W.N.W. of Midnapour.

GALEANTHROPIA, of γαλεη, *cat*, and ανθρωπος, *man*, in the writings of the *Ancient Phyſicians*, a term uſed to expreſs a ſpecies of madneſs, in which the patient fancied himſelf a cat, and endeavoured to perform all the motions of that animal.

GALEARII, in *Antiquity*, *helmet-bearers*; a name the Romans gave to the black guards, or ſervants of the ſoldiers. See Vegetius iii. 6. and Salmaſius on the third chapter of the life of Adrian by Spartian.

GALEASSE. See Galley.

GALEATE Flowers. See Flowers.

GALEDUPA, in *Botany*, Rumph. Amboin. v. 2. 59. t. 13. Lamarck in Juſſ. 363. An Aſiatic leguminous tree of which little is known. The *Pungam*, Hort. Mal. v. 6, 5. t. 3, cited by Juſſieu with heſitation, ſeems to be very diſtinct.

GALEETO, in *Ichthyology*, the name of a fiſh of the alauda kind, called by Rondeletius *alauda non criſtata*, and

in

in Engliſh the mulgranoc and the bullcard. See *Blennius* Pholis.

GALEGA, in *Botany*, a word, according to John Bauhin, Hiſt. Plant. v. 2. 342, of Italian origin, and from the ſynonyms it ſeems poſſibly to be a corruption of *herba gallica*. However obſcure or barbarous its ſource, it has long been ſanctioned by general adoption. Linn. Gen. 384. Schreb. 506. Willd. Sp. Pl. v. 3. 1239. Mart. Mill. Dict. v. 2. Juſſ. 359. Tourn. t. 222. Lamarck Illuſtr. t. 625. Claſs and order, *Diadelphia Decandria*. Nat. Ord. *Papilionaceæ*, Linn. *Leguminoſæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, ſhort, divided half way down into five awl-ſhaped, nearly equal teeth. *Cor.* papilionaceous; ſtandard large, ovate, reflexed at the ſummit and ſides; wings oblong, almoſt as long as the ſtandard, each furniſhed with an appendage; keel oblong, compreſſed, ſtraight, tumid underneath towards the extremity, ſharp above. *Stam.* Filaments diadelphous (ſimple and nine-cleft); anthers oblong. *Piſt.* Germen ſuperior, ſlender, oblong; ſtyle ſlender, aſcending, ſhorter than the germen; ſtigma a minute terminal point. *Peric.* Legume very long, compreſſed, pointed, furrowed with oblong ſtreaks between the ſeeds. *Seeds* ſeveral, oblong-kidney-ſhaped.

Eſſ. Ch. Calyx with awl-ſhaped, nearly equal teeth. Legume of one cell, linear, with oblique ſtreaks between the ſeeds.

This genus, originally eſtabliſhed on the Goat's Rue, *Galega officinalis*; Linn. Sp. Pl. 1062, has ſince been much enlarged by the addition of many Cape, as well as tropical plants, ſo that the ſpecies in Willdenow amount to 37. Of theſe the G. *piſcatoria*, Ait. Hort. Kew. v. 3. 71, a native of the Eaſt Indies and South-ſea iſlands, is uſed to intoxicate fiſh, by being put into the water, ſo as to cauſe them to be eaſily caught by the hand. Many of the *flowers* are ornamental, being uſually of a pink or purpliſh colour. The *roots* are commonly perennial; the *ſtems* often ſhrubby. *Leaves* in ſeven ſpecies ternate; in the reſt elegantly pinnate, moſtly with numerous elliptical leaflets.

There are two ſpecies of Galega among the Chineſe. The firſt and largeſt is a thick, heavy plant, covered with a hard, reddiſh bark, whitiſh from within, and of a ſharp, bitter taſte. Its bloom is like that of the pea, inodorous, ſometimes of a blue and ſometimes of a white colour. It gives vinegar a very agreeable taſte, and is reckoned a ſpecific in diſorders of the breaſt. The ſecond ſpecies is a hard root, of the ſize of a little finger, reddiſh within and without, and of a ſtronger and more aromatic taſte than the former. The plant ariſing from it has the form of a little tree, with leaves ſimilar to thoſe of the myrtle. It ſhould be ſelected freſh, juicy, of a high colour, compact, odoriferous, and with a ſtrong aromatic taſte. The Chineſe cut it into pieces of the ſize of a filbert, in order that it may be dried and carried about with more eaſe. They conſider it as an excellent antidote. Theſe two ſpecies of Galega are cultivated in the province of Xanxy, and the merchants of the city of Tayvan moſtly deal in them. Rochon's Madagaſcar.

GALEGOS, in *Geography*, a town of Portugal, in the province of Entre Duero è Minho; 4 miles N.E. of Barcelos.

GALEIEN, a town of Pruſſia, in Natangen; 25 miles S.E. of Brandenburg.

GALELA, a town on the E. coaſt of the iſland of Gilolo. N. lat. 1° 58′. E. long. 127° 51′.

GALEN, Claudius, in *Biography*, a celebrated phyſician of antiquity, was born at Pergamus, a city of Aſia Minor, in the hundred and thirty-firſt year of the Chriſtian era, and about the 14th or 15th of the reign of Adrian. From the place of his birth he obtained the ſurname of Pergamenus. He has himſelf informed us that his father, whoſe name was Nicon, was an honourable and wealthy man, and poſſeſſed of conſiderable knowledge of the belles lettres, philoſophy, aſtronomy, geometry, and architecture. Nicon was ambitious of initiating his ſon in all the learning of the age; and, after having inſtructed him in the rudiments of knowledge himſelf, ſent him to the beſt ſchools of philoſophy. Whilſt engaged in ſtudying the principles of the different ſects, Galen ſoon diſplayed his judgment, by ſelecting the various parts of the doctrines of the ſtoics, academics, and peripatetics, which appeared to him rational, and totally rejecting the faſhionable ſyſtem of the Epicureans. About the age of ſeventeen, he began his attachment to the ſcience of medicine, over which he was deſtined to preſide for many centuries with oracular authority. During his youth he travelled much, partly with a view of profiting by converſation with the moſt intelligent phyſicians of the age, and partly for the purpoſe of learning whatever related to the drugs, which were the products of different countries. He reſided ſeveral years at Alexandria, which was then the great reſort of men of ſcience, and the beſt ſchool of medicine in the world. He viſited Cilicia, Paleſtine, and the iſlands of Crete and Cyprus; he made two voyages to Lemnos, in order to aſcertain the nature of the Lemnian earth, which was deemed a medicine of extenſive utility; and he went to Cælo-Syria to examine the opobalſam. At the age of twenty-eight he returned from Alexandria to Pergamus, where his practice was attended with diſtinguiſhed ſucceſs. Four years after this, in the thirty-ſecond year of his age, he left his native place, and went to Rome, where he attempted to eſtabliſh himſelf. But he encountered much oppoſition and jealouſy from the phyſicians of that city, who adhered to the principles of the methodic ſect; he was ſtigmatized by them as a theoriſt, and even as a dealer in magic. Nevertheleſs his merit was recognized by ſeveral Romans of learning and rank. He became extremely intimate with Eudemus, a peripatetic of great reputation, whom he cured of an obſtinate intermittent; and he obtained the eſteem of Sergius Paulus, the pretor; of Barbarus, the uncle of the emperor Lucius; of Severus, afterwards emperor; of Boëthus, a man of conſular dignity, and others, before whom he made ſeveval diſſections, and demonſtrated eſpecially the organs of reſpiration and of the voice. But wanting temper and experience, neceſſary to a ſucceſsful conteſt with a numerous and popular party, he returned to Pergamus, after a reſidence of four or five years, under the pretence of avoiding the plague, which then raged in the metropolis of the world.

Galen had made himſelf known, however, to advantage; for he had not remained long in his native place before he was ſent for to attend the emperors Marcus Aurelius and Lucius Verus, who were then at Aquileia. The appearance of the plague at this place compelled the emperors to depart haſtily on their return to Rome, whither Galen ſoon followed. Lucius died on the road; but Galen had obtained ſo much of the eſtimation of the good Aurelius, that, during his famous expedition into Germany, he committed to him the care of his ſons Commodus and Sextus. Theſe princes were ſeized with fevers, which Galen had the good fortune to cure; and he alſo gave a correct opinion of the iſſue of their diſeaſes, contrary to that of all his colleagues, which raiſed him to an eminence, from which he was able to defy the power, and finally to ruin the credit, of his former opponents.

It is not known with certainty how long Galen reſided at Rome,

Rome, after he went thither the ſecond time, or whether he ever returned to Aſia; nor are his biographers agreed as to the age which he had attained at his death. It ſeems probable from his writings that he lived at Rome under the emperors Marcus Aurelius, Commodus, and Severus; and Fabricius aſſerts that he died at the age of ſeventy; which, if we calculate from his birth, muſt have happened in the ſeventh year of the reign of the laſt mentioned emperor, or in the firſt year of the third century of the Chriſtian era.

The high eſtimation in which the character of Galen was held by his contemporaries, is evinced by the public reſpect which he enjoyed to the end of his days, amid thoſe violent political tumults that afforded very ſlender ſecurity to the merits of other individuals. The greateſt part of his life was ſpent in the zealous purſuit of knowledge; and every ſubject, poſſeſſing the moſt remote, real or imaginary connection with medical concerns, became the object of his ardent inveſtigation. As the fruits of his reſearches, we are told, that he compoſed five hundred different eſſays on the various parts of medicine, and half as many on other ſcientific ſubjects, connected with it. The conſciouſneſs of his ſuperior endowments, however, inflamed his vanity, and rendered him ſomewhat contemptuous towards his brethren: he even preſumed to compare himſelf with the emperor Trajan, in reſpect to the benefits which he conferred on the public. But great vanity was a common characteriſtic of the learned men of his time.

Without entering into a long detail of all the particular treatiſes written by Galen, it may be ſufficient here to notice the different editions of the whole of his works that have been tranſmitted to us. The Greek editions are thoſe of Aldus and Aud. Aſulanus, printed at Venice, 1525, in five volumes folio, and of Hieron. Gemuſæus, at Baſil, 1538, in the ſame form. The Latin editions are, that of Paris, 1536, folio, printed by Simon Colinæus; and reprinted at Lyons in 1554, with additions and corrections, by Joan. Frellonius:—that of Baſil, 1542, folio, printed by Frobenius, and edited by Gemuſæus:—thoſe of Baſil again in 1549, 1550, and 1562; the laſt of which contains a preface by Conrad Geſner, in which he comments with great judgment on the merits of Galen, and his works, and of his different tranſlators:—the edition of Venice, 1562, with the corrections of John Baptiſt Raſario:—ten editions publiſhed at Venice by the Juntas, in different years between 1541 and 1625; the ninth of which, printed in 1609, and the laſt, are preciſely the ſame, and are the beſt and moſt correct:—laſtly, an edition printed at Venice in 1541-45, by John Farræus, in ſeven volumes 8vo., with the notes of Ricci. An edition of Galen's works, both in Greek and Latin, in an elegant form, was publiſhed at Paris, in thirteen volumes, folio, by Réné Chartrier, including alſo the works of Hippocrates; it is deemed a correct work. See Eloy. Dict. Hiſt. Le Clerc. Hiſt. de Med. For an account of the particular treatiſes of Galen, ſee the author laſt quoted, and Haller. Biblioth. Med. Pract. Galen has twice mentioned our Saviour in his treatiſe "De differentia pulſuum;" and in his celebrated work "De uſu Partium Corporis humani," he has mentioned Moſes. Lardner's Works, vol. viii.

This great phyſician has recorded a ſtory of the power of muſic over the paſſions, ſimilar to what has been related of Pythagoras by Boethius. He ſays that Damon, the muſic-maſter of Socrates, ſeeing a young ſtranger inflamed with wine, in ſo violent a rage, that he was on the point of ſetting fire to the houſe of his miſtreſs, for preferring his rival to him; and, moreover, animated by the ſound of a flute playing to him in the Phrygian mode, had this young man reſtored to reaſon and tranquillity, by ordering the Tibicina, or female performer on the flute, to change her mode, and play in a grave and ſoothing ſtyle, according to the meaſure uſually given to the *ſpondee*. Galen, though he differs much from Aſclepiades on moſt other ſubjects, joins with him in the medicinal powers of muſic: and about the middle of the laſt century, the learned Dr. Bianchini, profeſſor of phyſic at Udine, collected all the paſſages preſerved in ancient authors relative to the medicinal application of muſic by Aſclepiades, who flouriſhed near a century before the Chriſtian era; and it appears from this compilation, (entitled "La Medicina d'Aſclepiade per ben curare le Malatie acute, raccolta da varii frammenti Greci e Latini," in Venezia,) that it was uſed as a remedy by the ancient Egyptians, Hebrews, Greeks, and Romans, not only in acute, but chronical diſorders.. And this writer gives ſeveral caſes within his own knowledge, in which muſic has been efficacious; but the conſideration, as well as the honour, of theſe, more properly belong to *modern* muſic than to the ancient. See MEDICINA *Muſica*, where this ſubject will be reſumed.

GALEN, in *Geography*, a military townſhip of America, in Onondago county, New York, ſituated on Canandarqua creek; 12 miles N.W. of the N. end of the Cayuga lake, and 13 S. by E. of Great Sodus. On the ſouth it is bounded by Junius.

GALENA, in *Mineralogy*, lead mineralized by ſulphur. (See LEAD, *Sulphuretted.*) The meaning formerly conveyed by this term was vague; for, beſides ſulphuret of lead, alſo common or black blende was meant by it. It was alſo uſed by Wallerius and others as a prefix to the names of various metals to denote their ſulphurets: thus we have Galena antimonii or ſtibii, which is our grey-antimony-ore; Galena cobalti, or white and grey-cobalt-ore; Galena zincina, Galena biſmuthi, &c.

GALENA *Inanis*, a name given by authors to a glittering ſubſtance, very much reſembling ſome of the plated ores of lead, but really containing none of that metal.

GALENIA, in *Botany*, ſo denominated by Linnæus in memory of the celebrated ancient phyſician Galen. Linn. Gen. 194. Schreb. 263. Willd. Sp. Pl. v. 2. 436. Mart. Mill. Dict. v. 2. Juſſ. 84. Claſs and order, *Octandria Digynia*. Nat. Ord. *Succulentæ*, Linn. *Atriplices*, Juſſ.

Gen. Ch. *Cal.* Perianth minute, inferior, four-cleft, concave; its ſegments oblong. *Cor.* none. *Stam.* Filaments eight, capillary, hardly ſo long as the calyx; anthers of two lobes. *Piſt.* Germen ſuperior, roundiſh; ſtyles two, ſimple, reflexed; ſtigmas ſimple. *Peric.* Capſule roundiſh, of two cells. *Seeds* two, oblong, angular.

Eſſ. Ch. Calyx four-cleft. Corolla none. Capſule roundiſh, of two cells, containing two ſeeds.

1. G. *africana*, Linn. Sp. Pl. 515. Suppl. 227. (Atriplex africana lignoſa luteſcens, roriſmarini foliis; Till. Hort. Piſ. t. 15.) "Upright, ſhrubby. Leaves linear, fleſhy."—Native of Africa. A humble plant of no attractive aſpect, ſomewhat reſembling an *Aſparagus*, with terminal panicles of ſmall inconſpicuous greeniſh-white *flowers*, which are ſeſſile in the forks of the panicle.

2. G. *procumbens*. Linn. Suppl. 227. "Procumbent. Leaves ovate, channelled, with ſpreading recurved points."—Gathered by Thunberg at the Cape of Good Hope.

GALENICAL SYSTEM. The profeſſors of medicine at Rome were divided into a number of ſects at the time when Galen appeared; and of theſe the methodiſts appear to have been in the higheſt eſtimation, and the empirics in the loweſt, while the dogmatics were again divided in regard to the authority to which they appealed, ſome preferring the tenets of Hippocrates, others thoſe of Eraſiſtratus, of Aſclepiades, &c. (See EMPIRIC). But Galen treated with deriſion

theſe ſlaves of authority, and profeſſed himſelf of the eclectic claſs, who adopted whatever was valuable in the writings of all phyſicians indiſcriminately. Hippocrates, however, was the author whoſe works he held in the higheſt eſtimation, and he ſeemed to conſider himſelf as the firſt who had diſcovered the true interpretation of his language. After writing much in the way of comment on the father of phyſic, and even defending his principles againſt thoſe of ſome of the ſectarians, he eſtabliſhed his own ſyſtem by filling up the outline, as it were, of the theory of Hippocrates, to which he made numerous additions. This ſyſtem was formed with conſiderable ingenuity, and was ſufficiently plauſible, in the abſence of more accurate phyſiological knowledge, to be received as the true ſyſtem of nature, and to occupy the attention of the medical world for thirteen centuries, excluding all rational inveſtigation, and therefore retarding, rather than aſſiſting, the progreſs of the ſcience. We can only pretend to give a ſlight ſketch here of the opinions of this extraordinary man.

Galen maintained, with Hippocrates, that the body was compoſed of four elements, fire, air, water, and earth, which were poſſeſſed of the qualities of hot, cold, moiſt, and dry. While theſe elements and qualities remained in juſt proportion to each other, the different parts of the body were in a ſtate of juſt *temperament*, and performed their reſpective functions well; in other words, the body remained in health. But when any of theſe elements or qualities became deficient or exceſſive, an *intemperies* enſued, the functions were imperfectly or painfully performed, or altogether ceaſed. The organs of the body, he alſo remarked, were or were not in a proper ſtate in reſpect to ſize, figure, number, ſituation, connection, or diſunion: and theſe circumſtances included all the varieties of health and diſeaſe. Hence the buſineſs of the phyſician was, on the one hand, to maintain the proper *temperament*, and to correct any *intemperies*; and on the other, to preſerve the ſize, figure, number, ſituation, and connection of the organs, and to re-eſtabliſh theſe conditions when diſordered. From this view of the ſubject two axioms were deduced. The firſt was, that it is neceſſary to retain all the parts in their natural condition, by means which are ſimilar in quality or power: *i. e.* heat is adapted to preſerve the quality of heat in a hot part, cold to retain the quality of cold in a cold part, &c.; and, in like manner, we muſt guard againſt the circumſtances which tend to alter the figure, ſize, connection, &c. of the organs. This maxim related to the *preſervation of health*. The ſecond regarded the *cure of diſeaſes*, and inculcated the neceſſity of correcting the intemperies, and the derangements in point of ſize, figure, &c., by means of *contrary quality or power; i. e.* where a warm part is become cold, heat muſt be applied; and where a certain motion, or by violence an organ has been diſplaced, a motion or violence of an oppoſite tendency muſt be employed to reſtore it to its ſituation; and ſo on. In a word, contraries are cured by their contraries, "contraria contrariis medentur."

All the curative intentions of the practitioner were fulfilled, according to Galen, by diet, medicines, or manual operation. The principal practical maxims which Galen adopted upon theſe points were thoſe which Hippocrates had taught. It muſt be obſerved, however, with reſpect to pharmacy, or the preparation and uſe of drugs, that much additional knowledge had been acquired ſince the time of Hippocrates, and many new medicines had been employed, both ſimple and compound. Upon the ſubject both of ſimple medicines, and of compounding them, Galen wrote many treatiſes; and as he had employed ſome fancy in aſſigning the particular intemperies to each diſeaſe, in the various combinations of hot and dry, hot and moiſt, cold and moiſt, &c.; ſo he exerciſed the utmoſt ſtretch of imagination in determining the properties of ſimples. For theſe properties were deduced from the four primary qualities of hot, cold, moiſt, and dry, and were conceived by him to exiſt each in four different degrees. Thus the quality of hot, for inſtance, was poſſeſſed by different ſubſtances in the firſt, ſecond, third, or fourth degree. Cichory was believed to be cold in the firſt degree, and pepper to be hot in the fourth degree. By the different combinations of theſe qualities, in their different degrees, he ſuppoſed that all medicines operated: and he even explained the ſenſible qualities of certain ſubſtances, ſuch as ſour, ſalt, acrid, &c. as depending upon the primary qualities juſt mentioned. Thus ſaltneſs, he ſaid, originated in the principle of heat; bitterneſs he deduced from dryneſs; ſourneſs from cold; &c. Theſe latter qualities, however, he conſidered as differing from the former, in the one inſtance being *actual*, in the other *potential*: thus fire is actually hot, pepper potentially; ice is actually cold, mandrake potentially. In theſe ſpeculations, it is obvious that Galen admitted the phantoms of the imagination to ſupply the place of obſervation and experience: but even this comprehenſive theory, like other gratuitous ſyſtems, left many facts to be explained by ſome occult principle, or ſpecific cauſe, the final reſort of human ignorance. The common operation of purgatives was explained by a ſpecific attraction of each purgative ſubſtance for a certain humour, which it diſcharged: hence, though Galen employed blood-letting to diminiſh plethora, he uſed purgatives only with the intention of evacuating *cacochymy*, or morbid humours.

There are other points in the phyſiology of Galen, which, for the ſake of perſpicuity, we have omitted to notice in the preceding ſketch; but which merit attention, inaſmuch as they conſtitute in part the foundation of the language of phyſiologiſts, even in the improved condition of our knowledge in modern times. With Hippocrates, he divided the living body into three principles, or component parts, the *ſolids*, the *humours*, and the *ſpirits*. The ſolids he ſubdivided into ſimple, and compound or organic. Of the fluids he recognized the four humours of Hippocrates, the *blood*, *phlegm*, *bile*, and *black bile*, or melancholy, and their relations to the four elemental properties which that ancient phyſician had maintained: namely, he regarded the blood as a red, hot, and moiſt humour; the phlegm, as white, cold, and moiſt; the bile, as yellow, hot, and dry; and the melancholy, as a black, cold, and dry humour. With reſpect to the ſpirits, Galen divided them into three ſpecies, the *natural*, *vital*, and *animal* ſpirits. The firſt of theſe were only a ſubtile vapour, ariſing from the blood, and deriving their origin from the liver, which he deemed the elaboratory of the blood. Theſe natural ſpirits, when carried to the heart, and mixed with the air, taken in by reſpiration, became vital ſpirits; which again were converted into animal ſpirits in the brain. Theſe three ſorts of ſpirits he conſidered as the inſtruments of the three different faculties, reſident in the parts in which each ſort of ſpirits was formed. The *natural* faculty, or function, he placed in the liver, and believed it to preſide over the nutrition, growth, and generation of the animal body. The *vital* function he lodged in the heart, and conceived, that by it heat and life were communicated to every part of the body through the canal of the arteries. The *animal* faculty, including the rational principle, he placed in the brain, and conſidered it as diſtributing the power of motion and feeling to every part, through the medium of the nerves, and as preſiding over the other faculties. (See FUNCTION.) Theſe three faculties produced the three ſorts of actions, according to Galen, which are deſignated by the ſame epithets, and

which

which he divided into *internal* and *external*. The internal animal actions are imagination, judgment, and memory; the external are the five ſenſes, and motion. The internal vital actions are violent paſſions, as anger, &c.; the external are motion, the pulſation of the arteries, and diſtribution of the ſpirits through them, diffuſing life and heat. The internal natural actions are ſanguification, the digeſtion of food, and the actions connected with it; the external are the diſtribution of blood by the veins for the purpoſes of nouriſhing, enlarging, and preſerving the body. Beſides theſe general faculties, Galen admitted of particular faculties, reſiding in each organ of the body, and directing its movements: and if he were aſked, what was the prime mover of all theſe faculties, he anſwered with Hippocrates, Nature.

We ſhall not attempt to detail his numerous diviſions of diſeaſe, or his views of the different cauſes, ſymptoms, diagnoſtic and prognoſtic ſigns, which his ſlavery of ſyſtem led him to arrange in peculiar orders and claſſes. Before we conclude, we muſt remark, that the little and equivocal notice of the pulſe taken by the more ancient phyſicians, is amply compenſated by the copiouſneſs of Galen; who, after making it the greateſt ſtudy of his life, left behind him ſixteen or ſeventeen different treatiſes on this ſingle ſubject. But it was a more abundant ſource of abſurd hypotheſis than any of his other ſpeculations: nevertheleſs he evinced his prudence, in pointing out the neceſſity of comparing the ſtate of the pulſe with all other ſymptoms, before a final judgment of any diſeaſe is formed. Le Clerc. Hiſt. de la Med. Walker's Memoirs. For a full account of the extent of the anatomical acquirements of Galen, the reader may conſult the elaborate work of Monſ. Le Clerc, juſt quoted. It remains for us only to notice the

GALENICAL *Pharmacy*, which formerly ſtood in oppoſition to *chemical* pharmacy. The medicinal ſubſtances uſed by Hippocrates were generally given ſingly, and in the moſt ſimple forms. Deviations from this rational cuſtom, however, had extended to an incredible degree before Galen, much of whoſe time was employed in arranging according to his own theories the multifarious compoſitions of his predeceſſors. But inſtead of ſimplifying, he conjoined with the labour of methodizing, a zeal to enlarge the overgrown catalogue. Excepting, however, in the number of ingredients, ſuppoſed to poſſeſs ſimilar qualities, which he heaped together in boundleſs profuſion, his pharmacy poſſeſſed conſiderable ſimplicity; for it included only vegetable productions, and was confined to the mere operations of powdering, boiling, or infuſing. This Galenical or vegetable pharmacy remained, for ten centuries, a perfect code, or ſealed book, from which practitioners in medicine thought it little leſs than ſacrilege to deviate, even on the moſt minute occaſions.

When the chemical reſearches of Paracelſus and Van Helmont had introduced certain preparations of mercury, and other metallic or mineral ſubſtances, into the materia medica, theſe innovations were oppoſed by the followers of the doctrines of Galen, and the partiſans aſſumed reſpectively the titles of *Galeniſts* and *Chemiſts*. Theſe titles, however, are now extinct, and the numerous frivolous hypotheſes of both ſects are exploded: the ſcience of modern times, while it has found the neceſſity of diſcarding from the catalogue of the materia medica numerous ſimples employed by the Galeniſts, and of ſimplifying their multifarious compounds, has at the ſame time borrowed from the laboratory of the chemiſts ſome of the moſt active and ſalutary agents upon the living animal body.

GALENISTS, in *Medicine*, ſee the preceding article.

GALENISTS, or *Galenites*, in *Eccleſiaſtical Hiſtory*, are a branch of Mennonites, or Anabaptiſts, who take in ſeveral of the opinions of the Socinians, or rather Arians, touching the divinity of our Saviour.

In 1664, the Waterlandians were divided into two parties, of which the one were called Galeniſts, and the other Apoſtoolians.

They are thus called from their leader, Abr. Galenus, a learned and eloquent phyſician of Amſterdam, who conſidered the Chriſtian religion as a ſyſtem, that laid much leſs ſtreſs on faith than practice; and who was for taking into the communion of the Mennonites all thoſe who acknowledged the divine origin of the books of the Old and New Teſtament, and led holy and virtuous lives.

GALEOBDOLON, in *Botany*, from γαλεη, *a weaſel*, or *cat*, and βδολος, a *fœtid ſcent*. It has occaſionally been a ſynonym for ſome ſpecies of *Galeopſis*, or plants akin to that genus, and is retained by Linnæus as the ſpecific name of the yellow Archangel, made a diſtinct genus by Hudſon. Hudſ. Fl. Angl. 257. Sm. Fl. Brit. 631. (Galeopſis; Linn. Gen. 292. Schreb. 389. Juſſ. 114. Leonurus; Willd. Sp. Pl. v. 3. 115.) Claſs and order, *Didynamia Gymnoſpermia*. Nat. Ord. *Verticillatæ*, Linn. *Labiatæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, with five unequal ſpreading teeth, each armed with a ſpinous awn, permanent. *Cor.* of one petal, ringent; tube ſhort, dilated upwards; limb gaping; upper lip incurved, elliptical, concave, entire; lower in three equal, acute ſegments; without any teeth at the edge of the orifice of the tube. *Stam.* Filaments four, awl-ſhaped, incurved under the upper lip, two ſhorter than the others; anthers roundiſh, bifid. *Piſt.* Germen ſuperior, four-cleft; ſtyle thread-ſhaped, about the ſame length and poſition as the ſtamens; ſtigma in two ſharp ſpreading diviſions. *Peric.* none, except the dried rigid calyx. *Seeds* four, angular, abrupt.

Eſſ. Ch. Calyx five-cleft, unequal, awned. Upper lip of the corolla entire, vaulted; lower in three acute ſegments.

1. G. *luteum*. Hudſ. 258. Sm. Engl. Bot. t. 787. With. 530. (G. Galeopſis; Curt. Lond. Faſc. 4. t. 40. Galeopſis Galeobdolon; Linn. Sp. Pl. 810. Dreves t. 20. Lamium luteum; Raii Syn. 240.) Yellow Dead-nettle; or Weaſel-ſnout.—Native of groves throughout Europe, to which it is very ornamental in the ſpring. It rather prefers a moiſt ſoil, and is perennial. The habit is that of a *Lamium*, not of a *Galeopſis*. *Stems* ſimple. *Leaves* oppoſite, ſtalked, heart-ſhaped, ſerrated. *Flowers* about ſix in each whorl, large, yellow, prettily ſpeckled with red. The herb has no very remarkable flavour, or quality. No other ſpecies is known.—Linnæus originally referred this plant to Leonurus, in which he has been followed by Scopoli, and more recently by Willdenow. The habit does not well accord, nor is the upper lip villous as in that genus.

GALEOLA, in *Natural Hiſtory*, the name of a genus of the *echinodermata*, or ſea hedge-hogs of the galeated, or helmet kind.

They have their name from the Latin *galeola*, a diminutive of the word galea, and which ſignified with the ancient Romans a drinking-veſſel, made in the ſhape of a ſmall helmet. Of this genus there are three known ſpecies. 1. A papilloſe kind, covered with ſmall eminences. 2. An undulated kind, with its ſtriæ reſembling waves. 3. The ſmooth kind. Klein.

GALEOPSIS, in *Botany*, from γαλεη, *a weaſel*, or *cat*, and οψις, *aſpect*, an old name, alluding to the mouth of the flower. Dr. Sibthorp, however, has proved the γαλεοψις of

Dioſcorides to be *Scrophularia peregrina*. Linn. Gen. 292. Schreb. 389. Willd. Sp. Pl. v. 3. 91. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 628. Juſſ. 114. Lamarck Illuſtr. t. 506. Claſs and order, *Didynamia Gymnoſpermia*. Nat. Ord. *Verticillatæ*, Linn. *Labiatæ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, with five rather unequal ſpreading teeth, as long as the tube, each armed with a ſpinous awn, permanent. *Cor.* of one petal, ringent; tube ſhort; limb gaping; orifice rather wider than the tube, as long or longer than the calyx, bearing on each ſide, at the baſe of the lower lip, a little pointed tooth-like protuberance, hollow at the back; upper lip roundiſh, concave, ſerrated at the top; lower in three ſegments, the lateral ones roundiſh, the central largeſt, emarginate, and crenate. *Stam.* Filaments four, awl-ſhaped, concealed by the upper lip; two of them ſhorteſt; anthers roundiſh, cloven. *Piſt.* Germen ſuperior, four-cleft; ſtyle thread-ſhaped, about the ſame length and poſition as the ſtamens; ſtigma in two ſharp ſpreading diviſions. *Peric.* none, except the rigid, upright or cloſed calyx. *Seeds* four, angular, abrupt.

Eſſ. Ch. Calyx five-cleft, awned. Upper lip of the corolla notched, vaulted; lower with two teeth on its upper ſide.

Obſ. Linnæus remarks, that in G. *Ladanum* the upper lip of the corolla is ſomewhat reflexed at the apex, and ſcarcely at all crenate, but we do not find this quite applicable to our plant; ſee Eng. Bot. t. 884. In G. *Tetrahit* Dr. Smith obſerved at Matlock a remarkable variety of ſtructure, the terminal flowers of each branch having a regular quadrifid ſalver-ſhaped corolla, with four equal ſpreading ſtamens, whilſt all the others were of their uſual ſhape. See Linn. Fl. Lapp. ed. 2. 201. Some botaniſts take this genus, at leaſt ſome of its ſpecies, for the γαλεοψις of Dioſcorides, whilſt others ſuppoſe *Lamium purpureum* to be what he intended under that name. The late profeſſor J. Sibthorp has, in our opinion, ſettled the point by obſervations on the ſpot, and propoſes *Scrophularia peregrina* as moſt correctly anſwering to all the ancient deſcriptions, as well as growing where Dioſcorides relates. See Prodr. Fl. Græc. v. 1. 406 and 435. He found no real *Galeopſis* in Greece or its neighbourhood. We have four ſpecies of *Galeopſis* in England, of which G. *verſicolor*, Engl. Bot. t. 667, often called the Bee Nettle, from the reſemblance of its lip to the Bee Orchis, is the moſt ſpecious, and is truly a beautiful flower. It grows in ſandy fields, and, like its congeners, is an annual, eaſily propagated by ſeed. The herbage has an inelegant nettle-like aſpect, beſet with pungent prickles. Willdenow's Species Plantarum enumerates four ſpecies, but he has not our G. *villoſa* among them, and he divides G. *Ladanum* into two, perhaps not improperly.

GALEPSUS, in *Ancient Geography*, a Greek town which authors have attributed, at different periods, to Thrace, or to Macedonia. It was ſituated on the weſtern coaſt of the peninſula, adjoining, on the weſt, to that on which mount Athos ſtood. This peninſula was denominated Sithonia. Galepſus was about a mile from the coaſt, having to the N.W. Myla, and to the S.E. Torone, which gave name to the Toronaic gulf. It was a colony of Thaſians, according to Thucydides.

GALERA, in *Geography*, a town of Spain, in the province of Grenada; 5 miles S.S.E. of Hueſca.—Alſo, a town of Spain, in the province of Catalonia; 5 miles S.S.W. of Tortoſa.

Galera, a ſmall iſland in the Mediterranean, on the coaſt of Minorca.

Galera, *Cape*, a cape on the coaſt of South America, on the Spaniſh Main. N. lat. 11°. W. long. 75° 20'.—Alſo, the eaſt point of the iſland of Trinidad. N. lat. 10° 45'. W. long. 60° 30'.—Alſo, a town of Italy, in the Patrimony of St. Peter; 9 miles S.E. of Bracciano.—Alſo, a river of Mexico, which runs into the Pacific ocean. N. lat. 15° 55'.

Galera, in *Zoology*, a ſpecies of *Muſtela*; which ſee.

GALERIA, or Galaria, in *Ancient Geography*, a town of Sicily, according to Diodorus Siculus. Stephanus, the geographer, calls the town "Galarina Urbs," and the country "Galaria."

Galeria, *Gulf of*, in *Geography*, lies on the N.W. coaſt of the iſland of Corſica. N. lat. 42° 27'. E. long. 8° 44'.

GALERICULATE Flowers. See Flowers.

GALERITA, in *Ichthyology*, the creſted blenny, called alſo adonis. See Blennius.

GALERIUS, ſurnamed *Armentarius*, and ſtyled alſo the younger *Maximian*, in *Biography*, was appointed Cæſar by Diocleſian, March 1ſt, A. D. 292, and in the year 305 advanced to the Imperial throne. In 307, he elevated Licinius to the rank of Auguſtus, ſo that at this time there were in reality ſix Roman emperors, *viz.* Maximian, Galerius, Conſtantine, Maximin, Maxentius, and Licinius. Galerius died in 311, of a long and grievous diſtemper, ſuppoſed to have been inflicted upon him as a judgment from heaven for his inhuman treatment of the Chriſtians. For other particulars relating to him, ſee Dioclesian and Persecution.

GALERON, in *Geography*, a town of the iſland of Celebes, celebrated for its fiſhery; 15 miles from Macaſſar.

GALESUS, (Cervaro,) in *Ancient Geography*, a river of Italy, in the vicinity of Tarento, mentioned by Virgil and Martial.

GALETS, in *Geography*, an iſland at the N.E. end of lake Ontario, and in the ſtate of New York; 3 miles S.W. of Roebuck iſland.

GALETTE, La, a neck of land in the river St. Laurence, in Canada. The land adjoining to it is very good. It is 1½ league above the fall called Les Galots.

Galette, *Riviere à la Vielle*, a river of Upper Canada, which runs into the river St. Laurence, above iſle Fort Levi. N. lat. 44° 46'. W. long. 75° 27'.

GALEUS, in *Ichthyology*. See Squalus.

Galeus *Rhodius*, a name given by Athenæus and ſome other of the old writers, to a very large and delicate fiſh. Schoneveldt is of opinion, that they meant by it the ſturgeon, and brings many good reaſons for his opinion. See Acipenser *Sturio*.

Galeus *Stellatus*, the *ſtarred hound fiſh*, in *Ichthyology*, a kind of hound fiſh remarkably ſpeckled, with white ſpots in form of ſtars.

GALEXIA, a name given by Galen, and ſome of the other ancient writers, to the common lamprey.

GALGALA, in *Geography*, a town of Hindooſtan, in the country of Viſiapour; 48 miles S. of Viſiapour. N. lat. 16° 42'. E. long. 75° 25'.

GALGON, a town of France, in the department of the Gironde; 5 miles N. of Libourne.

GALGULUS, in *Ornithology*, a ſpecies of *Pſittacus*; which ſee.—Alſo, a ſpecies of *Corvus*; which ſee.—Alſo, a ſpecies of *Coracias*, Coracias garrula, or roller; and alſo the Coracias ſinenſis; ſee Coracias.—Alſo, a ſpecies of *Tetrao*, or the Tetrao nævius. See Tetrao.

GALHANO, in *Geography*, a town of Portugal, in the province of Beira; 12 miles N.E. of Coimbra.

GALI, in the *Materia Medica*, a name given by ſome to the

the indigo, or feculæ of the plant anil, uſed in dyeing, &c. Garcias gives us this name, and ſays, that the plant is like the mangirique; but Cluſius tranſlating this word by ocymum or baſil, has ſtrangely perplexed the caſe: the anil or indigo plant not having any reſemblance of that herb.

GALIAN, in *Ichthyology*, a ſpecies of *Cyprinus*; which ſee.

GALIANI, Ferdinand, in *Biography*, was born in the year 1728, at Chieti, a town of Abruzzi, where his father, a nobleman, was aſſeſſor of the royal court of juſtice. He was deſtined for the ſtudy of the law, and was carefully educated with that view. He was much given to ſatire, and being refuſed admiſſion into an academy, he made uſe of his powers of invective againſt that body before he was eighteen years of age, which firſt made him known as a writer. In a ſhort time afterwards he applied his talents to more important and ſerious ſubjects. The public finances of the two Sicilies had become much deranged, and various plans had been propoſed to remedy the evil, but without ſucceſs. War and ſome other events cauſed a prodigious influx of money into them from Spain, France, and Germany; many regulations were immediately made to promote the trade, the arts, and the proſperity of the country; nevertheleſs the ſpecie ſeemed at once, as it were, to diſappear; the price of commodities ſuddenly roſe; a great alteration took place in the courſe of the exchange, and many commercial houſes were reduced to a bankrupt ſtate. In this ſtate of affairs Galiani wrote a work in five books "On Money and Specie," which was publiſhed in the year 1750. Diffident, perhaps, of his own talents, he printed it without his name, and it was for a conſiderable time a principal topic of converſation. Few works, at that period, diſplayed ſo much order, preciſion, and boldneſs of thought, and in which the ſubject was treated in ſuch clear and elegant language. It was received with univerſal approbation in his own country, and among the literati of other nations. When its fame was fully eſtabliſhed, the author diſcovered himſelf, to the great joy of his uncle, the archbiſhop of Tarento, and his other friends. He now obtained preferment in the church, and at the expence of his uncle he was enabled to make a tour through Italy, which procured him an acquaintance with the moſt eminent men of letters in that country. About the year 1755 he began to form a collection of all kinds of ſtones found in the neighbourhood of Veſuvius, and having amaſſed one hundred and forty-one ſpecimens, he publiſhed a treatiſe, in which he gave an explanation of them; and immediately tranſmitted the collection, with the printed deſcription, to pope Benedict XIV., and on one of the boxes he inſcribed the following words:

"Beatiſſime pater, fac ut lapides iſti panes fiant."

The holy father was ſo much pleaſed with the preſent and with the inſcription, that he gave Galiani the living of Canonica, worth four hundred ducats per annum. He became a member of the academy of Herculaneum, the object of which was to explain and illuſtrate the antiquities of Herculaneum, Pompeia and Stabia; a conſiderable ſhare of the buſineſs fell to his lot, which he performed with much diligence and ſagacity. On the death of Benedict XIV. his friend and patron, he wrote his eulogy, and diſplayed upon the occaſion a vaſt flow of eloquence, as well as much of the noble principle of gratitude. This was in 1758, and in the following year he was appointed ſecretary to the French embaſſy, which was the commencement of his public career. He was but little pleaſed with Paris at firſt, but his wit and convivial turn procured him admiſſion into the firſt company, the friendſhip of the moſt eminent literary characters, and the general reputation of a great man. At Paris he begun to write annotations on Horace, in which he examined the occaſion and ſubject of each poem, and exhibited the progreſs which Horace himſelf made in poetry till he attained to a perfection that can never be imitated. In the year 1763, the celebrated geographer Zannoni of Padua was at Paris, having been invited thither by Louis XVI., for the purpoſe of determining the boundaries between the French and Engliſh poſſeſſions in America. Galiani employed him to make a new and improved map of the kingdom of Naples. In conſequence of an alarming ſcarcity of corn, which had prevailed in France for many years, and which had often been the occaſion of diſtreſs, famine, and inſurrection, Galiani wrote, in the French language, a work on the corn trade, conſiſting of eight dialogues. The king, to encourage, as he thought, the intereſts of agriculture, prohibited, in the year 1764, the free exportation of corn from all the provinces of the kingdom. Galiani undertook to ſhew that this and other regulations adopted by the court were the cauſes of the ſcarcity, and of the numerous diſorders that attended it. While he remained at Paris, he did not venture to oppoſe the prejudices of the country, but as ſoon as he left that place, his work appeared under the title of "Dialogues ſur le Commerce des Bleds;" Londres 1770-8; and it immediately excited conſiderable attention in France. Numerous writers appeared againſt him till the court interfered in favour of the ſyſtem recommended by Galiani. Upon his return to Naples the moſt conſiderable men of France entered into an epiſtolary correſpondence with him: their letters form nine large volumes in quarto. He died in October 1787, in the fifty-ninth year of his age. He is ſaid to have poſſeſſed his uſual ſpirits and vivacity till his laſt moments. Beſides the commentary on Horace, and the dialogues already referred to, he wrote, in three books, "A treatiſe on the innate Propenſities or Inclinations of Men, or the Principles of the Law of Nature and Nations, deduced from the Poems of Horace." To this work was prefixed a life of the poet, which contained no information but what was collected from his poems. In 1779 he publiſhed a book on the Neapolitan dialect; in which he explains the grammatical rules of it, and gives an account of all the writers who have made uſe of it. He was employed on a work "On the natural Duties of Princes to other belligerent Powers," which made its appearance in 1782, and was afterwards tranſlated into the German language. It was written in conſequence of the war between the Engliſh, French, and Spaniards, in which the Neapolitans, and other courts, remained neuter. The merit of Galiani was known and reſpected by the ſeveral monarchs of Europe, and no ſtranger of diſtinction arrived at Naples without endeavouring to form an acquaintance with him. The emperor, Joſeph the Second, during his reſidence in that city, often honoured him with an interview. Catharine the Second of Ruſſia not only ſent him preſents, but requeſted the academy of Peterſburgh, in the year 1782, to elect him a member. A life of Galiani, written by Louis Diodati, was publiſhed at Naples in 1788. Gen. Biog.

GALIATA, in *Geography*, a town of Italy, in the department of the Gogna, ſituated between the Teſino and the Gogna; 4 miles N.E. of Novara.

GALIBIS, or Charaibes, a nation of Indians, inhabiting near New Andaluſia, in South America; from which ſome have ſuppoſed the Charaibes of the Weſt Indies to be deſcended.

GALICANA, a town of the republic of Lucca; 13 miles N. of Lucca.

GALICIA, or Galitzia, a province, or kingdom, taken

from Poland by the houſe of Auſtria; compoſed of the palatinates of Lublin, Sandomir, and Cracow; together with Little or Red Ruſſia, including the palatinates of Lemberg, Chelm, and Belz; a part of the palatinates of Bielſk, Volhynia, Maſovia, and Podolia; and a ſmall portion of the Lithuanian palatinate of Brſeſk. This province lies to the north of Hungary, from which it is ſeparated by the Carpathian Mountains; about 280 miles in length, and from 60 to 100 in breadth. The capital is Lemberg or Leopol. It is watered by the Dneiſter, the San, and ſeveral other rivers.

GALIGNANA, a town of Iſtria; 14 miles N.E. of Rovigno.

GALILEANS, Galilæi, a ſect among the ancient Jews, denominated from Judas of Galilee, or the Gaulonite, their chief; who, eſteeming it unworthy that the Jews ſhould pay tribute to ſtrangers, raiſed up his countrymen againſt the edict of Auguſtus, which had ordered a cenſus or enumeration to be made of all his ſubjects.

Their pretence was that God alone ſhould be owned as maſter, and called by the name of the *Lord*: in other reſpects they had much the ſame doctrine as the Phariſees; but as they judged it unlawful to pray for infidel princes, they ſeparated themſelves from the reſt of the Jews, and performed their ſacrifices apart. The ſons of Judas were crucified in the time of Claudius. His grandſon Eleazar, after Jeruſalem was taken, defended a ſtrong fortreſs with 960 of his moſt deſperate followers. When the battering ram had made a breach, they turned their ſwords againſt their wives, their children, and at length againſt their own breaſts. They died to the laſt man.

As our Saviour and his apoſtles were of Galilee; they were ſuſpected to be of the ſect of Galileans; and it was on this principle, as St. Jerome obſerves, that the Phariſees laid a ſnare for him; aſking whether it was lawful to give tribute to Cæſar; that in caſe he denied it, they might have an occaſion of accuſing him. Vid. Joſeph. Ant. Jud. lib. xviii.

The learned Dr. Lardner has ſhewn in his "Jewiſh and Heathen Teſtimonies," (apud Works, vol. vii. p. 355.) that the Chriſtians in early days, as well as afterwards, were opprobriouſly called Galileans. (Acts, ii. 7.) Epictetus, in the time of Adrian, about the year of our Lord 120, ſeems to refer to Chriſtians under this appellation; and the emperor Julian, who both deſpiſed and hated the Chriſtians, and who, well apprized that they gloried in the name of their redeemer, countenanced, and perhaps enjoined, the uſe of the leſs honourable appellation of Galileans.

GALILEE, in *Ancient Geography*, a province of Aſia, being a part of Paleſtine, ſituated to the north of the country of Samaria. This province was divided into Upper and Lower Galilee. The former included the half tribe of Manaſſeh (ſee Manasseh), and was called "Galilee of the Gentiles," probably becauſe it contained moſt of that deſcription, who had been ſpared by the Manaſſites, or rather, becauſe it lay contiguous to the heathen nations. The latter, or Lower Galilee, was ſo called on account of its ſituation, being flat and low in compariſon of the other, which was altogether mountainous. The Lower Galilee lay on the fartheſt northern verge of Judea, and included the tribes of Aſher, Zabulun, Naphtali, and Iſſachar, ſettled by lot. This country was very fertile and champaign, except on the northern ſide towards Syria; produced excellent corn, wine, oil, fruits of all ſorts, with little labour; and was, in its flouriſhing ſtate, ſo full of towns and villages, that Joſephus, who was made governor of it, informs us, the leaſt of them contained 15,000 ſouls; but allowing for his exaggeration, the country was really very rich and populous, and its inhabitants, active and laborious, were ſtout and warlike, and very zealous for the Jewiſh religion. As the country was very fertile, it was of courſe very populous. It had, in particular, a ſpacious valley, ſo very rich, that it was emphatically denominated "the Fat valley," ſince better known by that of St. George, from a fort or caſtle built in it, and dedicated to that ſaint. As Nazareth was ſituated in this province, our bleſſed Lord was called a Galilean. The Galileans ſeemed to have had a dialect different from that of the Jews in general, for Peter was hence denominated a Galilean.

Galilee, *Sea of*, ſo called becauſe it was almoſt ſurrounded by the province of the ſame name, a lake of Paleſtine, formed by the river Jordan, which ran through it, and ſupplied it with freſh water. This is alſo ſtyled in the ſacred writings the ſea and lake of Kinnereth, or Cinnereth, and the lake of Geneſareth or Genezar. The Jewiſh hiſtorian commends it highly, amongſt other things, for the ſweetneſs, coolneſs, and excellence of its water, as well as the abundance and variety of its fine fiſh. It was in this lake that the apoſtles Peter, Andrew, John and James exerciſed their profeſſion of fiſhermen. According to Joſephus, it was 100 furlongs in length, and about 40 in breadth.

Galilee, in *Architecture*, a portico which was uſually built at or near the weſt end of the great abbey churches. Such a one ſtill remains, under the name of the "galilee," at the weſtern extremity both of Durham and Ely cathedrals. In this porch the monks collected themſelves, and drew up in returning from ſome of their proceſſions. Here alſo dead bodies were ſometimes depoſited previouſly to their interment; and here alone, in certain monaſteries, females were allowed to ſee the monks of it to whom they were related, or even to attend divine ſervice. Hence, the galilee at Durham was fitted up in a very ornamental way for this purpoſe, and a line of blue marble was drawn from the principal entrance on the north ſide of the church to the oppoſite ſide, beyond which women were not allowed to go eaſtward towards the high altar, but were required to turn weſtward into the galilee. Many improbable conjectures have been formed concerning the derivation of this name. The real occaſion of it ſeems to be this. When any female applied at the abbey gate for leave to ſee her relative who was a monk there, ſhe was directed to the weſtern porch of the church, and told in the terms which ſo frequently occur in the ſervice of the paſcal time, alluding to Mat. xxviii. 10. and Mark xvi. 7, that "ſhe ſhould ſee him in Galilee." This explanation is confirmed by a paſſage of Gervaſius, the monk of Canterbury. De Combuſt. et Repar. Dorob. Ecc. Twyſd. X. Script.

GALILEI, Vincenzio, in *Biography*, a Florentine nobleman, and father of the great Galileo Galilei, had received inſtructions in muſic from Zarlino; but being a performer on the lute, and of courſe a friend to the doctrines of Ariſtoxenus, which Zarlino, a favourer of tempered ſcales, conſtantly combats, he cenſured his maſter in a ſmall tract, entitled "Diſcorſo intorno all' Opere di Zarlino;" which not paſſing unnoticed in the ſecond volume of the theoriſt's works, Galilei, in 1581, publiſhed "Dialogo della Muſica antica e moderna, in ſua difeſa contra Giuſeppe Zarlino," in which he becomes an open antagoniſt. To analyſe the reaſonings on both ſides of this controverſy would afford the reader very little ſatisfaction, as it would be difficult to render the ſubject intereſting; we ſhall therefore only obſerve that beſides the diſpute with Zarlino, this work contains many miſcellaneous articles, ſome of which are amuſing and curious; however, there are others which are contra-

contradictory, and hazarded without ſufficient information or enquiry; and the author manifeſts no deep reſearch into antiquity, when he boldly aſſerts, p. 101, that the *battuta*, or beating time, was *not* practiſed by the ancients; and p. 133, that the monochord was invented by the Arabians.

It was the opinion of Galilei, that in his time there were not more than four great performers on the organ, who were likewiſe compoſers, in all Italy, which more abounded with muſicians than any other part of the world; and theſe were Annibale Padovano, Claudio da Coreggio, Giuſeppi Guami, and Luzzaſco Luzzaſchi. He mentions the viola d'arco and violone, but not the violin: and complains of the muſical *embroiderers* of his time, who, by their changes and diviſions, ſo diſguiſed every melody, that it was no longer recognizable, but reſembled the repreſentations of the firſt painters in oil, Cimabue and Giotto, which required the names to be written under them for the convenience of the ſpectator, who, without ſuch aſſiſtance, would be unable to diſtinguiſh a roſe from a lily, a rabbit from a hare, a ſparrow from a linnet, or a lobſter from a trout.

He ſays, that the Italians, who were in poſſeſſion of the harp before the time of Dante, had it from Ireland; and adds, that it is only a cithara with many ſtrings; having, when Galilei wrote, four octaves and a tone in compaſs. And as the harp came from the cithara, ſo the harpſichord had its origin from the harp: being nothing more than a horizontal harp, as every one who examines its figure with that idea muſt ſee. The *cetera*, or guittar, he ſays, was furniſhed to Italy by the Engliſh, who were formerly famous for making ſuch inſtruments.

Galilei is ſaid to have been aſſiſted in this controverſy by Girolamo Mei, a Florentine nobleman, mathematician, philoſopher, and theoretical muſician.

Battiſta Doni, in his "Trattato 2do. ſopra gl'Inſtrumenti di Taſti," or keyed inſtruments, ſays, that in the beginning of his muſical ſtudies, his partiality for the muſic of the ancients was greatly increaſed by the peruſal of the Dialogue of Galilei, in which Mei had the greater part, (dove il Mei ebbe la meggior parte), and ſtill more by a treatiſe written by this learned perſonage (Mei) De Modis Muſicæ, a MS. preſented to the Vatican library by Monſig. Guarengo, Op. Om. tom. i. p. 324. Doni has ſupported this aſſertion by no proof; but in the Vatican library, among the queen of Sweden's MSS. there is a volume of inedited tracts and letters, written by Girolamo Mei, upon the muſic of the ancients, in which are diſcoverable, not only opinions ſimilar to thoſe of Galilei, but frequently the words in which they are expreſſed in his Dialogue; particularly in a letter from Mei, dated Rome, 1572, in anſwer to two that he had received from Galilei, in which he ſeems to have been conſulted concerning the uſual difficulties which thoſe have to encounter who undertake to diſcuſs the muſic of the ancients. We procured a copy of this entire letter, and conſiderable extracts from the other writings of Mei, which indeed contain the whole ſubſtance of Galilei's Dialogue, except what concerns his controverſy with Zarlino relative to the muſical ſcales and proportions of the ancients.

G. Battiſta Doni, ſpeaking of the inventors of recitative, ſays, Vincenzio Galilei was at this time in ſome credit among muſicians, and, flattered with his reputation, he purſued his ſtudies with ſuch diligence, that after the publication of his "Dialogue on Ancient and Modern Muſic," he attempted new things, and with the aſſiſtance of ſig. Barde, count of Vernia, he was the firſt who compoſed melodies for a ſingle voice; having modulated that pathetic ſcene of Count Ugolino, written by Dante, which he ſung himſelf very ſweetly to the accompaniment fo a viol. This eſſay certainly pleaſed very much in general; however, there were ſome individuals who laughed at the attempt; notwithſtanding which, he ſet, in the ſame ſtyle, parts of the Lamentations of Jeremiah, which were performed to a devout aſſembly.

GALILEI, GALILEO, an eminent mathematician, philoſopher, and aſtronomer, flouriſhed towards the cloſe of the 16th and beginning of the 17th centuries, and immortalized his name by his inventions and diſcoveries. He was the ſon of Vincenzio Galilei (ſee his article), and born at Piſa, in Italy, in the year 1564. The attention of his youth was engaged by the amuſing ſtudies of poetry, muſic, and drawing; but in the progreſs of his years theſe were exchanged for other and ſublimer ſciences, in which he was deſtined to excel. Intended by his father for the medical profeſſion, he was educated in the univerſity of Piſa; but conceiving a diſlike to the ſtudy of medicine, as well as to the Ariſtotelian philoſophy which was then taught in the ſchools, the predominant bias of his mind led him to cultivate an acquaintance with mathematics, and with the other ſciences that are connected with it; and he was allowed by his father to indulge his natural inclination without reſtraint. Having been well inſtructed in the Greek language, he read Euclid, Archimedes, and other mathematicians in the original. The reputation which he acquired in this department of ſcience was ſo diſtinguiſhed, that, before he was 26 years of age, he was appointed by the duke of Tuſcany to the chair of mathematical profeſſor in the univerſity of Piſa. In the regular diſcharge of his profeſſional duties he gave ſatisfaction to the more liberal and enlightened of his auditors; but his ſituation was rendered unpleaſant to him by the envy and jealouſy of the bigotted Ariſtotelians, who took occaſion to reproach him as a viſionary and dangerous innovator. Diſguſted by their conduct, he accepted, in the year 1592, an invitation which he received from the republic of Venice to occupy the mathematical chair in the univerſity of Padua. In this ſituation he continued for 18 years, contributing very much to the reputation and popularity of the ſeminary with which he was connected. Tuſcany, however, by degrees felt an increaſing ardour for improvement; and the patriotiſm of Galileo rendered him deſirous of devoting his ſervices to the benefit of his native country. His inclination being made known to Coſmo II., the grand duke, he was immediately invited to Piſa, and in 1611 appointed profeſſor of mathematics, with a conſiderable ſtipend. The grand duke afterwards invited him to Florence, giving him the title of principal mathematician and philoſopher to his highneſs, and continuing his ſalary of profeſſor at Piſa, without the obligation of reſidence. In this, as well as in other ſituations, Galileo united with the ſtudy of mathematics that of phyſics, and particularly the doctrines of mechanics and optics. Indeed, before his ſettlement at Padua he had written his "Mechanics," ſtating the advantages to be derived from that ſcience and its inſtruments; and alſo his "Balance," for finding the proportion of alloy in mixed metals. Being informed, in the year 1609, that Janſen, a Dutchman, had invented a glaſs, which made diſtant objects appear as if they were near, he turned his attention to the ſubject, and invented and conſtructed an inſtrument, by which, as he ſays, objects appeared magnified one thouſand times. Turning this inſtrument, or teleſcope, towards the heavens, he was even aſtoniſhed by the objects that preſented themſelves to his view. On the ſurface of the moon he ſaw lofty mountains and deep vallies. The galaxy, or milky way, he diſcovered to be a crowded aſſemblage of fixed ſtars, inviſible to the naked eye. Venus

he

he found to vary in its phaſes like the moon. The figure of Saturn he diſcovered to be oblong, conſiſting of three diſtinct parts, two of which were *anſæ*, or extreme parts of the ring. Jupiter he ſaw ſurrounded with four moons, which he named Medicean ſtars: and on the ſun's diſc he perceived ſpots, from the motion of which he inferred, that the ſun revolves about its axis. The duke of Tuſcany, to whom he dedicated an account of theſe diſcoveries, wrote him a congratulatory letter on the occaſion; and whilſt aſtronomers in general applauded his attempts, ſome ſuſpected that his ſuppoſed diſcoveries were the amuſing dreams of his own imagination. Deſirous of applying his diſcoveries to ſome practical uſe, he engaged his patron, the duke, to apprize the king of Spain of the great benefits which navigation might derive from them; but his ſuggeſtion ſeems to have been diſregarded. Convinced of the truth of the Copernican ſyſtem, he availed himſelf of his diſcoveries in illuſtrating and confirming it; and though he publiſhed a treatiſe, in which it was proved, from the authority of the fathers and orthodox divines, that the language of Scripture is not to be ſtrictly followed in queſtions that are merely phyſical, the ignorant and bigotted clergy were alarmed; and this incomparable philoſopher was, in the year 1615, cited before the court of inquiſition, accuſed of hereſy, and thrown into priſon. The charge of hereſy was ſupported by allegations againſt him, that he maintained the two following propoſitions, *viz.* that the ſun is the centre of the world, and immoveable by a local motion, and that the earth is not the centre of the world, nor immoveable, but that it moves with a diurnal motion. Theſe propoſitions, which he was not ſuffered to explain or defend, he was ordered by the inquiſition to renounce, and he was prohibited from vindicating them either in converſation or writing. It is generally ſaid, that he was actually committed to the priſon of the holy office, and confined there about five months; but ſome accounts ſtate, that in conſequence of the interpoſition of the duke of Tuſcany, and of other perſons of high rank and influence at the papal court, he was treated with mildneſs, and merely threatened with impriſonment, if he ſhould prove refractory. It is certain, however, that he was obliged to conform to the decree of the inquiſition before he was permitted to leave Rome. Having obtained his releaſe, he reſumed and purſued his ſtudies, and laid before the public an account of his diſcoveries, which tended more and more to eſtabliſh the opinions which the court of inquiſition had condemned. In the year 1632, notwithſtanding the danger to which he expoſed himſelf, he had the reſolution to publiſh his famous "Dialogues on the two greateſt Syſtems of the World, the Ptolemaic and Copernican," urging arguments in favour of each, without abſolutely deciding for either, but inſinuating his attachment to that of Copernicus. In theſe dialogues he alſo introduces ſome ſtrokes of raillery againſt the Ariſtotelians, on account of their bigotted and ſervile attachment to every hypotheſis of their maſter. The cry of hereſy was inſtantly renewed, and Galileo was again cited to appear before the tribunal of the inquiſition in 1633.

At the age of 70 years this venerable philoſopher was obliged to comply with the citation; and, on his arrival at Rome, he was committed priſoner to the apartments of the fiſcal of the holy office. But at the interceſſion of the grand-duke he was permitted to reſide in the houſe of his ambaſſador during the proceſs that was carried on againſt him. After a trial of about two months, he was brought to receive ſentence in full congregation, and ſolemnly ordered to abjure and condemn the Copernican ſyſtem, as contrary to the Scriptures, and to bind himſelf by oath no longer to teach or ſupport it, either directly or indirectly. As a puniſhment for having diſobeyed a former decree of the holy office, he was detained in priſon at the pleaſure of the cardinal inquiſitors, and enjoined, as a ſaving penance, for three years to come, to repeat, once a week, the ſeven penitential pſalms; the court reſerving to itſelf the power of moderating, changing, or taking away, wholly or in part, the above-mentioned puniſhment and penance. His "Dialogues" were alſo cenſured, prohibited, and ordered to be burnt at Rome. The rigour of his ſentence was afterwards conſiderably abated by pope Urban VIII.; and he was at length, *viz.* in 1634, permitted to reſide at his country-houſe at Arcetri, in the neighbourhood of Florence. Here he ſpent the reſidue of his days, proſecuting his ſtudies and obſervations, and communicating the reſult of them occaſionally to the public; and here he was viſited by perſons of the principal rank and character at Florence. Injured in his ſight by the conſtant uſe of his teleſcope, and by the nocturnal air, he became blind about three years before his death; and this calamity, which he bore with philoſophical fortitude, prevented his execution of ſeveral plans which he had in contemplation for the improvement of ſcience and the benefit of the world. In 1642 he was ſeized with a diſtemper which terminated his valuable life, in the 78th year of his age.

Galileo was of ſmall ſtature, venerable aſpect, and vigorous conſtitution; his learning was extenſive; the acuteneſs of his wit, and the affability of his temper and manners, rendered him a pleaſant companion. His chief paſtimes were architecture, agriculture, drawing, painting, and muſic.

The light which Galileo caſt upon natural philoſophy by his aſtronomical diſcoveries and mechanical inventions and improvements, aided by his extenſive knowledge of mathematics, entitle him to rank in the firſt claſs of mathematical philoſophers. The following ſketch of his diſcoveries and improvements was drawn by Mr. Maclaurin, a highly competent judge, and we ſhall therefore give it in his own words.

"He made the evidence of the Copernican ſyſtem more ſenſible, when he ſhewed from the phaſes of Venus, like to the monthly phaſes of the Moon, that Venus actually revolves about the ſun. He proved the revolution of the ſun on his axis, from his ſpots; and thence the diurnal rotation of the earth became more credible. The four ſatellites that attend Jupiter in his revolution about the ſun, repreſented, in Jupiter's leſſer ſyſtem, a juſt image of the great ſolar ſyſtem; and rendered it more eaſy to conceive how the moon might attend the earth, as a ſatellite, in her annual revolution. By diſcovering hills and cavities in the moon, and ſpots in the ſun conſtantly varying, he ſhewed that there was not ſo great a difference between the celeſtial and ſublunary bodies as the philoſophers had vainly imagined.

"He did no leſs ſervice by treating, in a clear and geometrical manner, the doctrine of motion, which has been juſtly called the key of nature. The rational part of mechanics had been ſo much neglected, that there was hardly any improvement made in it, from the time of the incomparable Archimedes to that of Galileo; but this laſt named author has given us fully the theory of equable motions, and of ſuch as are uniformly accelerated or retarded, and of theſe two compounded together. He firſt demonſtrated, that the ſpaces deſcribed by heavy bodies, from the beginning of their deſcent, are as the ſquares of the times, and that a body, projected in any direction that is not perpendicular to the horizon, deſcribes a parabola. Theſe were the beginnings of the doctrine of the motion of heavy bodies, which have been ſince carried to ſo great a height by ſir Iſaac Newton."

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In geometry Galileo has been allowed, on the beſt authority, to be the inventor of the cycloid (ſee CYCLOID): he alſo invented the ſimple pendulum, and made uſe of it in his aſtronomical experiments; he had alſo thoughts of applying it to clocks; but the honour of executing his deſign was reſerved for his ſon Vincenzio, who made the experiment in Venice in 1649; and the invention was afterwards carried to perfection by Huygens. (See CLOCK and PENDULUM.) Galileo alſo invented a machine with which the Venetians render their Laguna navigable.

This excellent philoſopher "alſo diſcovered the gravity of the air, and endeavoured to compare it with that of water, and opened up ſeveral other inquiries in natural philoſophy. He was not eſteemed and followed by philoſophers only, but was honoured by perſons of the greateſt diſtinction of all nations."—"Galileo had ſcholars worthy of ſo great a maſter, by whom the gravitation of the atmoſphere was eſtabliſhed fully, and its varying preſſure accurately and conveniently meaſured, by the column of quickſilver, of equal weight, ſuſtained by it in the barometrical tube. The elaſticity of the air, by which it perpetually endeavours to expand itſelf, and, while it admits of condenſation, reſiſts in proportion to its denſity, was a phenomenon of a new kind, ("the common fluids," as it was then thought, having no ſuch property,) and of the utmoſt importance to philoſophy. Theſe principles opened up a vaſt field of new and uſeful knowledge, and explained a great variety of phenomena, which had been accounted for in an abſurd manner before that time. It ſeemed as if the air, the fluid in which men lived from the beginning, had been then firſt diſcovered. Philoſophers were every where buſily inquiring into its various properties, and their effects; and valuable diſcoveries rewarded their induſtry. Of the great number who diſtinguiſhed themſelves on this occaſion, we cannot but mention Torricelli in Italy, Paſchal in France, Otto Guerick in Germany, and Boyle in England."

The treatiſes written by Galileo were ſo numerous, that we ſhould far exceed our preſcribed limits if we recited all their titles, and their reſpective dates and places of publication. Theſe treatiſes, together with others written by ſome of his diſciples in defence of his doctrines and obſervations, were collected and publiſhed by Menoleſſi, in 1656, under the title of "L'Opere de Galileo Galilei Lynceo, nobile Florentino, &c." in two volumes, 4to. A volume alſo of his "Letters" to ſeveral learned men, and ſolutions of a variety of problems, was publiſhed at Bologna, in 4to. His laſt diſciple, Vincenzo Viviani, a very eminent mathematician, methodized a piece of his maſter's, and publiſhed it under the title of "Quinto Libro de gli Elementi d'Euclide, &c." 1674, 4to.; and he alſo publiſhed ſome other pieces of Galileo's, including extracts from his letters to a learned Frenchman, in which the author gives an account of the works which he intended to have publiſhed, and an extract of a "Letter to John Camillo," a mathematician of Naples, concerning the angle of contact. Many other of Galileo's writings were unfortunately loſt to the world, through the ſuperſtition of one of his ignorant nephews; who, conſidering that his uncle died a priſoner of the holy office, though permitted to reſide in his own houſe, ſuſpected that his papers might contain dangerous hereſies, and therefore committed them to the flames.

Beſides the obligations which aſtronomy, mathematics, and the general knowledge of nature, have had to this great man, which are well known; his inquiries into the propagation, properties, and ratios of ſound; diſcovering the harmonic proportions into which a ſingle ſtring divides itſelf when ſounding; the ſympathy of perfect conſonance, in one ſtring cauſing another to ſound that is tuned in uniſon, octave, or fifth, have been ſo much the means of extending the knowledge of harmonics, by ſubſequent writers, that this great philoſopher as well merits an honourable niche among benefactors to the ſcience, as his father Vincenzio Galilei, among thoſe who have advanced the art of muſic by their labours. Galileo, in his "Diſcorſi e Demonſtrationi Matematiche," treats of the vibrations of ſtrings, harmonies of kindred ſounds, propagation of ſound, and of muſical proportions. The dedication of theſe diſcourſes to the Conte de Noailles, is dated 1638, four years before the author's death. (Opere del Galileo, in Bologna 1655, vol. ii. dial. 1mo. p. 74, et ſeq.) It has long been a received opinion, that Galileo was the natural ſon of Vincenzio Galilei, a Florentine nobleman; but this opinion has lately been confuted by ſeveral Italian writers, particularly Signor Carlo Giuliani, who ſent the late M. Diderot, one of the editors of the Encyclopedie, where the illegitimacy of Galileo is aſſerted, the neceſſary documents to prove that this great philoſopher, born at Piſa February 19th, 1564, was the legitimate offspring of Vincenzio Galilei and Giulia di Corimo Ammanati di Peſcia, his true and lawful wife. See Elogj Italiani, tomo v. Moreri. Hutton's Mathematical Dictionary. Maclaurin's Account of Sir Iſaac Newton's Philoſophical Diſcoveries, b. i. c. 3. Brucker's Hiſtory of Philoſophy, by Enfield, vol. ii. b. x. c. 3. § 3. Gen. Biog.

GALILEO's *Teleſcope*. See TELESCOPE.

GALILEO's *Temperament of the Muſical Scale*.—According to Mr. Overend's MS. in the library of the Royal Inſtitution, vol. i. p. 135, this ſcale had the fifth tempered $\frac{2}{7}$ths of a major comma flat, and the fourth as much ſharp: the major third was $\frac{8}{7}$ths of a comma flat, and the minor ſixth the ſame quantity ſharp: the minor third $\frac{6}{7}$ths of a comma ſharp, and the major ſixth as much flat: the major ſecond or greater tone $\frac{4}{7}$ths of a comma flat, and the major ſeventh $\frac{10}{7}$ths of a comma flat. Such a ſyſtem as this ſeems very inapplicable to practice, to which perhaps it never was ſubmitted, like numerous modern tuning ſchemes.

GALINA POINT, in *Geography*, a cape on the north coaſt of Jamaica. N. lat. 18° 26'. W. long. 76° 41'.

GALINAZZO, a town of Italy, in the department of the Mela; 12 miles N. of Breſcia.

GALINGA, a town of Italy, in the department of the Serio; 16 miles E. of Bergamo.

GALINGEN, a town of Pruſſia, in the province of Natangen; 7 miles S. of Bartenſtein.

GALINHAS, called by the Portugueſe Magualbari, a river of Africa, which runs into the Atlantic. N. lat. 7° 5'. W. long. 11° 15'.

GALIOLA, a ſmall iſland in the gulf of Venice, S.W. of Cherſo. N. lat. 44° 54'. E. long. 14° 20'.

GALIOTE *à Bombes*, Fr. See BOMB-*veſſels*.

GALIPÆA, in *Botany*, a barbarous name formed by Aublet out of the French appellation of the Caribée Indians, Galipons, who call the plant in queſtion *Inga*. Aublet. Guian. 662. t. 269. Willd. Sp. Pl. v. 1. 41. Juſſ. 418. Lamarck Illuſtr. t. 10. Claſs and order, *Diandria Monogynia*. Nat. Ord. uncertain, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, tubular, with four or five angles, and as many acute equal teeth. *Cor.* of one petal, longer, regular; tube ſhort, inſerted into a glandular receptacle; limb in four or five deep, oblong, acute, nearly equal ſegments. *Stam.* Filaments four, two of which are ſhort and abortive; two as long as the calyx; all inſerted into the tube of the corolla; anthers oblong, obtuſe, of two lobes and two cells. *Piſt.* Germen ſuperior,

ſuperior, roundiſh, with four or five angles; ſtyle thread-ſhaped, as long as the ſtamens; ſtigma blunt, four-lobed. *Fruit* unknown.

Eſſ. Ch. Calyx inferior, tubular, four or five-cleft. Corolla tubular; limb in five deep ſpreading ſegments. Two ſtamens abortive. Germen ſuperior, angular.

1. G. *trifoliata*, the only ſpecies, is a native of the ſhores of rivers in Guiana. A *ſhrub* four or five feet high. *Leaves* alternate, ſtalked, ternate; leaflets equal, elliptic-oblong, pointed, entire, ſmooth; their veins united in a marginal rib. *Flowers* terminal, corymboſe, ſmall, greeniſh. It ſeems moſt akin to the order of *Vitices*.

GALISANO, Cape, in *Geography*, a cape on the N. coaſt of Spain. N. lat. 43° 28'. W. long. 30° 40'.

GALISPA, a town on the E. coaſt of the iſland of Gilolo. N. lat. 2° 4'. E. long. 127° 50'.

GALISTEO, a town of Spain, in Eſtramadura; 10 miles E. of Coria.

GALITSCH, a town and diſtrict of Ruſſia, in the government of Koſtroma, on the S. ſide of a lake of the ſame name; 56 miles E.N.E. of Koſtrom. N. lat. 57° 56'. E. long. 60° 40'. The lake is about 50 miles in circumference, and communicates with the river Koſtroma by the ſmall rivulet Vara.

GALIUM, in *Botany*, γαλιον of Dioſcorides, from γαλα, *milk*, becauſe the ancients believed it to have the power of curdling that fluid. This is denied by Bergius, Krocker, and Martyn. It is very probable that plants of this genus may, in a paſtoral ſtate of ſociety, have ſerved as ſtrainers for milk, and poſſibly G. *verum*, which is the preciſe γαλιον of Greek writers, may, on account of its yellow flowers, have been thought to communicate a richer colour to it in conſequence. Matthiolus ſays this plant makes the milk ſweeter. Ladies' Bed-ſtraw. Linn. Gen. 52. Schreb. 69. Willd. Sp. Pl. v. 1. 584. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 173. Prod. Fl. Græc. v. 1. 90. Juſſ. 196. Lamarck Illuſtr. t. 60. Gærtn. t. 24. Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Stellatæ*, Linn. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, minute, of four equal teeth; ſometimes wanting. *Cor.* of one petal, wheel-ſhaped, deeply four-cleft, acute; tube ſcarcely any. *Stam.* Filaments four, awl-ſhaped, inſerted into the corolla, ſhorter than the ſegments; anthers ſimple. *Piſt.* Germen of two grains; ſtyle thread-ſhaped, cloven half-way down, as long as the ſtamens; ſtigmas globoſe, *Peric.* Two dry, cohering, globoſe berries. *Seeds* ſolitary, large, kidney-ſhaped.

Eſſ. Ch. Corolla of one petal, flat, ſuperior, ſeeds two, roundiſh.

Obſ. Tournefort divided his genus *Aparine* from *Galium*, or, as he writes it, *Gallium*, on account of the roughneſs of the fruit in the former; but this is ſo far from a good generic diſtinction, that it proves, in ſome caſes, not a permanent ſpecific difference, at leaſt ſo far as hairineſs is concerned. Several ſpecies differ permanently in the kind of roughneſs which cover their fruit. The genus, however, ſtill ſtands divided in books into ſpecies with a ſmooth fruit, and others with a hairy or briſtly one. Perhaps a better diſtinction would be between an even and a tuberculated fruit.

The habit of this genus is very ſlender; the ſtems herbaceous, acutely quadrangular, oppoſitely branched, very brittle, except the central woody part, which is tough and elaſtic. Leaves whorled, from four to eight or more in each whorl, linear inclining to obovate, rarely elliptical, never ovate; their margins entire, often revolute. The angles of the ſtem, and ribs, edges, and ſurfaces of the leaves, are often beſet with hooked prickles, and very excellent ſpecific marks are ſometimes to be diſcovered in the different directions of theſe prickles on the ſeveral parts of the leaf. The root is ſmall, either fibrous or creeping, in moſt inſtances perennial, ſometimes red like Madder. Flowers white, yellowiſh, or dull red, in terminal, forked, occaſionally axillary, panicles or tufts. Corolla ſometimes awned.—Willdenow diſtinguiſhes 50 ſpecies of *Galium*. In the Prodromus Fl. Græcæ are 21, comprehending ten new ones not known to Willdenow. The Flora Britannica has thirteen, all of which are figured in Engl. Bot. except. G. *Witheringii*; and to which is to be added G. *Spurium* of Linnæus, Engl. Bot. t. 1871, recently found in Scotland by Mr. George Don. The genus is principally European.

The Galium Aparine is common in cultivated ground and hedges, producing its flowers from June till September. This ſucculent plant has no ſmell, but to the taſte it is bitteriſh, and ſomewhat acrid. Dioſcorides mentions an ointment made of the bruiſed herb, mixed with lard, as an uſeful application to diſcuſs ſtrumous ſwellings; and Gaſpari, an Italian, ſucceſsfully adopted a ſimilar practice. He alſo informs us, that a decoction of the plant, employed as a fomentation, was found very efficacious in ſwellings of the glands of the neck, which followed a certain epidemic at Verona.

Dr. Cullen, however, tried the aparine in glandular indurations without advantage. Mayerne ſays, that three ounces of the juice of the plant, taken twice a day in wine, were experienced to be an uſeful arcient and diuretic in incipient dropſies. But the character, in which the aparine has of late been chiefly eſteemed, is that of an antiſcorbutic; for which purpoſe a tea-cup full of its expreſſed juice is to be taken every morning for nine or ten days. When the dried plant cannot be procured, it may be uſed in a dried ſtate as tea.

Other ſpecies of Galium have been uſed medicinally, eſpecially the G. verum, or yellow lady's bed-ſtraw, the flowers of which have been recommended in hyſteric and epileptic complaints. Theſe flowers, as ſome have aſſerted, contain an acid which coagulates milk; but neither Bergius, Cullen, nor Young, obſerved this effect, after repeated trials. Woodville's Mat. Med.

GALL. See Liver.

Gall, in the *Materia Medica*. The depurated liquor of gall has been eſteemed one of the greateſt of all remedies for freckles in the face: the manner of uſing it is this; mix together equal parts of it, and of oil of tartar per deliquium: to a dram and a half of each of theſe, add an ounce of river water, mix them well by ſhaking, and keep them in a vial well ſtopped: the end of the finger being wetted with this, is to be touched upon the freckled part, and this repeated three or four times a day, letting it dry on; at length the part will look red, and there will be a ſort of tickling ſenſation felt in it; and after that, the ſkin will become ſcurfy, and both that and the freckles will fall off. If this does not ſucceed the firſt time, it is to be repeated, and it will clear the face for ſix or eight months, at the end of which time it is to be uſed again. Mem. Acad. Par. 1709.

The gall of divers animals has been recommended for divers uſes, but moſt of theſe are now reckoned fabulous and unfounded.

With us theſe fluids are employed only for external purpoſes; a mixture of ox-gall with camphorated ſpirit of wine is ſaid to be an uſeful embrocation for ſprains, bruiſes, rheumatic pains, &c.

Gall-*bladder*. See Liver.

GALL-*bag of birds*. See *Anatomy of* BIRDS.

GALL-*ſickneſs*. See FEVER.

GALL-*ſtones*. See BILIARY *Calculi*.

GALL, in *Mining*, is one of the many names for a *fault*, which ſee.

GALLS, in *Vegetable Phyſiology*, are morbid excreſcences, originating from the moſt vigorouſly growing parts of plants, in conſequence of the attacks of inſects, chiefly of the Hymenopterous order, and of the genus *Cynips*. The parent inſect is provided with a ſharp ſting, ſerving to perforate the branch, leaf, or bud, in which its egg is to be depoſited, and in ſome caſes the puncture made is very deep. As ſoon as the egg is hatched, the young larva or maggot, ſtimulating the vital principle of the plant, cauſes the part in which it is lodged to aſſume a great degree of luxuriance, diſplayed in various whimſical excreſcences, foreign to the nature of the plant in itſelf, but each appropriated to the particular kind of inſect from whoſe operations it ſprings. The original perforation is ſoon cloſed up and entirely obliterated. At length, the maggot having fed on the juices of the plant, copiouſly directed to the injured part, undergoes its changes to a chryſalis, and, finally, to a winged fly, like its parent, when it immediately eſcapes from its confinement by a freſh perforation, and the gall, being left empty, ſoon dries or hardens. The main ſtems of ſome of the large ſhrubby kinds of Hawkweed, *Hieracium ſabaudum* and *umbellatum*, are often thus ſtung, and ſwell into oval knots, in which, while growing, young inſects may be found latent. The two Britiſh ſpecies of Oak bear ſeveral different kinds of Gall, as the light ſpongy bodies vulgarly named oak apples, growing from the ſtalks of the leaf or flower, or from the young twigs; and a red juicy berry-like excreſcence, reſembling a cranberry, from the leaves, which is well figured, with its inſect inhabitant, in Roeſel's work on the transformations of that tribe of animals. The aſtringent galls brought from the Levant for the purpoſes of dyeing and making ink are the produce of an oak, whoſe ſpecies is not very clear to us, nor have we ever had an opportunity of ſeeing this ſort of gall, uſually termed the Aleppo Gall, in a recent ſtate, but its natural hiſtory is well explained, with a plate, in Olivier's Travels. Mr. Arthur Aikin, in his valuable Dictionary of Chemiſtry, charges naturaliſts in general with having, without enquiry, taken up ſuperficial and erroneous ideas of Galls, and particularly of this Aleppo kind, which latter he ſeems inclined to prove a ſort of ſeed-veſſel. He probably had not ſeen the work of Olivier, which ſhews it to be the excreſcence of an oak, and conſequently quite independent of the true and indubitable ſeed of that tree, the acorn; nor, from the wide and indiſcriminate cenſure thrown by Mr. Aikin on naturaliſts in general relative to this ſubject, can he have peruſed the pages of Reaumur, Roeſel, and others, which are models of clear and practical information reſpecting the origin, growth, and appearance of various ſimilar productions. What may have miſled the judgment of this acute and liberal writer in the dried Aleppo galls, we have not at preſent materials to determine; nor ought much ſtreſs to be laid on the appearances of bodies in ſo unnatural a ſtate, whether they may have ſuffered merely from keeping, or whether, as we have ſome ſuſpicion, they may occaſionally have undergone the operation of baking. In either caſe the appearance and condition of the young animal within may well be altered; nor is it any objection to the prevailing theory of its introduction into the plant, that the original perforation, made by the parent in laying the egg, is no longer to be traced. So great a change in the neighbouring parts takes place, that this perforation is very ſoon obliterated in all the common galls that we have examined.—Several galls are found on Willow and Poplar leaves; but the moſt remarkable excreſcence of this kind is the Bedeguar, or moſſy ball found on the Dog-roſe of our hedges, each ſpecimen of which lodges internally numerous maggots of the *Cynips Roſæ*, which, when they arrive at their winged ſtate, eat their way out. After this, and not before, various perforations may be found in the Bedeguar, which ſoon afterwards withers and dries. Analogous to this ſort of Gall, is one obſerved by the writer of the preſent article on Willows in Provence, which branches out like a moſs, or tufted Lichen. Nor is the roſaceous expanſion at the end of each branch of the Roſe Willow, *Salix Helix*, at all different in nature, though unlike in ſhape. Both theſe laſt-deſcribed are permanent, though withered, on the twigs, long after all the proper leaves are fallen. More akin to the galls of the Oak are thoſe of ſeveral Sages in the Levant, *Salvia pomifera*, *triloba*, and *officinalis*, which reſemble little apples, and are ſold in the markets of Crete in particular, being eſteemed a delicacy when prepared with ſugar. It is remarkable that the production of galls cauſes ſuch a change in the ſecretions of the parent plant in thoſe parts, as always tends to the generation of acetous acid, or more eſpecially of the aſtringent or tanning principle. Their colour is conſequently more tinged with red than the neighbouring parts; at leaſt this appears in the Bedeguar, the ſmall galls on willow and oak leaves, and more or leſs in many other inſtances. Some bodies of the nature of galls lodge in one common cavity a multitude of growing inſects, witneſs thoſe remarkable ones, as big as the finger, found in the ſouth of Europe on the Maſtic-tree, *Piſtacia Lentiſcus*. Theſe are very red, of a coriaceous texture, and ſwarm internally with the *Aphis Piſtaciæ* of Linnæus. The red ſwellings on a peach or nectarine leaf, though they have no cavity ſhut up from the external air, as we believe, is completely the caſe with thoſe of the Maſtic, bear a conſiderable affinity to galls, the leaf being greatly diſeaſed, tumid, diſcoloured, and ſwarming with *Aphides*, whoſe ſtimulating action appears to cauſe its morbid ſtate. S.

Galls, with regard to their medicinal uſe, are found to be very aſtringent, and good under proper management in diarrhœas, dyſenteries, and hæmorrhages of all kinds; and applicable to the ſame indications as the oak-bark. They have alſo a great virtue as a febrifuge, and are often found to cure an intermittent. Their efficacy in intermittent fevers was tried by Mr. Poupart, by order of the Academy of Sciences, and from his report, it appears, that the galls ſucceeded in many caſes; and alſo that they failed in many other caſes, which were afterwards cured by the Peruvian bark. (Mem. pour l'An. 1702.) In fevers half a dram or more of the powder of Aleppo galls may be given for a doſe. They are alſo uſed externally as a ſtrengthener and aſtringent: a decoction of them is applied with ſucceſs by way of fomentation in *procidentiæ of the anus*, and has been injected in the fluor albus with great ſucceſs. As they poſſeſs a greater degree of aſtringent and ſtyptic power than the oak-bark, they ſeem to have an advantage over it, and to be better ſuited for external uſe. Reduced to fine powder, and made into an ointment, they have been found of great ſervice in hæmorrhoidal affections. Cullen, Mat. Med. vol. ii.

Galls may be made a very uſeful teſt for iron in the ſeveral ſpecies of vitriols; for it is certain that an infuſion of galls will become black with a ſolution of any vitriol that contains iron, and not at all ſo with ſuch as contain only copper, as the common blue vitriol and the like.

Dr. Lewis obſerves, that if a decoction or infuſion of galls

galls is dropt into a ſolution of this vitriol largely diluted with water, the firſt drops produce blueiſh or purpliſh red clouds, which mingling with the liquor, tinge it uniformly of their own blueiſh or reddiſh colour. With diſtilled water, or the common ſpring waters, the mixture is always blue; but if the ſmalleſt portion of alkaline ſalt be diſſolved in the water, or if the water is in the leaſt degree putrid, the colour produced will be purple or reddiſh. If more of the aſtringent infuſion be added to the blue or purple liquors, they will deepen to a black, which will be more or leſs intenſe according to the degree of dilution: and the colouring matter may be ſeparated from the liquors, unleſs they are of a full blackneſs, by dilution with water and depoſition. The ſeparation may be retarded or prevented, as is done in the preparation of ink, by adding ſome mucilaginous matter, as gum arabic. This coloured matter is evidently a ferruginous precipitate; for, although it cannot be attracted by a magnet, this property may be given to it by a ſlight calcination. This precipitate is ſoluble by acids, as in the caſe of inks, whoſe colour is hereby deſtroyed, but it may be reſtored by the addition of alkalies. Lewis's Com. Phil. Techn. p 344, &c. See the next article.

GALL-*nut*, in *Chemiſtry*.—Of the great variety of gall-nuts, two in particular are well known as extenſive articles of commerce, *viz.* the common, and the Aleppo gall-nut. The former is brought from the ſouthern parts of Europe, and the latter from Aſia Minor and particularly Syria, and both are the produce of the prickly-cupped oak. (Quercus cerris, Linn.) Theſe two alone have engaged the attention of chemiſts. We ſhall preface the reſults of their enquiries with a deſcription of the gall-nut itſelf of each kind, extracted principally from Aikin's Chem. Dictionary.

The Aleppo gall-nut is a round body of an olive green colour. It is hard and heavy, and frequently exhibits ſmall protuberances on its ſurface. When broken it is found to conſiſt of four diſtinct parts, which admit of being ſeparated. The external, or cortical covering, is of a cloſe fibrous texture and very thin; it is highly aſtringent to the taſte. The part that immediately follows is very ſimilar to reſin, both in its fracture and luſtre; its colour is dark yellowiſh brown, it is very brittle, and its taſte is nauſeouſly aſtringent and bitter; on a red hot iron it becomes black, exhales a peculiar odour in great abundance, conſumes without flame like the cortical covering, and leaves a little aſhes. It is bounded on the interior by a pale yellowiſh brown ſhell, which has many of the properties of ligneous fibre. This ſhell encloſes, when the gall-nut is found, an oval kernel of about a quarter of an inch in length, of a brown cream colour, or if mouldy, of a bright chocolate; it is inſipid unleſs chewed, then a faint ſweetiſh flavour is perceived, which has been compared to that of a bad almond.

The common gall-nut differs conſiderably from the preceding, and is eaſily diſtinguiſhed. It is of a yellowiſh colour, not ſo heavy as the Aleppo gall, nor poſſeſſed of the ſame reſinous fracture, it is alſo larger, being about the ſize of a nutmeg, leſs aſtringent, and not capable of making equally good infuſions with water, on which account it is much leſs valued.

For our chemical knowledge of the gall-nut, we are principally indebted to the labours of Scheele, Deyeux, Seguin, Prouſt, and Davy. Scheele diſcovered that the gall-nut contains gallic acid; M. Deyeux, in an elaborate memoir, pointed out the effects of a variety of re-agents on the infuſion, and ſhewed that it contained extractive matter. M. Seguin aſcertained the exiſtence of tannin, as a peculiar principle, and found that it entered into the compoſition of the gall-nut; Mr. Prouſt made known ſeveral curious particulars on the mode of ſeparating the tannin from the other ingredients of this ſubſtance, &c. And Mr. Davy greatly increaſed the general ſtock of information, to which other chemiſts have likewiſe contributed, by many additional new facts, and by minutely examining thoſe before made public.

The chemical hiſtory of the gall-nut is ſo intimately connected with that of tannin, that to treat the ſubject at full length, would be to break in upon the latter article, which being of more importance requires to be more fully diſcuſſed; we ſhall therefore only deſcribe the general properties of the ſubſtance in queſtion, and refer our readers for farther information to the article TANNIN.

Pounded gall-nuts treated with water form a deep brown coloured infuſion; ſeveral portions of water are neceſſary to exhauſt all the ſoluble matter, and what remains after the water ceaſes to act appears very analogous to woody fibre. The laſt infuſions obtained, though apparently they poſſeſs the ſame properties as the firſt, differing only in degree, frequently have a green colour. This colour, which is attributed to the preſence of gallat of lime, is deſtroyed by the nitric and oxy-muriatic acid, and is changed into red by the addition of a few drops of ſulphuric acid. On account of the variable proportions of the ſoluble matter in different gall-nuts, there is ſome difficulty in making uniform infuſions; the beſt method is to macerate the gall-nuts, finely powdered, in ten times their weight of cold water, for 24 hours. Infuſions made with boiling water are generally turbid, and therefore unfit for delicate experiments. The ſuſpended matter that occaſions this turbidneſs cannot be ſeparated by frequent filtrations, but in time it gradually ſubſides and leaves the infuſion tranſparent. The ſtrongeſt infuſion that can be made at 56° Fahrenheit, is of the ſp. gr. 1.068. It is of a yellowiſh brown colour, and ſemi-tranſparent. To the taſte it is exceſſively aſtringent, and it ſtrongly reddens vegetable blues. Alcohol, when added to it, occaſions no precipitate, but ſometimes a ſlight turbidneſs; hence it may be inferred that little or no mucilage is preſent. The red ſulphat of iron gives a deep black precipitate indicating the preſence of gallic acid; a ſolution of gelatine forms a copious precipitate indicating tannin; and muriat of alumine and oxymuriat of tin throw down a precipitate which, it is generally conceived, denotes extract. From this knowledge of the component parts of the infuſion, it is eaſy to conceive its effects on re-agents, and the facts which have been diſcovered reſpecting its agency will agree with this compoſition. Thus, as it might be inferred, a precipitate is produced in the infuſion by the ſulphuric, muriatic, and dilute nitric acids, and a decompoſition without a precipitate by the oxymuriatic acid and concentrated nitric acid. The cauſtic alkalies render the infuſion of a browniſh red colour; but in their carbonated ſtates they produce immediate precipitates. The alkaline earths, either pure or in combination with carbonic acid, ſeparate moſt of the conſtituent parts of the infuſion, forming compounds poſſeſſed of little ſolubility; magneſia and alumine have the ſame effect; but the reſults in all theſe inſtances greatly depend on the proportions uſed, and the time allowed for the reſult; when the earths are in large quantities, they ſeparate almoſt the whole of the tannin, gallic acid, and extract, but when their quantity is ſmall, the principal part of the gallic acid remains in ſolution, combined with part of the earth employed, forming a ſuper-gallat. Generally either the ſolid compound formed, or the ſuper-natant liquor is of a green colour, and the latter does not precipitate gelatine, unleſs an exceſs of acid be preſent. The oxyd of zinc and tin, when boiled in the infuſion, renders the water pure. Several neutral ſalts occaſion a precipitate, when

added

added ſeparately to the infuſion. This effect is produced by ſulphat of lime and alumine, by nitrat and acetite of potaſh, and by muriat of ſoda and barytes. Theſe compounds are to a certain extent ſoluble in water, and their ſolutions precipitate gelatine. Mr. Davy conceives that they contain, beſides tannin, a portion of gallic acid, and extract in union with part of the ſalt itſelf. He is of opinion, too, that the precipitates which moſt metallic ſalts afford with an infuſion of galls, are of a ſimilar nature.

When the infuſion is ſlowly evaporated it becomes turbid, and depoſits a matter ſimilar to extract, which may be moulded when warm like wax, but when cold is brittle. It is remarkable, that if a freſh infuſion is made with the reſidue evaporated to dryneſs, this infuſion on a ſecond evaporation depoſits more extract, and if the treatment is ſeveral times repeated, the ſame effect is produced.

When gall-nuts are diſtilled with water, at a heat below its boiling temperature, the water comes over pure; but when the temperature is raiſed a little above 212°, a liquor is received that contains, beſides a ſmall portion of gallic acid, a conſiderable quantity of acetic.

When gall-nuts are diſtilled in a retort at a temperature very ſlowly raiſed from 212° to a red heat, carbonic acid in great abundance is conſtantly produced; the firſt fluid that condenſes in the receiver contains much gallic acid; the next product is ſublimed gallic acid; and the laſt is a liquor, which is a mixture of a lemon coloured fluid, of a light oil of the ſame colour, and of a heavy empyreumatic oil. The laſt portions of carbonic acid gas are mixed with carburetted hydrogen. The reſidual coal is very black and retains ſtill, imperfectly, the form of the galls.

When the diſtillation is carried on with a heat more rapidly raiſed, the reſults are very different. A much larger quantity of carbonic acid gas is evolved, no gallic acid ſublimes, the liquid products are more coloured, and the carburetted hydrogen is produced in greater plenty.

Reſpecting the compoſition of the gall-nut, different opinions are entertained; that adopted by the moſt approved writers is, that it is a compound of tannin, gallic acid, mucilage, extract, and an inſoluble matter, ſimilar to woody fibre. It is certain that the ſubſtances, to which theſe names have been applied, can be extracted from the gall-nut; but the exiſtence of theſe ſubſtances themſelves, as peculiar principles, has lately been queſtioned. Thus M. Bouillon La Grange conſiders gallic acid as a combination of acetic acid and tannin. M. Thenard maintains that tannin is a compound of gallic acid and vegetable matter; and Dr. Boſtock and Mr. Murray are doubtful reſpecting the propriety of admitting tannin and extract as two diſtinct principles. We ſhall not here enter into a diſcuſſion of theſe gentlemen's views; the two firſt, for the preſent, may be oppoſed to each other, and the juſtneſs of all of them can only be determined by future experiments. The ultimate parts of the gall-nut are the ſame as thoſe of all other vegetable ſubſtances; *viz.* carbon, oxygen, and hydrogen; the earths, which it ſometimes contains, appear to be adventitious, and to depend on the nature of the ſoil on which the nut-gall is produced.

For the only analyſis of the gall-nut we are indebted to Mr. Davy. He found that 500 grains contain 185 grains of ſoluble matter, which were compoſed of

Tannin	130 grs.
Mucilage, rendered inſoluble by evaporation	12
Gallic acid and a little extract	31
Remainder, lime and ſaline matter	12
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For the uſes of the gall-nut, ſee the articles DYEING and INK. Annales de Chimie, tom. xvii. p. 1, and tom. lx. p. 173. Philoſophical Tranſactions, 1803, p. 239.

Theophraſtus, Dioſcorides, Pliny, and other writers of antiquity, mention the gall-nuts of Syria as being of ſuperior quality, and ſtill at the preſent day thoſe that are brought from the Eaſt are preferred to all the reſt. The principal places from which this valuable article of trade is exported to Europe, are Aleppo, Tripoli, Smyrna, and Said; particularly the firſt of theſe places, to which the gall-nuts are brought from Moſul, ſituated on the weſtern bank of the Tigris, about 10 days' journey from Aleppo. The real Moſul gall-nuts are unqueſtionably the beſt of all; but, according to Dapper, all thoſe gathered farther in the interior of the country, near the river Tigris, and towards Perſia, near Sahrozour, Gibel, Summanſu, and Serty, are equally known by the name of Moſul gall-nuts. The trade of this article is entirely in the hands of the Curdes, who reſort to Aleppo from September to May. Thoſe gall-nuts that come lateſt are generally ſuppoſed the beſt. An inferior kind is that ſold at Said; but of the worſt quality are thoſe which are carried from Caramania to Cyprus.—The Levant gall-nuts differ from thoſe of Europe in being on the whole ſmaller, much more compact and heavy, in having a more tubercular, and almoſt prickly ſurface, and in their blackiſh colour, which often ſhows a tinge of greeniſh or bluiſh. Thoſe that are light-coloured, yellowiſh, and whitiſh, which is not ſeldom the caſe with thoſe of Cyprus, are held in little eſtimation; they contain leſs aſtringent matter; as is ſaid to be likewiſe the caſe with thoſe furniſhed with a hole, and which were gathered after the inſect had pierced through its incloſure.

The reaſon why the Levant gall-nuts are of ſuperior quality to the European does not appear to be well underſtood. Perhaps the inſect which produces them is a ſpecies of cynips different from ours; perhaps, too, the warmth of the climate of the eaſtern countries promotes the concoction of the ſpecific juice, which is ſecreted after the puncture made by the inſect. Several authors have ſuppoſed that the Levant gall-nuts are produced by an oak ſpecifically different from ours; according to Bergius, Cullen, and Murray, it is *Quercus Cerris*; while others have thought *Q. Ægylops* to be the ſpecies. It is, however, well known, that both theſe ſpecies are alſo found in Spain and in ſome parts of the ſouth of Europe.

The bluiſh gall-nuts are the higheſt in price, and next to them thoſe of a greeniſh colour from Smyrna. The whitiſh ſort is the cheapeſt; a circumſtance of which impoſtors avail themſelves to increaſe their value by dyeing them blue. The deceit is, however, detected by the deeper tinge of blue of theſe artificial productions, as well as by the hole which is generally found in the white ſort.

A particular kind of gall-nuts is known in Germany by the name of *knoppern* or *knobben*, of which an account has been lately given by profeſſor Beckmann. They are probably not unknown in this country; but we have not been able to learn by what name they paſs among the traders in this merchandize. They are not, like the common gall-nuts, nearly globular, but irregularly angular and amorphous, and are larger, and more compact than even the Aleppo nuts. The beſt are ſaid to come from Natolia; and Beckmann ſuppoſes that theſe are mentioned by writers under the Turkiſh name of *bazgende*, and as now and then occurring among the gall-nuts from Aleppo. The eaſtern nations, excelling in the arts of tanning and dyeing, uſe them, for both theſe purpoſes, in preference to the real gall-nuts, which are far inferior in ſtrength. From the Levant they found their way into Italy, and from thence to Vienna. Afterwards, when, on

account of the great demand for this article, it roſe conſiderably in price, and ſubſtitutes were accordingly ſought after, it appeared that the ſame *knoppern* were likewiſe found in abundance in the extenſive oak-foreſts of Hungary, Moravia, Croatia, and particularly of Sclavonia. Formerly, the farmers and foreſters of thoſe countries, who principally ſubſiſted by the breeding of hogs in their foreſts, were wont to conſider the frequent occurrence of thoſe excreſcences as a calamity, ſince, when they appeared in abundance, the crop of acorns was conſiderably diminiſhed; but they ſoon found that the profits ariſing from the ſale of this new article of trade far ſurpaſſed that derived from the acorns, for which neceſſity ſoon pointed out a ſubſtitute. In the year 1774, the juſt-mentioned provinces obtained permiſſion to export this article by ſea to the Auſtrian harbours in the Mediterranean. Since that time, the price of the knoppern has been fluctuating. In 1780, the kübel, being two Preſburgh buſhels, ſold for 17 florins; but ſoon after it fell to five and two florins the buſhel; and in 1783, the price was as low as from four to ſix groſchen a buſhel. In Hungary, they are found moſt abundantly in the Bakony foreſt, and the principal market for them is Fünfkirchen. Before they are uſed, the knoppern are pounded in fulling-mills.

When this new article of commerce was firſt diſcovered, it was generally ſuppoſed to be the work of the ſame inſect which produces the gall-nuts, but the oak was conſidered as a different ſpecies. Later obſervations, however, have proved that there is no difference in the oak, which is the common ſummer oak with elongated pedicles. What is equally certain is, that the inſect from which the knoppern originate is a diſtinct ſpecies of cynips: it depoſits its eggs in the germen or young fruits, and by this means an excreſcence is formed, which often covers the whole cup and acorn. Owing to the preſſure thus cauſed, the fruit is generally prevented from developing itſelf, and therefore remains in a dwarfiſh ſtate.

As a ſubſtitute for gall-nuts, the ancients, as appears from Paulus Ægineta, made uſe of the cups of acorns as well for the purpoſes of medicine as for tanning: and they are ſtill uſed in Italy, from whence, in latter times, they have found their way into Germany and France. They are imported from the Greek iſlands, Chios, Zia, Cyprus, and Samos, (which latter, on account of its oak-foreſts, was formerly called Δρύσα), but particularly from Smyrna, and the neighbouring ſmall harbours of Vourla and Segigiek, from whence alone 50,000 cwt. are ſaid to have been annually exported to Venice and Ancona. When, in 1779, the knoppern failed, a merchant of Vienna cauſed upwards of 1200 cwt. of acorn cups to be ſent from Smyrna, which he ſold with great advantage. Theſe cups, and the acorns they contain, are the largeſt of any we know; the former are about two inches in diameter, are woolly within, and furniſhed with woody ſcales on the external ſurface. The acorns are about two inches long, and almoſt entirely encloſed by the cup, ſo that the top only is viſible, which exhibits a kind of depreſſed umbilicus. The ſpecies of oak which furniſhes theſe cups is, according to the beſt accounts we poſſeſs, *Quercus ægylops*: the modern Greek denomination is *Velani*, a corruption of the Βαλανος of the ancient Greeks; whence Labat is miſtaken in deriving this name from that of Valone, a place on the eaſtern coaſt of the Adriatic, where this oak is ſaid to be found in abundance.

GALLS, *Box*, in *Natural Hiſtory*, the name given by authors to a very ſingular kind of galls, of a conic figure, with a conic top, or cover reſembling a wooden box, and encloſing a white worm in the manner of the other vegetable lodgments of the ſame kind; this ſort of gall is found only on the leaves of the lime-tree. Reaumur.

GALLS, *Bramble*, a ſpecies of galls found on the branches of the common wild bramble. Theſe are often no other than tumefactions of the ſtalk, for the ſpace of an inch, or thereabout, which ſometimes form only ſo many thick cylindric pieces; at other times they are of the ſhape of an olive, and ſometimes they affect only one ſide of the branch: in all caſes, however, the tumid part, or gall, is much harder than the other parts of the branch, which are in their natural ſtate. They are inhabited by a great number of worms of an oblong figure, and yellow colour, which have a ſharp point of a brown colour, and of the hardneſs of iron, proceeding from the extremity of the head, with which they tear and break the woody fibres, and near its end there is a ſlit, which is the mouth of the creature, and ſerves for receiving and conveying into the ſtomach the fragments of wood which it breaks with the point. Reaumur.

GALLS, *Broom*, a ſpecies of galls found on the Geniſta vulgaris, or common broom. This gall is found to contain a ſmall oblong worm, of a red colour; and too ſmall to be ſeen diſtinctly without a glaſs.

GALLS, *Lime*. See LIME.

GALLS, *Muſhroom*. See MUSHROOM.

GALLS, *Gooſeberry*. See GOOSEBERRY.

GALLS, *Grape*. See GRAPE.

GALLS, *Roſe*. See ROSE and GALLS.

GALLS, *Willow*. See WILLOW.

GALL, *Wind*. See WIND.

GALL-*inſect*, in *Natural Hiſtory*, the name of a claſs of inſects, ſo called from their reſemblance to ſmall galls or vegetable protuberances of a like kind upon trees. They are indeed ſo like theſe ſubſtances, as to have been by many miſtaken for them, and thought not of the animal, but of the vegetable kingdom. Theſe inſects paſs a very great part of their life, even many months together, faſtened againſt the leaves and ſtalks of plants, without any appearance of life or motion, and this is the time in which they acquire their ſtated growth. They are in this ſtate as immoveable as the branch they are fixed on, and ſeem to make a part of it. Their exterior form is remarkably plain and ſimple, and the more the creature increaſes in growth, the leſs appearance of life it ſhews; and even when it has acquired its maturity, and is in a condition to depoſit its eggs for the propagation of its ſpecies, it then appears leaſt of all of an animal form, and more, than in any other ſtate, reſembles a gall, or ſuch vegetable protuberance. Not only the vulgar and incurious have been deceived by this appearance, but the accurate count Marſigli, among others, after very attentively examining the gall-inſects of one ſpecies, remained ſeemingly convinced that they were real vegetable excreſcences. (See CYNIPS.)

They are uſually found on the ſtalks and branches of trees, ſhrubs, and perennial plants. They are very various in ſize, ſhape, and colour.

Theſe creatures have ſo little to attract the obſervation even of the curious, that they might probably have remained much longer unregarded, were it not that they multiply ſo exceſſively faſt on ſome fruit-trees. The peach-trees, in particular, are ſometimes in a manner covered with them, and theſe of more than one ſpecies; ſome of the globular kind, and others of the boat figure. The branches thus covered look rough and ſcabby, and the gardeners, ſenſible that whatever the things were, they muſt be nouriſhed at the expence of the juices of the tree, have attempted to deſtroy them. The leaves and fruit of theſe trees are often blackened by the wet that has run off from theſe inſects; and our orange-trees, which are frequently full of them, firſt ſtirred up the attention of the more careful obſervers of them to clear them away: theſe are principally of that kind,

whoſe form is that of the inverted boat. Meſſrs. de la Hire and Sedilieau were at the pains of making a ſet of obſervations of a very curious kind concerning them; theſe gentlemen call this ſpecies the orange-tree-bug, a name by which the gardeners alſo call them, though they have nothing in common with any known ſpecies of that animal. See the Memoirs of the Academy of Paris, 1692. If many of the ſpecies of theſe little animals, however, do miſchief to our fruit-trees, there are ſome other kinds of them, the value and uſe of which may very well make us amends; ſince it is from one ſpecies of theſe little creatures that the inhabitants of many places make ſuch great gains, gathering a harveſt of them without the trouble or expence of ſowing or cultivating. The kermes, ſo well known by name, though ſo little truly underſtood, is of this kind, to which both the phyſician and the dyer are ſo greatly obliged. Reaumur's Hiſt. Inſects, vol. iv. p. 1.

Dr. Liſter was, perhaps, the firſt diſcoverer of the gall-inſect and progal inſect claſſes: he found theſe animals on the plum, cherry, vine, laurel, and many other trees, and calls them *patellæ* of theſe trees. He was well apprized of their animal origin, and in the year 1671 diſcovered that ſome of them would ſtrike a carnation-red colour, with ley of aſhes, which was not only a good but a permanent tinge. The principal kind of which he made the experiment was the ſemiglobular ſort, which he deſcribes as being entirely round, except when they are applied to the tree. They were of the ſize of half a large pea, of a cheſnut colour, and of a ſhining ſurface, faſtening themſelves to the bark of the tree, as the limpets do to the rocks, and were generally ſought after by ants and other vermin.

GALL, *Peach-inſect.* See PEACH.

GALL, *Shell-inſect.* See SHELL.

GALL, *Vine-inſect.* See VINE.

GALL-*inſect fly*, the male of the gall-inſect ſpecies. It is a two-winged fly of a very particular kind. There ſeems a great reſemblance between theſe flies in all the gall-inſect claſs, and that of the peach-gall-inſect may give a proper idea of all the reſt. This little creature, examined with the help even of the beſt glaſſes, ſhews, on the under part of its head, nothing analogous to the organs of other flies, deſtined to convey their nouriſhment; nothing that at all reſembles the trunks of the other two-winged flies, nor any thing that can be compared to teeth. Where the teeth, if any, ought to be placed, nothing is to be ſeen but two hemiſpheric, or more than hemiſpheric bodies, black and ſhining, and in all reſpects reſembling eyes. If theſe are eyes, they are very remarkably ſituated; and juſt over againſt them, on the other ſide of the head, and near the baſes of the antennæ, there are two other ſimilar bodies, which indeed cannot be taken for any thing but eyes. It ſhould ſeem that this fly has therefore no organs to receive aliments, but has two eyes in the place of ſuch.

The want of theſe organs is nothing ſingular in the inſect world, ſince the moths and butterflies afford us inſtances of it. Many of theſe may be ſeen, as ſoon as produced from their chryſalis, in a ſtate to propagate their ſpecies, and depoſit their eggs; and this great end atchieved, they have no farther occaſion for life, nor any means for its ſupport; and probably the caſe is the ſame with theſe flies, which, as ſoon as looſe from their ſhell, ſeek out and fecundate the females, and have after this no farther uſe for life. It is another ſingularity in this ſpecies, that they are produced from their ſhell by their hinder part firſt, whereas all other ſpecies of the two-winged flies are produced with the forepart of their body firſt; and if we cannot ſay what may be the reaſons for this ſingularity in the production of this fly, we can however eaſily perceive that every thing is prepared and deſtined accordingly for it. In the nymphs of other flies, all the legs are conſtantly applied cloſe to the body, whereas, on the contrary, in the nymph of the gall-inſect fly, the legs placed next the head, or the firſt pair, are conſtantly ranged upward, and each of them embraces one ſide of the head; the conſtant poſition of theſe legs in this direction is a proof that it is the order and courſe of nature in the production of the animal; nor is it without reaſon that they are thus placed in a ſpecies which, contrary to all others, is to force itſelf backward out of its ſhell, ſince they ſerve very properly for the creature to puſh himſelf backward by: and as the anterior part of the caſes of other flies naturally and eaſily opens to give paſſage to the animal, ſo the poſterior part of this does. They ſeem alſo to be more than ordinarily ſlow in their getting out, ſome of them having been obſerved to be ten or twelve hours, from the time of the firſt appearance of a piece of each wing, to their perfect enlargement. Reaumur's Hiſt. Inſect, vol. iv. p. 40.

GALLA, in *Geography*, a town of Arabia Felix; 24 miles S.E. of Taas.

GALLÆ. See GALLI.

GALLAM, GALAM, or *Fort St. Joſeph*, in *Geography*; a town of Africa, and capital of a kingdom called Kajaaga, and by the French Gallam, on the river Senegal. A fort was built here by the French, who ceded it to the Engliſh, by the peace of Verſailles, in 1763; during the American war it was taken by the French, but at the peace of 1783 reſtored to Great Britain. N. lat. 14° 35'. W. long. 10° 50'.

GALLAN, a ſmall iſland on the coaſt of Peru, in S. lat. 14°, 5 miles N. of the high land Morro Vejo, or Old Man's Head, affording between it and the high land an eligible ſtation for veſſels bound for Callao to cruiſe.

GALLAND, ANTHONY, in *Biography*, was born at Rollo in Picardy in 1646; he received the uſual education at the college of Noyon, whence he was taken to be initiated into ſome trade. But he manifeſted ſo ſtrong a turn for literature that it was determined he ſhould proceed to Paris to purſue a regular courſe of ſtudies. His aſſiduity and ſucceſs were anſwerable to the expectations formed of him, and he ſoon became diſtinguiſhed for his knowledge in the oriental languages. He was attached to M. de Nointel's embaſſy to Conſtantinople and the Levant, where he collected a rich treaſure of inſcriptions and drawings of the antiquities of the places through which he paſſed. In 1675 we find him again at Paris intimately connected with Vaillant and other medaliſts, who formed ſo high an opinion of his talents that they engaged him in a ſecond voyage to the Levant. In 1679 he made a third voyage to the ſame place at the expence of the French Eaſt India company, when he perfected himſelf in his knowledge of the principal oriental languages, which qualified him for the office, which he undertook upon his return, of aſſiſtant to Thevenot the king's librarian, and after the death of d'Herbelot he continued the publication of his "Biblioth. Orientale," and wrote a preface to it. At the age of ſixty-three he was appointed royal profeſſor of Arabic; and in the year 1715, he died in the ſeventieth year of his age. He was a learned and induſtrious man, ſimple in his manners, careleſs in the ordinary affairs of life, and zealouſly attached to the ſeveral purſuits in which he engaged. His moſt popular work is his verſion of the Arabian tales, which is well known in every part of the civilized world. He was author of various other pieces tranſlated from the eaſtern languages, and ſeveral papers to be found in the Memoirs of the Academy of Inſcriptions, of which body he was a moſt uſeful and valuable member. He has papers, likewiſe, reſpecting

ſpecting medals and matters of antiquity in other collections. Moreri.

GALLAND, AUGUSTUS, a conſiderable lawyer and hiſtorian of the ſeventeenth century, was a native of France, and roſe to the dignity of attorney-general of Navarre and counſellor of ſtate. He was author of many learned works, but the principal was one, which he wrote againſt the allodial rights pretended by ſome of the provinces, to which he added the laws given to the Albigenſes by Simon de Montfort. He died about the year 1644, and in 1648 his ſon publiſhed as a poſthumous work his Memoirs for the Hiſtory of Navarre and Flanders. A diſcourſe to the king concerning the origin, progreſs, &c. of the city of Rochelle publiſhed without a name in 1628 and 1629 was generally aſcribed to M. Galland. Some years ſince many genealogies of noble families drawn up by this author were to be found in the libraries of France. Moreri.

GALLANT, or GALANT, a French term, ſignifying civil, polite, well-bred; or a perſon of wit and addreſs, who does every thing with a good grace: in fine, a civil perſon, ſomewhat brighter, gayer, and more agreeable than ordinary.

It is difficult to define all the qualities annexed to the idea of a gallant man. It ſometimes implies one who has what the French call the *bon ton*; but it generally means one who has a great devotion for the fair ſex, with the manners adapted to pleaſe them. The French authors are very nice on this point; they diſtinguiſh *galant homme*, and *homme galant*.

GALLANT, *Cape*, in *Geography*, a cape in the ſtrait of Magellan, diſtant about eight leagues from cape Holland: this cape is high and ſteep, and between this and cape Holland lies a reach about three leagues over, called "Engliſh Reach;" about five miles S. of cape Gallant lies a large iſland, called "Charles's Iſland;" and a little to the eaſtward of cape Holland is a fine ſandy bay, called "Wood's Bay," in which there is good anchoring. In cape Gallant bay, which may be entered with great ſafety, there is a fine large lagoon, where a fleet of ſhips may moor in perfect ſecurity; the depth being every where four fathom, with a ſoft muddy ground, and on the eaſt ſide from ſix to ten fathom, where is the beſt anchoring. There is plenty of good watering from two rivers, and plenty of wood. The lagoon abounds with wild fowl, and wild celery; muſcles, and limpets are plentiful. The landing is good. The latitude of the bay and lagoon is 53° 50′ S., and longitude 73° 9′ W.; the variation is two points eaſterly.

GALLANTES, among the Romans, a ſurname given to the prieſts of Cybele; whence the modern terms of *gallant*, and *gallantry*, have been formed. See Mem. Acad. Inſcript. vol. v. p. 427.

GALLAO, in *Geography*, a town of Africa, in Bambarra; 140 miles E. of Sego.

GALLAPAGOS. See GALAPAGOS.

GALLAPAGOS *Rocks*, rocks that lie on the E. coaſt of the iſland of Lucaya. N. lat. 27°. W. long. 77° 10′.

GALLARATO, a town of Italy, in the department of the Olona; 20 miles W.N.W. of Milan.

GALLARDON, a town of France, in the department of the Eure and Loire; nine miles N.E. of Chartres.

GALLATIN, a county of America, in Kentucky, containing 1078 inhabitants, of whom 276 are ſlaves.—Alſo, a poſt-town of Sumpter county, Teneſſee, 714 miles W. by S. from Waſhington.

GALLATON, or GALLOWTOWN, a town of Scotland, in the county of Fife; 15 miles N.E. of Edinburgh.

GALLBRUN, a town of Auſtria; ſeven miles N.W. of Brugg.

GALLE, or *Point de Galle*, a town of Ceylon, conſidered, in point of importance, as the third town on the iſland, and lying about ſixty miles due S. of Columbo, in N. lat. 6° 1′. E. long. 80° 19′ 20″. The fort is ſtrong, and the garriſon generally conſiſts of two or three companies of Europeans, half a company of artillery, and a battalion of native troops. It is commanded by the next ſenior field-officer after the governors of Columbo and Trincomalee. The harbour is ſpacious, particularly the outer road. The inner harbour is ſecure during a great part of the year, and always, except in a S.W. wind; but it has this diſadvantage, that winds from a particular quarter are neceſſary to carry veſſels out. At the entrance, which is narrow, lies a large rock, on which is a ſmall work. The ſurrounding ſhore is rocky and full of ſhoals, dangerous to ſtrangers. Ships outward bound from Europe generally come in ſight of the firſt land at Dondre-head, the ſouthern promontory of Ceylon, and make Point de Galle the firſt harbour. The houſes, both in the town and port, are ſuperior to thoſe of Trincomalee. The whole town is populous, and with reſpect to trade ranks next to Columbo. The coaſt and country about Galle is very mountainous. From the neighbouring heights, Adam's Peak is very plainly ſeen, and ſeveral of the hills in the interior. Fiſheries to a very conſiderable extent are carried on here; and indeed form the chief branch of its traffic. A great number of Malays and natives are employed in catching, curing, and drying the fiſh to prepare it for exportation to different parts of the continent of India. Arrack, oil, pepper, cotton, and cardamoms alſo form a part of its exports. Cinnamon is alſo grown here, but not in ſuch quantity as about Columbo; but in quality it is much the ſame. One of the India ſhips touches here annually, either before or after ſhe has taken in part of her cargo at Columbo, to carry off any cinnamon that is prepared for exportation. Percival's Ceylon, p. 152.

GALLE, a ſmall iſland in the Atlantic, near the coaſt of Braſil. S. lat. 27° 50′.

GALLED, SADDLE. See SADDLE-*galled*.

GALLED, in *Sea Language*, is applied to a maſt, yard, cable, &c. which is chafed and worn by friction. They are uſually covered with ſkins, mats, canvas, &c. in thoſe parts which are the moſt expoſed by the rocking of the veſſel, as a preſervative from this injury.

GALLED *Crops*, in *Agriculture*, are ſuch as have numerous thin ſpots in different parts of them.

GALLEGO, in *Geography*, a town of Spain, in the province of Leon; eighteen miles S.S.E. of Salamanca. —Alſo, a river of Spain, which runs into the Ebro, oppoſite to Saragoſſa.

GALLEGOS, a town of Spain, in Old Caſtile; thirty-five miles N.W. of Avila.

GALLEMBERG, a town of the duchy of Carniola; thirty miles E. of Laubach.

GALLEN, ST. a territory of Switzerland, bounded N. by the lake of Conſtance, and on the S. by the canton of Appenzel. The whole territory of the town of St. Gallen does not exceed a mile and a half in circumference; and including the town contains near 8000 inhabitants. The abbot and town of St. Gallen are both allies of the Swiſs cantons, and each enjoys the privilege of ſending deputies to the general diet. The abbot of St. Gallen is titular prince of the German empire, and is choſen by the ſeventy-two benedictines, who compoſe this chapter. He formerly poſſeſſed the ſovereignty of the town; but the inhabitants ſhook off his authority, and became independent. However, the diſputes of the rival parties have been compromiſed by the interpoſition of the Swiſs cantons. The town is entirely proteſtant,

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and its government ariſto-democratical; the ſubjects of the abbot, whoſe territory is very extenſive, are moſtly catholics. It is remarkable, that the abbey in which the prince reſides is ſituated cloſe to the town, and in the midſt of its territory; as the town is alſo entirely ſurrounded by the poſſeſſions of the prince. The town owes its flouriſhing ſtate to the uncommon induſtry of its inhabitants, and to the very extenſive commerce, ariſing chiefly from manufactures of linen, muſlin, and embroidery. In this town the arts and ſciences are much cultivated, and literature is held in high eſtimation. The library belonging to the abbey is very numerous and well arranged; and among a number of monkiſh MSS. of which thirteen volumes in folio contain letters of the firſt Swiſs and German reformers, contain ſeveral claſſic writers. To this library we owe Petronius Arbiter, Silius Italicus, Valerius Flaccus, and Quintilian, copies of which were found in 1413. Many of its curious MSS. were borrowed, during the council of Conſtance, and never returned.

The ſubjects of the abbot of St. Gallen formerly amounted to no leſs than 90,000. His dominions compriſed, firſt, the ancient territory of the abbey (Alte Landſchafften), and ſecondly, the country of Tockenburgh, which was purchaſed, in 1468, by Ulric abbot of St. Gallen, from the laſt count who died without iſſue male. The former, or Alte Landſchafften, comprehended 124 ſquare geographical miles, occupied by 45,000 inhabitants, and the latter included 188 ſquare miles, and the number of its inhabitants was 46,000. After various diſputes between the abbot, ſupported by the catholic, and the people aided by the proteſtant, cantons, the conſtitution of the Tockenburgh was ſettled in 1718, which preciſely aſcertained the prerogatives of the abbot and the privileges of the people. New diſputes occaſionally aroſe, and in the effervеſcence of the revolution, the abbot was driven from the country, and obliged to take refuge in the Brifgau. In the new diviſion of Switzerland, in 1798, the dominions of the abbot, and the town of St. Gallen, were compriſed in the canton of Sentis, of which St. Gallen was the capital.

According to the conſtitution of the 29th of May, 1801, St. Gallen was annexed to Appenzel, and formed the ninth department.

GALLEN-*Head*, a cape on the W. coaſt of the iſland of Lewis. N. lat. 58° 11'. W. long. 7° 4'.

GALLENBOULON, a town on the eaſtern coaſt of the iſland of Madagaſcar, ſituated on a creek of the ſame name. S. lat. 17° 20'. E. long. 54° 4'.

GALLENEK, a town of the duchy of Carniola; 14 miles S.E. of Stein.

GALLENSTEIN, a town of the duchy of Stiria; 3 miles W. of Reiffling.

GALLEON. See GALLION.

GALLERICA LAPIS, a name given by the writers of the middle ages to a ſpecies of emerald, which was larger than the finer gems of that kind, and of a pleaſant green, but debaſed by an admixture of white.

GALLERY, in *Architecture*, is an apartment of a houſe not always deſtined to anſwer the ſame purpoſe. Savot, in his architecture, derives the word gallery from *Gaul*, as ſuppoſing the ancient Gauls to have been the firſt who uſed them. Nicod fetches it from the French *aller*, *to go*; q. d. *allerie*: others bring it from *galere*, *galley*; becauſe it bears ſome reſemblance thereto in reſpect to health.

A common paſſage to ſeveral rooms in one range in any of the upper ſtories of a houſe is called a gallery. It is alſo uſed for an exhibition room of pictures. The length of galleries are (according to Palladio) from five to eight times their breadth. In churches and theatres the galleries are thoſe platforms raiſed upon pillars for the accommodation of a greater number of people than could be done upon the ground floor.

GALLERY, in *Fortification*, a covered walk, or paſſage, made acroſs the ditch of a town beſieged, with timbers faſtened on the ground, and planked over.

The ſides of the gallery are to be muſket-proof, and to conſiſt of a double row of planks, lined with plates of iron; and the top is ſometimes covered with earth, or turf, to hinder the effect of ſtones, artificial fires, &c. of the enemy.

Galleries are chiefly uſed to ſecure and facilitate the miners' approach to the face of the baſtion, over the moat, which is already ſuppoſed filled up with faggots and bavins, and the artillery of the oppoſite flank diſmounted. Sometimes this is called a *traverſe*.

GALLERY, in *Gardening*, a kind of covered walk, in a garden or pleaſure-ground, formed by trees of the hornbeam, lime, and others of the ſame kind, in the following manner. A line is firſt to be drawn to the length of the intended gallery, and this is to be planted with hornbeam, which is to be the foundation of the gallery. Theſe require no further care than to be ſheared a little, and ſometimes digged about, as there may be occaſion. But the chief curioſity is in the ordering the fore-part of the gallery, and forming the arches. The pillars of the porticoes, or arches, muſt be placed at four feet diſtance from one another, and the gallery muſt be 12 feet high, and 10 feet wide, that there may be room for three perſons to walk abreaſt in it. When the hornbeams are grown to the height of three feet, the diſtance of the pillars well regulated, and the ground-work of the gallery finiſhed, the next thing is to form the frontiſpiece; to perform which, the hornbeam muſt be ſtopt between two pillars at the height, and a trellis, made for that purpoſe, muſt be run up, which forms the arch. As it grows up, thoſe branches which out-top the others, muſt be levelled with the ſhears; and in time they will grow very ſtrong, and may be kept in regularity by the ſhears. Portico galleries may be covered with lime-trees.

Galleries in general have been always but ſlightly eſteemed in England; they were once very much in repute in the gardens of Italy, and other hot countries, but now they are got out of credit even there. Miller.

GALLERY *of a Mine*, denotes the branch, or that narrow paſſage under ground, leading to a mine carrying on under any work deſigned to be blown up.

The beſiegers and beſieged do each of them carry galleries, or branches under ground, in ſearch of each other's mines; and theſe ſometimes meet and deſtroy each other.

GALLERY, in *Mining*, ſignifies a drift or paſſage under ground, in or leading to ſome mine: gang-way, gate, augle, audit, level, ſough, brough, &c. are terms of nearly ſimilar import, in different mining diſtricts.

GALLERY *in a Ship*, is a kind of balcony, made upon the ſtern, without-board, into which there is a paſſage out of the great cabin.

Theſe galleries are for ſhew, and the captain's pleaſure, rather than any other benefit; for, in ſhips of war, all open galleries of this kind are to be avoided; on account of the facility of an enemy's entrance and boarding of the ſhip that way.

GALLERY-*ladder*, in a *Ship*. See LADDER.

GALLERY, *Whiſpering*. See WHISPERING *places*.

GALLESE, in *Geography*, a town of Italy, in the Patrimonio; 25 miles from Rome.

GALLEY, in *Chemiſtry*, is the name given to reverberatory furnaces, in which ſeveral retorts may be placed at the

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ſides of each other. They are ſo called becauſe they are oblong, and have lateral openings, in which they are ſuppoſed to reſemble galleys.

GALLEY, in *Naval Language*, a low-built veſſel, going both with oars and ſails; chiefly uſed by the ſtates bordering on the Mediterranean.

The galley is called by the Greek authors under the eaſtern empire γαλαια, and γαλεια; and by the Latin authors of the ſame time, *galea*; whence the modern denomination. Some ſay it was called *galea*, on account of the figure of a caſk or helmet, which it bore on its head or prow, as Ovid atteſts, De Triſtib. The French call it *galere*; becauſe they ſay that the top of the maſt is uſually cut in manner of a hat, which the Italians call *galero*. Others derive both *galea* and *galere* from a fiſh, by the Greeks called γαλεωτης, or ξιφιας, and by us the *ſword-fiſh*, whoſe ſhape this veſſel reſembles. Laſtly, others derive *galley*, *galea*, *galere*, *galeaſſe*, &c. from the Syriac and Chaldee *gaul* and *gallin*, a man expoſed on the water, or in a veſſel of wood.

The largeſt ſort of theſe veſſels, called *galeaſſe*, is employed only by the Venetians. They are commonly 162 feet long above, and 133 feet by the keel; 32 feet wide, with 23 feet length of ſtern-poſt. They are furniſhed with three maſts, and 32 banks of oars; every bank containing two oars, and every oar being managed by ſix or ſeven ſlaves, who are uſually chained to it. In the fore-part they have three little batteries of cannon, of which the loweſt is of two 36-pounders, the ſecond of two 24-pounders, and the uppermoſt of two two-pounders; three 18-pounders are alſo placed on each quarter. The complement of men for one of theſe galleys is generally 1000, or 1200. They are very convenient for bombarding, or making a deſcent on an enemy's coaſt, becauſe they draw little water; and, on account of their oars, they have often the advantage of ſhips of war in light winds or calms, by cannonading the latter near the ſurface of the water, by ſcouring their whole length with their ſhot, and at the ſame time keeping on their quarter or bow, ſo as to be out of the direction of their cannon. The galleys next in ſize to theſe, called alſo *half-galleys*, are from 120 to 130 feet long, 18 feet broad, and nine or 10 feet deep. They have two maſts, which may be ſtruck at pleaſure, and are furniſhed with two large lateen ſails, and five pieces of cannon; they have commonly 25 banks of oars, as already deſcribed. Thoſe of a ſize ſtill leſs than this are called *quarter-galleys*, carrying from 12 to 16 banks of oars.

All the galleys, both ancient and modern, are of a finer and ſlenderer make than ſhips. Formerly they made divers kinds; at preſent the galleys are all alike: all the difference between them is as to ſize, and nothing as to figure. They uſually keep towards the coaſts; though ſometimes they croſs the ſea.

The king of France formerly kept up 40 galleys for the uſe of the Mediterranean, the arſenal thereof being at Marſeilles. The general of the galleys bears a double anchor, placed in pale, behind the eſcutcheon of his arms, as a mark of his office.

Galleys in Latin are called *biremes*, *triremes*, and *quadriremes*; not on account of their having two, three, or four ranges of oars before one another, as many learned men have imagined, and particularly Scaliger and Snellius, though this laſt has wrote excellently on the ſubject of navigation; for this were impracticable; nor yet on account of their having but two, or three, or four oars, for then they would want ſtrength; but becauſe there were two, three, or four rowers, faſtened to each oar, as in the galleys uſed among us; as is very well ſhewn by the Jeſuit Dechales in his "Art of Sailing." The error was occaſioned by ſome ancient galleys, repreſented on medals, or baſſo relievos, wherein are ſeveral ranges of rowers placed over each other; but all the mathematicians, pilots, and ſhip-builders, look on this as a mere viſion; inaſmuch as Pliny makes mention of galleys of 15, 20, 30, 40, 50 rows of rowers: ſo that, if they were ranged over each other, though we were only to allow four feet for each deck, there would be a diſtance of 160 feet between the loweſt rowers and the higheſt; and yet we are aſſured that the higheſt veſſel ever built was only 72 feet high.

Scaliger affirms, that the firſt *triremis*, or galley of three ſtories, was built at Corinth; and is of opinion that what Pliny calls *long ſhips*, were what we call *galeaſſes*: the firſt of which was that of the Argonauts. Vegetius mentions a galley of five decks; and Memnon another with eight, and only one man to each oar. See ENNERIS.

GALLEY, *Captain*, is the principal galley of a ſtate, commanded by the captain-general of the galleys: in France the royal galley is the firſt.

GALLEY, *Patroon*, denotes the ſecond galley both of France, Tuſcany, and Malta.

The ſecond general of the galleys is always on board the royal galley; and the lieutenant on board the patroon.

The terms peculiar to galleys are very numerous, and make a new ſyſtem of ſea-language different from that uſed in ſhips.

Monſ. de Baras, an ancient officer on board the king of France's galleys, engaged himſelf in writing a new dictionary of the dialect of the galleys.

GALLEYS, *Condemnation to the*, is a penalty impoſed on criminals and delinquents, whereby they are adjudged to ſerve the king, or ſtate, as ſlaves on board the galleys, either for ever or for a limited time.

Condemnation to the galleys for ever imports confiſcation of lands, goods, &c.; for, in France, that which confiſcated the perſon confiſcated the goods.

A man condemned to the galleys for perpetuity is dead in a civil ſenſe. He cannot diſpoſe of any of his effects; cannot inherit; and, if he be married, his marriage is null; nor can his widow have any of her dower out of his goods.

The eccleſiaſtical courts cannot ſentence to the galleys: it is out of their juriſdiction.

By an ordonnance of Charles IX. in 1564, the judges are enjoined not to condemn a criminal to the galleys for leſs than ten years: and Henry III. by another of 1579, enjoins the captains not to detain their galley-ſlaves after their time is expired. But neither of theſe laws are now obſerved.

GALLEY, in *Printing*, a wooden frame or inſtrument formed of an oblong ſquare board, with a ledge on three ſides, and a groove to admit a falſe bottom called a galley-ſlice, into which the compoſitor empties the letters out of his compoſing-ſtick, as often as it is filled.

The galley, when filled, contains the matter of one page; and when they have compoſed as many pages as are required for a whole ſheet, half ſheet, or the like, they impoſe them, *i. e.* they take the ſeveral pages out of the galleys; put them into a chaſe; lock them up with the furniture; and ſo make forms ready for the preſs.

GALLEY-*halfpence*, a kind of coin, which, with *ſuſkins* and *doitkins*, were forbidden by the ſtatute Hen. V. cap. 1. It is ſaid they were brought into this kingdom by the Genoeſe merchants, who, trading hither in galleys, lived commonly in a lane near Tower-ſtreet, and were called Galley-men; land-

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ing their goods at Galley-key, and trading with their own ſmall ſilver coin, termed galley-halfpence.

GALLI, or GALLÆ, in *Antiquity*, a name given in Phrygia to the eunuch-prieſts of the goddeſs Cybele.

The principal of them was called *Archi-Gallus*. The Galli were alſo called *Dactyli Idæi*, *Corybantes*, &c. Authors are not agreed as to the reaſon of this denomination. Some derive the name from the river Gallus; becauſe theſe prieſts drank of its waters, which inſpired them with a kind of religious fury and enthuſiaſm, and deprived them of their ſenſes to ſuch a degree, that they mutilated themſelves; this was preſcribed by Cybele as a qualification for their office: thus Ovid, "Qui bibit, inde furit."

Others hold, that the firſt prieſt of Cybele having been named Gallus, the name became appropriate to all his ſucceſſors. Voſſius, who propoſes theſe two opinions, ſeems to incline moſt to the latter; though Ovid, in the fourth of his Faſti, and Herodian, lib. i. favour the former.

When youth were initiated into this order, the cuſtom in Syria, according to Lucian, was to throw off their cloaths, to make loud cries, and with drawn ſwords to caſtrate themſelves; after which they ran about the ſtreets, carrying in their hands the marks of their mutilation, which were thrown into a houſe, and in that houſe they put on women's dreſs.

Theſe prieſts threw themſelves into a kind of phrenſy when they performed the ceremonies of the goddeſs; apparently in imitation of the young Atys, her favourite, whom they likewiſe imitated, by mutilating themſelves. For authors relate, that Cybele being deſperately in love with that young Phrygian, ſhe gave him the ſuperintendance of her ſacrifices, on condition he would keep his virginity; but that ſoon after, forgetting his promiſe, he had an affair with the nymph Sangaritis; that Cybele, provoked hereat, ſtruck him mad; that in a vehement exceſs of his phrenſy he was going to kill himſelf; and that the goddeſs, relenting, reſtored him to his underſtanding; that, out of his own remorſe, he caſtrated himſelf; and that after his example all the prieſts of Cybele from that time did the like.

Their phrenſy, at the time of the ſacrifices, conſiſted in throwing round the head with great rapidity, and making violent contortions of the whole body: they had alſo drums and flutes, wherewith they played and danced to them: as already obſerved under the articles CORYBANTES and CURETES.

Van-Dale conſiders theſe Galli as ſo many ſtrollers, vagrants, and quacks, who went about ſtrolling from town to town, playing upon cymbals and crotala, wearing on their breaſts ſmall images of the mother of the gods, in order to raiſe charitable contributions. Apuleius repreſents them as the dregs of the people, as a ſet of furious fanatics, and as infamouſly debauched. They are held in equal contempt by Clemens of Alexandria, Lactantius, Chryſoſtom, and St. Auguſtine. Nevertheleſs, we learn from Cicero, that the law provided for their ſubſiſtence, and marked out days when they had permiſſion to aſk alms, and on which none elſe were allowed to go a-begging; this kind of begging, authorized by law, occurred about once in every month, and hence the prieſts obtained the name of "Menagyrtæ" and "Metragyrtæ;" becauſe it was for the mother of the gods they collected theſe alms: they were alſo denominated, by way of deriſion, "Agyrtæ," an appellation which denotes jugglers and dealers in legerdemain for money. Accordingly Clemens of Alexandria adds to the qualifications of theſe Galli that of a fortune-teller and ſooth-ſayer, becauſe they really pretended to prediction. They had always in their retinue old women, who paſſed for ſorcereſſes. Plutarch ſays of them, ſpeaking of the verſes which they ſang, that they had brought the poetry of oracles into ſuch contempt, that by their means the true oracles of the Tripos, *i. e.* of Delphi, were wholly neglected. The ſame author adds, that they delivered their oracles extempore, or drew them by lot from certain books which they carried with them, and ſold their wretched predictions to ſilly women who were charmed with the cadence of their verſes.

GALLI, *Caput*. See CAPUT.

GALLI, *Criſta*. See CRISTA.

GALLI, *Signora*, in *Biography*, arrived in England at the ſame time as Fraſi, in 1743, when lord Middleſex was proprietor of the Opera-houſe, and the principal ſingers were Monticelli, the Viſconti, and Amorevoli. Galli's voice being of a lower pitch, which the Italians call *mezzo ſoprano*, and her appearance being leſs feminine than that of Fraſi, in "Enrico," ſet by Galuppi, ſhe firſt performed a man's part, and was afterwards frequently employed in male parts on the ſtage. There was ſomething ſpirited and intereſting in her manner; however, ſhe was little noticed by the public till ſhe ſung in Handel's oratio of "Judas Maccabæus," 1746, when ſhe acquired ſuch favour in the air "'Tis liberty alone," that ſhe was not only encored in it every night, but became an important perſonage, among ſingers, for a conſiderable time afterwards.

GALLIA, in *Geography*, a county of America, in the ſtate of Ohio; bounded N. on Waſhington and Roſs; S. and E. on the Ohio; and W. on Roſs and Scioto counties.

GALLIA, in *Ancient Geography*. See GAUL.

GALLIAMBIC, in the *Ancient Poetry*. Galliambic poems denote compoſitions in Galliambic verſes.

GALLIAMBIC *Verſe*, a ſort of iambic, conſiſting of ſix feet; 1. An anapæſt, or a ſpondee; 2. An iambic, or an anapæſt, or tribrach; 3. An iambus; 4. A dactyl; 5. A dactyl; and 6. Anapæſt.

Though one might meaſure the Galliambic verſe in another manner, and make a different arrangement and combination of ſyllables, which would give different feet. It is certain the ancients regarded little more in the Galliambic verſe beſide the number of meaſures, or intervals, without troubling themſelves about the number of ſyllables, or the kinds of feet whereof it was compoſed.

GALLIAMBUS, in *Poetry*, a pleaſant kind of verſe, uſed to be ſung by the Galli, prieſts of Cybele, in honour of that goddeſs.

The word is a compound of *Gallus*, a prieſt of Cybele, and *iambus*, a foot in the Greek and Latin verſe.

Galliambus alſo denotes a piece or compoſition in Galliambic verſes.

GALLIANO, in *Geography*, a town of Italy, in the department of the Lario; ſix miles S.S.E. of Como.

GALLIARD, JOHN ERNEST, in *Biography*, a native of Zell, in Suabia, and, according to Walther, the ſon of a French peruque-maker, and ſcholar of Marichal; though it has been ſaid by one of his biographers, that he had leſſons of the Abate Steffani, and Farinelli, director of the concerts at Hanover, and author of the ground that goes under his name, upon which Corelli's 12th ſolo is founded.

He came into England in the ſuite of prince George of Denmark; his inſtrument was the hautbois, which he played in public, perhaps for the laſt time, in accompanying Mrs. Barbier in a ſong at his benefit in Lincoln's-inn Fields playhouſe, 1722. He ſeems to have ſtudied our language on his arrival in this country with conſiderable diligence and ſucceſs; for in 1712 he was choſen by Hughes to ſet his opera

of "Calypſo and Telemachus," for the Queen's theatre in the Haymarket. And he afterwards not only compoſed cantatas written by Hughes and Congreve, but the muſic of many entertainments and pantomimes for Lincoln's-inn Fields and Covent-garden; and, in 1742, publiſhed an admirable tranſlation of Toſi's Art of Singing. But in 1709, it is not probable that he could have been the tranſlator of Raguenet's "Parallele des Fran. et des Ital." as has been imagined, the Engliſh of which is even ſuperior to that of the tranſlation of Toſi. He was conſtantly attached to Rich, both at Lincoln's-inn Fields and Covent-garden, and compoſed for no other theatres; though his hunting ſong in the Royal Chace, "With early horn," was long the delight of every play-houſe and public place in the kingdom. Beard and Lowe hardly ever appeared on the ſtage without being called upon to ſing it, and, indeed we ſcarcely know a more agreable vocal *chaſſe*, than it ſtill continues to be.

In 1728, he publiſhed, by ſubſcription, his muſic to the hymn of Adam and Eve, from Milton; this is extremely well ſet in the grave and learned ſtyle of Steffani. The recitative is ſtill in the more ancient ſtyle of Italy, in which there are formal cloſes, terminated with a ſhake, inſtead of the more colloquial cadence of modern recitation.

He compoſed, in queen Anne's time, for victories obtained by the duke of Marlborough, a Te Deum, and Jubilate, and three anthems, for St. Paul's.

In 1746, being in years, and not in ſplendid circumſtances, Rich, the patentee, propoſed to let him have a benefit concert at Lincoln's-inn Fields; when this venerable muſician was ſo truly ſimple and ignorant of the world, that he *whiſpered* it to Quin, as a profound ſecret, deſiring him not to ſpeak of it.—"Why then," ſays Quin, "by keeping it a ſecret, you intend only good maſter Galliard, that this ſhall be a benefit for your friends, to ſave them the expence of tickets; and to wait for your own benefit, till you ſhall be allowed *benefit of clergy*—at your funeral."

At this his laſt benefit, among his other compoſitions that were performed on the occaſion, there was a piece for twenty-four baſſoons and four double baſes! This worthy muſician, who died in 1749, was certainly an excellent contrapuntiſt; but with reſpect to his compoſitions in general, we muſt confeſs, that we never ſaw more correctneſs, or leſs fancy and originality in any author that we have examined of the laſt century, Dr Pepuſch always excepted.

GALLIARD, or *Gagliarda*, in *Muſic* and *Dancing*, a ſort of dance, anciently in great requeſt; conſiſting of very different motions and actions, ſometimes proceeding *terra à terra*, or ſmoothly along; ſometimes capering; ſometimes along the room, and ſometimes acroſs.

The word is French, *galliarde*, or rather Italian: and literally ſignifies *gay*, *merry*, *ſprightly*. This dance was alſo called *Ramon ſque*, becauſe brought from Rome.

Thoinot Arbeau, in his Orcheſography, deſcribes it as conſiſting of five ſteps, and five poſitions of the feet, which the dancers performed before each other, and whereof he gives us the ſcore, or tablature, which is of ſix minims, and two triple times.

GALLIARD, in *Mining*, ſignifies, in ſome diſtricts, the ſame ſubſtance as ganiſter or crowſtone, a fine-grained ſilicious ſtone, uſually imbedded in fire-clay, and abounding with large and curious impreſſions of vegetables. See CROW-STONE.

GALLIARD'S *Iſland*, in *Geography*, a ſmall iſland of America, in South Carolina, in the Santee. N. lat. 33° 30'. W. long. 80° 10'.

GALLIARDA, in the *Italian Muſic*, the name of a tune that belongs to a dance called a galliard. The air of it is lively in triple time.

GALLIC ACID. *Acide Gallique*, Fr. *Galluſſaure*, *Gallapfelſaure*, Germ.—The infuſion of nut-galls had long attracted the attention of chemiſts, and had been the ſubject of numerous experiments before it was proved to contain a peculiar acid. Dr. Lewis, when engaged in an enquiry on the beſt method of making ink, found that the precipitate which a ſolution of galls affords with ſulphat of iron is not attracted by the magnet; he likewiſe obſerved that the black colour which it imparts to the acid ſolutions of iron is capable of being deſtroyed and re-produced by the alternate application of alkalies and acids. The academicians of Dijon went farther; they aſcertained that it reddened vegetable blues, diſſolved iron, decompoſed the alkaline hydro-ſulphurets, produced with metallic ſolutions various coloured precipitates, and, that when diſtilled, the fluid product had the ſame properties as the original ſolution; but it was reſerved for Scheele to ſeparate the acid from the ſubſtances with which they had examined it, in combination. This he in a great meaſure effected by the proceſs which he made public in 1780. The acid diſcovered by the Swediſh chemiſts, when its peculiar nature was determined, acquired, on account of the ſubſtance which firſt afforded it, the name of acid of galls, or gallic acid. But it is not confined alone to nut-galls; a variety of other aſtringent vegetables are capable of affording it.

The following method of obtaining the acid, is that diſcovered by Scheele. Make an infuſion, by macerating one part of gall-nuts, reduced to a coarſe powder, in ſix parts of cold water. At the end of fifteen days filter the ſolution, and place it in a large veſſel, covered with a ſheet of paper, in a warm room. In a ſhort time, a mouldy pellicle will appear on the ſurface of the liquid, which is to be occaſionally broken: as the operation proceeds, the original aſtringent taſte diminiſhes, and the acid taſte becomes more ſenſible. At the end of two or three months, the interior of the veſſel will be found coated with a brown matter, containing diſperſed, ſhining, granular, cryſtals. Separate this ſediment, and cover it with rectified alcohol; gently heat the mixture, and a ſolution of the cryſtallized acid in alcohol will be formed, which, evaporated, affords gallic acid in the form of very fine grains.

Scheele diſcovered that gallic acid is volatilized by a low degree of heat; and, in diſtilling nut-galls, he found the acid ſublimed and condenſed in the receiver. Mr. Deyeux was the firſt to avail himſelf of this property, in order to obtain the acid free from the tannin and extractive matter, which it always contains, when prepared in the old way. He gradually heated powdered nut-galls in a large glaſs retort, till a ſublimate aroſe, which condenſed in brilliant white cryſtalline plates. An increaſe of heat occaſions the decompoſition of the acid; and if the operation is long continued an oil diſtils over that diſſolves the acid ſublimate, and renders the experiment fruitleſs. This method, without great precaution, is very liable to fail. Mr. Davy recommends ſeparating previouſly ſome of the tannin of the nut-galls, by infuſing them, for a ſhort time, in a little water, by which means the production of empyreumatic oil is diminiſhed. The ſame chemiſt obſerves, that it is time to ſtop the operation, when the cryſtals formed in the lower part of the retort begin to melt. But, even allowing all theſe precautions are obſerved, it appears almoſt impoſſible to obtain the acid entirely free from empyreumatic oil, the preſence of which is indicated from the very commencement of the operation, by the peculiar aromatic ſmell that is produced.

A variety of other methods have been propoſed for procuring

curing the acid in a ſtate of purity. It will be ſufficient to mention briefly thoſe which appear moſt adequate to the purpoſe. Mr. Davy's method: Boil carbonat of barytes in an infuſion of galls; gradually add dilute ſulphuric acid to the bluiſh-green liquid which is thus produced, till all the barytes is ſeparated: the liquid, on the application of the common teſts, appears to be perfectly free from tannin and extractive matter; evaporate it to dryneſs, and the gallic acid will be obtained. This method is far preferable to the one recommended by Mr. Fiedler, which conſiſts in digeſting alumine with a ſolution of galls, decanting the clear liquor, and ſeparating the cryſtals of gallic acid, (more probably of ſuper-gallat of alumine.) which are produced by ſlow evaporation. Mr. Richter's method: Take any quantity of gall-nuts reduced to a fine powder; digeſt them in cold water; agitate the mixture; paſs the liquid through a cloth; add more water to the reſidual pulp; and ſeparate the water by means of a preſs: join the liquors, and ſlowly evaporate them; a brittle dark coloured ſubſtance remains. Cover this ſubſtance, reduced to a fine powder, with alcohol, and a ſolution of a pale ſtraw-colour is formed; a ſecond infuſion of alcohol acquires but very little colour. Diſtil the two extracts together in a ſmall glaſs retort to one-eighth; add water to the reſidue, and expoſe it to a gentle heat; evaporate the ſolution thus formed, and very ſmall white priſmatic cryſtals of gallic acid will appear. By this proceſs, half an ounce of cryſtals may be procured from a pound of gall-nuts. M. Bouillon La Grange, who has employed it, ſays, he was never able to obtain acid of the purity deſcribed by Mr. Richter. The cryſtals he procured were always of a light ſtraw-colour; and he found that repeated diſtillations with alcohol did not render them white, the gallic acid itſelf being partially decompoſed by this treatment. One objection to this method is, that unleſs the alcohol is highly rectified it diſſolves a portion of tannin.

The properties of gallic acid appear, in ſome meaſure, to depend on the method employed for its production. The different methods, generally conſidered, are of two kinds, the dry and the moiſt. Accordingly, there appear two varieties of gallic acid, that procured by diſtillation differing conſiderably from that formed by cryſtallization, if any credit is to be attached to the obſervations of M. Bouillon La Grange.

Gallic acid, procured in the moiſt way, is of a light ſtraw-colour; it has a ſharp acid taſte, but poſſeſſes leſs aſtringency than nut-galls; it changes vegetable blues to red. For its ſolution, it requires 12 parts of cold water, or 1½ of boiling; and it imparts to this liquid a light lemon-colour, which becomes black by expoſure to the air. Alcohol takes up, when cold, about ¼th of its weight of this acid; but at a boiling temperature, nearly its own weight. It is ſoluble in either. Expoſed to heat, it readily fuſes; it forms juſt before it begins to ſublime a brown viſcid fluid; full of air-bubbles; and emits vapours which have an odorous ſmell. The action of a ſtrong heat partially decompoſes it; but to accompliſh this completely, it requires, on account of its volatility, to be ſubjected to repeated diſtillations, and the products appear to vary according to the intenſity of the heat applied. Scheele procured, by diſtilling it in a glaſs retort, firſt, an acid liquor, free from oil; next, part of the acid itſelf, which, condenſed in the liquid, forms and ſhoots into cryſtals, as it gradually cools, and a large reſidue of charcoal. M. Deyeux has found that it is capable of being converted by heat into oxygen and charcoal. From whence he concluded that it differs only from carbonic acid in containing leſs oxygen; but his reaſoning is fallacious, from his not having taken into conſideration the acid fluid that is alſo produced. On the contrary, M. Bouillon La Grange obtained, by its diſtillation, an acidulous liquid, charcoal, and much carbonic acid gas, with which was mixed a little carburetted hydrogen gas. The latter gas was ſo concealed by the former, that it did not appear inflammable till the carbonic acid gas was ſeparated by means of lime-water.

Gallic acid is decompoſed and carbonized by ſtrong ſulphuric acid; the ſame effect, moſt probably, is produced by liquid fluoric acid; nitric acid converts it partly into the malic and oxalic acids; oxymuriatic acid, according to M. Bouillon La Grange, has no action on it; it is ſoluble in the other acids without decompoſition.

With the earths and alkalies it combines, forming ſalts, denominated gallats, of which very little is known. The alkaline gallats poſſeſs a conſiderable degree of ſolubility: according to Richter they give black precipitates, with the ſalts of iron, and precipitate all other metallic ſolutions. From the obſervations of Mr. Davy, the alkaline earths appear capable of combining with two different proportions of this acid, an exceſs of acid rendering the ſalts very ſoluble, which before poſſeſſed little ſolubility. Gallic acid precipitates glycine, yttria, and zircon from their acid ſolutions, and decompoſes all the carbonats.

The gallats are decompoſed by a ſtrong heat. Some of them have been found to yield acetic acid when diſtilled with very dilute ſulphuric acid.

The action of gallic acid on metallic ſalts appears to be proportionable to the ſtrength of the affinity which the different metals have for oxygen. The ſolution of this acid imparts to a ſolution of gold a dark green colour, and produces a brown precipitate, which is metallic gold. It renders a ſolution of ſilver brown, and occaſions, with the aſſiſtance of a gentle heat, the depoſition of a grey powder, which is finely divided ſilver. The precipitate which it gives with a ſolution of mercury is orange yellow; with a ſolution of copper, brown; with a ſolution of acetat of lead, white; and with biſmuth, lemon coloured. It imparts to molybdic acid a dark yellow, without occaſioning any precipitate. It appears to have no effect on the ſalts of platina, zinc, tin, cobalt, and manganeſe. When boiled on red oxyd of mercury, the acid itſelf is decompoſed, and running mercury is produced. It ſuffers the ſame change when ſimilarly treated with the black oxyd of manganeſe or oxyd of tin; but theſe metals, inſtead of being reduced, are brought only into lower ſtates of oxydation. The moſt diſtinguiſhing property this acid poſſeſſes, is that of giving dark-blue coloured precipitates with the oxygenated ſalts of iron. According to M. Berthollet's views of the ſubject, it is not abſolutely neceſſary that the iron ſhould be at the maximum of oxydation for this effect to be produced, for he obſerves that the ſalts which contain the oxyd at the minimum, though not changed at firſt by gallic acid, yet become coloured; when the ſolution confined from air is much diluted with water. He conceives, and M. Richter is of the ſame opinion, that every thing which weakens the affinity of the ſulphuric acid for the oxyd promotes the combination of the gallic acid with the metal in whatever ſtate of oxydation it may be: indeed the latter chemiſt aſſerts, that a ſolution of green ſulphat of iron is never coloured by gallic acid, unleſs tannin be preſent, which, according to him, attracts the ſulphuric acid, and then the gallic acid unites with the oxyd of iron ſeparated. Mr. Prouſt, from his obſervations, has been led to a different concluſion. He thinks that iron is incapable of combining with gallic acid, unleſs highly oxydated; and he thus explains the colour which a mixture of green ſulphat of iron and gallic acid acquires by expoſure to the air; the blackening of ink after being poured out of cloſe

veſſels, and many of the manipulations of dyers who find their profit in this oxydating proceſs carried on in the atmoſphere. M. Berthollet indeed admits that gallic acid ſtrikes a deeper colour with the oxygenated ſalts of iron, than with thoſe which contain leſs oxygen; but he attributes this effect to the decompoſition of the acid itſelf, and the developement of ſome of its charcoal.

Such are the general properties of gallic acid procured in the moiſt way. M. Bouillon La Grange has pointed out a few inſtances in which the acid obtained by ſublimation according to the method of Deyeux differs. Theſe differences it will be neceſſary to mention, they are principally the following. The ſublimed acid is leſs acid to the taſte. It gives to metallic ſolutions precipitates of different colours. Its ſolution is darkened by oxymuriatic acid. It imparts variable colours to ſulphat of iron, and it does not precipitate gelatine. It moreover appears to contain a little eſſential oil, which by diſſolving the acid in water, ether, or a ſtrong ſolution of pot-aſh, ſeparates, becomes ſenſible to the ſmell, and is ſeen ſwimming on the ſurface of the fluid.

The nature of gallic acid is not yet ſatisfactorily determined. The generally received opinion is, that it is a ſimple acid, but there are ſome chemiſts who maintain it to be a compound one; M. Bouillon La Grange has endeavoured to ſhew that the cryſtallized acid procured in the moiſt way is compoſed of acetic acid, tannin, and extractive, and that the acid obtained by ſublimation is merely acetic acid modified by a peculiar eſſential oil. His arguments for this opinion are, the difficulty, indeed the impoſſibility, of obtaining the acid free from theſe impurities, and the production of acetic acid by the diſtillation of gall-nuts with water, and alſo by ſubmitting ſome of the gallats to the ſame operation with dilute ſulphuric acid. However ingenious this reaſoning may be, it is not concluſive. Doubt can be alone baniſhed from the ſubject, by ſubmitting the theory to the teſt of experiment; by endeavouring to form gallic acid of either kind by adding to the acetic the ſubſtances by which it is ſuppoſed to be modified, in the acid in queſtion. It is certain, however, that, like the other vegetable acids, gallic acid is a compound of carbon, hydrogen, and oxygen, and not, as M. Deyeux maintains, of carbon and oxygen alone.

Its uſes are few, in its pureſt ſtate, and theſe are known alone in the laboratory of the chemiſt; but in combination with other ſubſtances, it is of extenſive and important applications in the arts. See the articles DYEING and INK.

Elemens de Chimie, tom. iii. Crell's Chemical Journal, vol. i. p. 24. Journals of the Royal Inſtitution, vol. i. p. 274. Nicholſon's Journal, 8vo. vol. i. p. 458. Phil. Mag. vol. xxiii. p. 74. Annales de Chimie, tom. xvii. Chemical Statics, vol. ii. Annales de Chimie, tom. 60. p. 156.

GALLICAN CHURCH denotes the church of France; or the aſſembly or convocation of the prelates of France.

M. du Pin has an expreſs treatiſe of the liberties of the Gallican church. See CHURCH.

GALLICAN *Breviary* denotes the breviary uſed by the church of Agrigentum, in Sicily; which the modern writers call Breviarium Gallicanum.

The reaſon, no doubt, is its having been introduced by St. Gerlan, who was made biſhop of Agrigentum, after earl Roger had been driven out of Sicily by the Saracens; and by the other French biſhops, whom the Norman princes brought thither. See BREVIARY.

GALLICAN *Liturgy* is the manner of performing divine ſervice anciently obſerved in the Gauls.

F. Mabillon ſhews wherein it differed from the Roman liturgy. 1 Liturg. Gall. cap. 5, &c.

GALLICAN *Maſs*. See MASS

GALLICIA, or GALICIA, in *Geography*, a province of Spain, ſituated at the north-weſt angle of the country, and forming a very irregular kind of quadrilateral. On the north and weſt it is bounded by the Atlantic ocean; on the eaſt by Aſturia and Leon, and on the ſouth by the Portugueſe provinces of Tras-los-Montes and Entre-douro-è-Minho. Its mean extent is about 46 leagues from north to ſouth, and 140 leagues from eaſt to weſt. This country took its name from its ancient inhabitants, the Callaici, whence have been formed the names of Gallæci, Galiciæ, and Galicia. Gallicia was conſtituted a kingdom in the year 1060 by Ferdinand the Great, king of Leon and Caſtile, who gave this province to his ſon Don Garcias. But till the reign of Ferdinand V. and Iſabella, in 1474, the inhabitants, hemmed in by their mountains and rivers, paid little reſpect to the royal authority. The nobility exerciſed a kind of ſovereignty in their own territories, and countenanced their ſubjects in the pillage of ſtrangers. Theſe diſorders, however, were terminated by Ferdinand and Iſabella, who civilized the country, and entered into an engagement with the Gallicians, that their kingdom ſhould always preſerve its title. It is at preſent the moſt populous province in Spain. This country is, in general, very mountainous; interſected with beautiful valleys, and bounded by ſmall plains; the mountains are for the moſt part well wooded, and abound in game. The lands produce ſome wheat and oats, a great quantity of maize, millet, flax, hemp, pulſe, lemons, and other fruit, and in ſome places wine. Oak, walnut, cheſnut, and hazle trees are numerous. The inhabitants rear many horned cattle and mules. One of the principal branches of the induſtry of this province conſiſts in woollen manufactures, blankets, and hoſiery, and particularly in common linens. The lands generally belong to the nobles, to churches, and to monaſteries, ſo that the maſs of the people have ſcarcely any property. Gallicia is interſected by a chain of mountains, which proceeds from the Pyrenées near Roncevallos, between Biſcay and Navarre, directing its courſe to the north-weſt, and leaving on its right the Aſturias, penetrating by Leon into Gallicia, which it traverſes, and continues till it is ſtopped by the ſea, after forming cape Finiſterre. The mountains of this Gallician branch have different names; the moſt conſiderable of which is the Sierra de Mondonnedo, of great extent, occupying the whole extremity of the north-eaſt of Gallicia towards the Aſturian boundary on the eaſt, and proceeding to the north as far as cape Ortegal, and to the weſt as far as the Atlantic ocean. As this province has 100 leagues of coaſt its ports are numerous, ſome on the north and others on the weſtern ocean. In number they are more than 40, but in general they are very ſmall. Thoſe that chiefly deſerve notice are, Maria, Corcuvion, Bayona, Pontevedra, Muroz, Guardia, Vigo, Corunna, Ferrol, Santa Marta, Vivero, Ribadeo, &c. Its principal rivers are the Eo, or Rio de Miranda, which ſeparates the frontiers of Aſturias from Gallicia, and after purſuing a courſe of 24 leagues from ſouth-eaſt to the north, falls into the northern ocean above Ribadeo in Gallicia, and Caſtropol in Aſturia; the Ulla or Ilia, which has a courſe of 23 leagues from the north-eaſt to the ſouth-weſt; the Tambra, or Tamaris, which gives the name of Tamaricians to the people who occupy its banks, purſuing a courſe of 20 leagues from the north-eaſt to the ſouth-weſt; the Mandeo, whoſe courſe is 16 leagues from the eaſt to the north-eaſt; the Minho, which riſes in the eaſt of the Sierra Mondonnedo, and after receiving

ſeveral tributary ſtreams, and ſeparating Gallicia from Portugal, in a courſe of about 52 leagues, firſt from north to ſouth and then to the ſouth-weſt, falls into the ocean near the port of Guardia; the Sil, which riſes in the mountains to the weſt of Leon, and after a courſe of 33 leagues falls into the Minho. In this province they reckon 70 rivers, excluſively of ſmall ſtreams. The principal towns of Gallicia, are Compoſtella, Lugo, Tuy, Orenſe, Corunna, Finiſterre, Vigo, &c. &c. It has an archbiſhopric, San-Jago, four biſhoprics, Tuy, Orenſe, Mondonnedo, and Lugo; five cathedral and five collegiate chapters, ſeveral abbeys of Benedictines and Bernardines, two commanderies of religious orders, 3,683 pariſhes, 98 religious houſes, 30 hoſpitals, an univerſity, 5 colleges for the inſtruction of youth, 7 cities, 74 towns, 3,434 villages, upwards of 40 ports, 2,640 pariſh prieſts, 1,043 pariſh curates, 6,742 ſecular prieſts, 2,394 monks, 600 nuns, 13,800 nobles, 966 advocates and writers, about 4,500 ſtudents, 18,900 ſervants, and the total of the population is eſtimated at 1,345,810 perſons, or, as ſome ſay, 1,500,000, and according to others two millions. Its capital in Compoſtella or Saint Jago. The climate of Gallicia is generally conſidered as mild upon the coaſt, and cold in the interior, which is expoſed to winds and heavy rains, with ſome few exceptions.

This country is reckoned rich and productive. Each farmer keeps flocks of ſheep and goats in proportion to the extent of land which he poſſeſſes or cultivates; and the Gallicians are generally deemed laborious in the culture of their ſoil, and in other departments of agriculture. But they are not much addicted to the mechanical arts or to commerce. On this account many of them ſeek ſubſiſtence in the neighbouring province, where they are employed in the moſt ſervile and laborious employments, for which they are deſpiſed by the other Spaniards. There are, however, ſome manufactories in Gallicia: ſuch are thoſe of woollen ſtuffs, coarſe cloths and hoſiery at Lugo; thoſe of ropes and ſailcloth at Ferrol and Corunna; that of linen at Tuy; that of ſilk in the territory of Montforte, in the county of Lamos; thoſe of hats, &c. However, upon the whole, Gallicia is, with regard to manufactures, the leaſt induſtrious part of Spain. Its coaſts are ſo extenſive, and its rivers are ſo numerous, that it is plentifully ſupplied with various kinds of fiſh; ſuch as the bezugos, or hog-fiſh, which is taken in the months of November and December, and ſent quite freſh into Caſtile and Leon, ſalmon, herrings, ſhad, trout, lampreys, ſkate, eels, &c. The exports of this province are not very conſiderable; the cattle it produces, the fiſh, and the cloth it manufactures, are ſent into ſome of the provinces of Spain, and its ſalt proviſions are exported into foreign countries. They alſo ſend to other provinces table-linen, ſkins, hides, and leather, hats, tapes and knit ſtockings, wool and wine; and they alſo trade in cattle, mules and horſes. The importations from the Engliſh, French, and Dutch are received at the port of Vigo, and the exportations are ſent from the port of Corunna, from which Gallicia communicates with America, whither it ſends ſoap, ſkins, leather, and furriery, table-cloths, napkins and knit ſtockings; and in return it receives cocoa, logwood, ſugar, and other colonial productions.

Gallicia was formerly in great reputation for its mines; but thoſe that are now chiefly known are copper, lead, and tin. There are alſo white marble and jaſper between Corunna and Betanzos, and likewiſe marcaſite, vitriol, ſulphur, &c. The ſame mountains alſo furniſh excellent timber for building ſhips. Gallicia abounds in mineral waters of various deſcriptions. The woods, foreſts, and narrow paſſes of the mountains of Gallicia, were formerly infeſted with bears, wolves, foxes, wild aſſes, and birds of prey without number: but at preſent they ſupply roebucks, deer, hinds, ſtags, wild boars, and a great quantity of game. A fine breed of aſſes is preſerved, good hogs, and a large quantity of poultry.

The Callaici, who were the ancient inhabitants of this country, employed themſelves in war and hunting, and alſo in fiſhing. Their wives ploughed the land, ſowed, gathered the harveſt, and took care of their families. At preſent the traveller finds in the mountains of Gallicia ſimple and pure manners, a quiet and hoſpitable people, having no idea of luxury. The Gallicians are large, muſcular and robuſt, and capable of enduring fatigue. The women are fair, tolerably handſome, with black hair and eyes, fine teeth, and regular, but not very expreſſive features. The men,, women, and children go barefoot. In their diſpoſition they are grave, ſober, and prudent; they lead a kind of melancholy life, and keep little company. In other reſpects they are ſaid to diſtinguiſh themſelves by their probity and courage. They furniſh a great number of ſoldiers for the army; and they ſeem to be naturally inclined to arms. Thoſe of Montforte are remarked for this, as well as thoſe of Lamos, which is watered by the little river Cabe, and the capital town of which is ſituated upon a ſteep and lofty mountain. The Gallicians were the firſt poets of Spain. Before the deſcent of the Romans, they compoſed and ſung verſes, but they made little progreſs in this art. The preſent language of Gallicia is a mixture of the ancient Caſtilian of the time of Alphonſo the Wiſe, and of Portugueſe, with ſeveral expreſſions which it has retained of the ancient Roman language.

GALLICIA, *New*, a province of America, in the domain of Mexico, known alſo by the name of "Xaliſco." It is rather woody and mountainous: but the plains are very fertile, and produce moſt of the European fruits. Here are alſo mines of ſilver. Zaratecas, a very rich mining country, is regarded as a diſtrict of New Gallicia.

GALLICISM, a phraſe or conſtruction, peculiar to the French language; or which has ſomething contrary to the ordinary rules of grammar of other languages.

Thus, *Cet homme eſt ſur la bouche* is a Galliciſm, having no regular conſtruction; and the ſame may be ſaid of *Fair de la terre le foſſe;* which no grammar could ever find out.

With us it is uſed to denote ſuch phraſes or modes of ſpeech in Engliſh as are formed after the French idiom.

GALLICO, in *Geography*, a town of Naples, in Calabria Ultra; 5 miles N. of Reggio.

GALLICULUS, JOHN, in *Biography*, a German writer on counterpoint, in Latin, was contemporary with Martin Luther; and, according to Walther and Schamelius, compoſed the muſic to ſeveral Lutheran hymns and pſalm-tunes that were publiſhed at Leipſic. He was author of an ample treatiſe on counterpoint, in which the rules of compoſition, as far as the art was then known, are clearly explained; this book was printed in 1548 and 1553, and addreſſed to George Rhaw, the learned bookſeller and muſician of Wittemberg. This tract, which has for its title "Libellus de Compoſitione," contains twelve chapters, wholly appropriated to counterpoint.

There was another Galliculus (Michael) a Ciſtertian monk of Zell; who, in 1520, publiſhed a ſhort treatiſe "De vero pſallendi modo," to which Ornithoparchus refers his readers who are curious concerning the eccleſiaſtical chants. This book is in Anthony Wood's Coll. in the Aſhmol. Muſeum, Oxford.

GALLICUS MORBUS, the venereal diſeaſe. See LUES VENEREA.

GALLIGASKINS, in our *Old Writers*, denote wide hoſe

hoſe or breeches, having their name from their being uſed by the Gaſcoigns.

GALLIMATHIAS, a dark, perplexed diſcourſe, where words and things are huddled together, ſo as to make an inconceivable jargon.

The word is French, formed, as ſome will have it, from *polymathia*, which ſignifies diverſity of ſciences; becauſe ſuch as have their memory burdened with ſeveral kinds of ſciences, are uſually confuſed, and expreſs themſelves ill. M. Huet rather takes the word gallimathias to have had the ſame origin with *alibenum*; and to have firſt ariſen at the time when all the pleadings at the bar were in Latin. There was a cauſe, it ſeems, upon the carpet, about a cock, belonging to the plaintiff Matthias; the counſel in the heat of his harangue, by often repeating the words *gallus* and *Matthias*, happened to blunder; and, inſtead of ſaying *gallus Matthiæ*, ſaid *galli Matthias*; which at length became a general name for all confuſed, embroiled language and diſcourſe.

GALLIMAWFRY, a ragou, hatche, or hotch-pot, made of the remains of ſeveral kinds of meats.

The word is French, *gallimafrée*, which ſignifies the ſame.

Hence the word is alſo uſed in a figurative ſenſe for a piece, or compoſition, of ſeveral different parts, ill digeſted and embarraſſed.

GALLINA, in *Ornithology*, the name of ſeveral ſpecies of *Scolopax*, *Pſophia*, and *Tetrao*; which ſee reſpectively.

GALLINÆ, in the Linnæan ſyſtem of *Ornithology*, the name of a large order of birds, the general character of which is, that their beak is convex; the upper mandible is arched, and extends beyond the lower; the noſtrils are half covered with a cartilaginous convex membrane; the feathers of the tails are more than twelve, and the feet are cloven; but the outermoſt and inner toes are connected by the firſt joint of the middle toe by a ſmall membrane. The *Otis*, *Struthio*, *Didus*, *Pavo*, *Meleagris*, *Penelope*, *Crax*, *Phaſianus*, *Numida*, and *Tetrac*, belong to this order.

GALLINACEOUS, the name of a ſpecies of birds of the pheaſant kind, including the common cock and hen, the characters of which are theſe. The beak is ſhort, ſtrong, and a little crooked, proper for the picking up of corn, which is the food of the whole ſpecies; the body is large, thick and fleſhy; the wings are ſhort and hollowed, and not calculated for much flying; they all breed a numerous progeny; they build on the ground; the young are not fed by the parent, but immediately ſhift for themſelves; and ſome have long ſpurs behind their legs. See COCK, FOWL, and POULTRY.

GALLINAGINIS CAPUT, in *Anatomy*. See CAPUT.

GALLINAGO, a general name for heath fowls, as the wood-cock, ſnipe, &c. See SCOLOPAX.

GALLINAGO *Minor*. See SCOLOPAX and SNIPE. See alſo RALLUS.

GALLINARE, in *Geography*, a ſmall iſland in the Mediterranean, near the coaſt of Genoa; 10 miles S. of Finale. N. lat. 44° 2′. E. long. 8° 25′.

GALLINAS, LAS. See BISSAGOS.

GALLINAZO, in *Ornithology*. See VULTUR *Aura*.

GALLINE, in *Ichthyology*, a name given by the Maſſilians to the flying-fiſh, called by authors *milvus* and *lucerna*. See TRIGLA *lucerna*.

GALLINE, in *Geography*, a river of America, which runs into lake Michigan. N. lat. 42 23′. W. long. 86° 21′.

GALLING, in *Medicine*, inflammation and excoriation of the ſkin by friction. See INTERTRIGO.

GALLINI, *Sir* JOHN, in *Biography*, a native of Italy, a celebrated ſtage-dancer and dancing-maſter, ſome time patentee of the Opera houſe, and always proprietor of the concert rooms in Hanover-ſquare, from the time that he fitted them up for Bach and Abel's ſubſcription concerts till his death.

He came into this country early in life, after having obtained conſiderable diſtinction as a dancer at Paris. He ſeems to have come hither on ſpeculation, without any previous engagement. He firſt appeared on our Opera ſtage in 1759, during the performance and management of the Colomba Mattei; where his ſtyle of dancing pleaſed ſo much, that in a pas ſeul he was frequently encored, which we never remember to have happened to any other dancer.

We find, in a collection of the *libretti*, or opera books of the words, that he performed in 1759 in the opera of "Farnaſe," compoſed by Perez, where he is ſtyled, "Il Signor Giovanni Andrea Gallini, director of the *balli*, and principal dancer." He has the ſame titles in the operas of "Erginda" and "Ciro Riconſciuto," of the ſame year, and "La Clemenza di Tito," 1760, all compoſed by Cocchi. In 1761 Gherardi was ballet-maſter and principal dancer at the Opera. But in 1762, Gallini's name appears again in the opera books; and in 1763, in the comic operas of "La Calamita de' Cuori," and "La Finta Spoſa," in which the De Amices ſung and acted ſo admirably, we find Gallini dancing with the Aſſelin. After this his name no longer appears in books of the lyric theatre, either as ballet-maſter or principal dancer.

It was ſoon after his profeſſional celebrity at the Opera houſe that he married lady Elizabeth Bertie, ſiſter of the late earl of Abingdon, whoſe father, in 1727, married at Florence the daughter of ſir John Collins, knight, of a family originally Engliſh; but which had long reſided in Italy. Signor Collino, brother to the then counteſs of Abingdon, was the laſt performer on the lute in this country. The earl, his brother-in-law, died in 1760, and his counteſs in 1763. The late lord Abingdon, celebrated at Geneva by Voltaire, we believe, was not in England at the time of his ſiſter lady Betty's marriage with Gallini; who, admitted at firſt as a dancing-maſter, by his vivacity, talents, knowledge of the Italian language, and manners, ſo inſinuated himſelf into the favour of this noble family, as ſoon to be admitted as *amico della caſa*, and afterwards to a cloſer alliance.

Many ridiculous ſtories were in circulation at the time, of Signor Gallini's expectations of the honours which would accrue to him by his marriage into a noble family; which he imagined would confer on him the title of my lord. But he was ſoon convinced of his miſtake, and content with an inferior title: for when the marriage became a ſubject of converſation, we happened to hear in the gang-way of the Opera pit the following converſation. One of two ladies, going into the front boxes, ſays to the other, "It is reported that one of the dancers is married to a lady of quality;" when Gallini, who happened to be in the paſſage near the lady who ſpoke, ſays, "Luſtriſſima, ſon io."—"And who are you?" demanded the lady; "Eudenza, mi chiamo Signor Gallini Eſquoire."

This match, as is uſual with ſuch diſproportioned alliances, was not the ſource of permanent felicity. They lived aſunder many years. Lady Elizabeth died in the courſe of the year 1788.

By his great benefits at the theatre, and faſhion as a dancing-maſter at the principal ſchools and houſes of the nobility and gentry, he, with unwearied diligence and exceſſive parſimony, had accumulated a fortune ſufficient to purchaſe in 1786 the patent of the Opera houſe, when he became ſole *impreſario* of that theatre.

It was after this period, in going to Italy to engage performers, that he obtained his title at Rome of the pope, who made him "Cavaliere del ſperon d'Oro," knight of the golden

golden ſpur, the only order which his holineſs has to beſtow. But lord Kenyon, when his title was introduced in court on a trial, refuſed to acknowledge it, and treated the aſſumption with indignation and contempt. Sir John, however, continued to retain it, and was abetted by the public, in ſpite of the lord chief juſtice.

The chevalier, extremely worldly, dextrous at a bargain, and cautious in his dealings with mankind, was an unfortunate projector in his attempt at a rapid increaſe of his property. The rooms in Hanover-ſquare, we believe, were very productive, as he let every floor and every room, not only to concerts, balls, and aſſemblies, but to exhibitions, lectures, and lodgers of all kinds, ſcarcely allowing himſelf a habitable apartment for his own reſidence.

When the Opera houſe was burned down, in 1789, he advanced 30,000*l.* towards rebuilding it, and ſent an architect to Italy to procure plans of all the great theatres of that country, out of which to chooſe the moſt eligible for the new conſtruction; but it has been ſaid, and generally believed, that by ſome jumble of claſhing intereſts, or chicane of law, the management was taken out of his hands, and he not only loſt his power but his money.

While the great theatre in the Haymarket was rebuilding, ſir John fitted up the oppoſite little theatre as a temporary opera houſe, and had Marcheſi and Madame Mara to ſing; but the theatre was ſo ſmall and inconvenient, that it could not contain an audience ſufficient to cover his expences. The next year the Pantheon was transformed into an opera houſe before that in the Haymarket was finiſhed; and the unfortunate knight of the golden ſpur, tired of the ſquabbles and accidents which happened previous to the opening of his new theatre, ſold his patent, and afterwards wholly confined himſelf to the produce of his Hanover-ſquare rooms, and the exerciſe of his profeſſion as a dancing-maſter, to the end of his life.

Indeed, at the time of the French revolution, he could not reſiſt the temptations which were thrown out in that country for turning the penny in the purchaſe of the eſtates of the guillotined and emigrant nobility and gentry under the title of national domains. And he bought an eſtate near Boulogne, which coſt him 30,000*l.*; but of which, by the artifice of French lawyers, and connivance of the uſurpers, he was never able to obtain ſecure poſſeſſion, and at length abandoned all hopes of the eſtate or his money. This loſs had much leſs effect upon his avaricious character than could be expected, conſidering that he was ſo rigid an economiſt, that his private life would furniſh materials for a new drama on the ſubject of frugality.

It has, however, been juſtly ſaid of him, that he was generally conſidered as the moſt able teacher of his art that ever appeared in this country; and is ſuppoſed, by his inceſſant labours in this reſpect, notwithſtanding his great loſſes, to have left money and effects to the amount of 100,000*l.* to portion his family, which conſiſted of a ſon, in the army, and two daughters. He was a very ſhrewd, intelligent man, who perfectly knew the world; and, if he was not generous, he was, however, honourable in his dealings; and if few had cauſe to be grateful for his bounty, no one had a right to complain of his injuſtice.

In the height of his profeſſional practice and favour he publiſhed a book, in which he gave a hiſtory of dancing from its origin, and the manner in which it is practiſed in various parts of the world. It appeared in 1762, under the title of "A Treatiſe on the Art of Dancing, by Giovanni Andrea Gallini, director of the dancers at the Royal Theatre in the Haymarket," 6*s.* bound. Dodſley and Becket. We have not ſeen the original; but in the Monthly Review, for which it has furniſhed an article of 12 pages, there are ſuch copious extracts, that an idea may be formed of the work, which, till the more elegant "Lettres ſur la Dance of the celebrated ballet-maſter, Noverre," publiſhed at Stutgard in 1760, had penetrated into this country, was much read and talked of as a literary performance. Neither Gallini nor the reviewers mention Noverre's captivating book, which, perhaps, neither had ſeen; but unluckily, in a work of M. Cahuſac, publiſhed at the Hague, in three ſmall volumes, 1754, 12mo. we find all the hiſtorical part of Gallini's treatiſe, with the ſame ſtories of the wonderful powers of the ancient mimics Bathyllus and Pylades, at Rome, their quarrel, and the feuds it occaſioned. But, to ſay the truth, we, who knew Gallini from his firſt arrival in England, never thought that he had literature ſufficient to write an original work in his own language, or even to tranſlate ſuch a one as that of Noverre or Cahuſac into any language. The title of this laſt is, "La Danſe ancienne et moderne, ou Traité Hiſtorique de la Danſe."

The late active and enterpriſing artiſt, Gallini, ſeems to have had a pleaſure in his profeſſional labours to the end of his life, like Marſeille, the celebrated dancing-maſter in France, and Cavalry in England, who continued to give leſſons on their art when they had not a leg to ſtand on, much leſs with which to exemplify graceful motion. But Gallini, by temperance and exerciſe, enjoyed a good ſtate of health, and eſcaped decrepitude to the laſt: for it was ſaid in the printed accounts that "Sir John Gallini, on Saturday, 5th of January, 1805, rung his bell at eight o'clock, and, upon his ſervant entering his chamber, ordered his breakfaſt to be prepared immediately, his chaiſe to be at the door at nine o'clock, and his chariot in waiting at three." A few minutes after giving theſe directions, he complained of not being well, and ſaid, "I will reſt till nine o'clock." In half an hour he rang his bell again, and ordered medical aſſiſtance, as he had a violent pain in his ſtomach. Dr. Hayes and Dr. Wood immediately attended; but at nine o'clock he expired without a groan.

GALLINULE, in *Ornithology*, a diviſion of the genus *Fulica*, which ſee.

GALLINULA *Ærythropus*, a name given by many authors to the bird commonly called in Engliſh the *red-ſhank*. See SCOLOPAX *Calidris*.

GALLINULA *Hypoleucos*, a name given by ſome authors to the becaſſine, or, as we call it in Engliſh, the *ſandpiper*. See TRINGA *hypoleucos*.

GALLINULA *Melampus*, a name given by Geſner and ſome others to the bird more uſually known by its German name, *rotknuſſel*. See GLAREOLA *nævia*.

GALLINULA *Rhodopus*, *phœnicopus*, and *ochropus*, names by which Geſner, and ſome others, have called the common tringa; a bird in which the legs are, at different ages, and in the different ſexes, greeniſh, yellowiſh, or reddiſh. See TRINGA *Ochropus*.

GALLINULA *Serica*, a name given indiſcriminately by many authors to the grinetta and the water-rail; both birds of the moor-hen kind, but ſmaller than the common moor-hen. See FULICA.

GALLIO, in *Scripture Biography*, was proconſul, or, as it is in our tranſlation, deputy, of Achaia in the firſt century of the Chriſtian era. He was elder brother of Seneca the ſtoic philoſopher, and as his brother deſcribes his character (Nat. Queſt. l. iv. in præf.) a man of much wit and good ſenſe, of a ſweet and gentle diſpoſition, and of much generoſity and virtue. The apoſtle Paul was brought before him in the year of our lord 52 or 53; but it was

impoſſible for the enemies of the apoſtle to move him to give any judgment on the caſe. Acts, xviii. 11 — 16.

GALLIO, in *Geography*, a town of Italy, in the Vicentin; 20 miles N. of Vicentin.

GALLION, or GALLEON, formerly denoted a large veſſel, or ſhip of war, of three or four decks.

GALLEON is now only uſed in ſpeaking of the Spaniſh fleet; the galleons being a part of the ſhips employed in the commerce of the Weſt Indies.

The Spaniards have been accuſtomed to ſend every year two fleets; the one for Mexico, which they call the flota; and the other for Peru, which they call the galleons.

GALLEON, *Manila*, is a ſhip employed in the trade from Manila in the iſland of Luconia, the chief of the Philippine iſlands, to Acapulco on the coaſt of Mexico. This ſhip ſets ſail from Manila about July, and arrives at Acapulco in December, January, or February following. There is ſeldom more than one ſhip employed in this trade at a time; but there are three or four ſtout ſhips provided to carry on this commerce, one of which is always ready for the ſea when the other arrives. The largeſt of theſe ſhips is little leſs than one of our firſt rate men of war, and carries twelve hundred men; the others are of the burthen of twelve hundred ton and upwards, and carry from three hundred and fifty to ſix hundred men, with between fifty and ſixty guns. Theſe ſhips are commiſſioned and paid by the king of Spain, who pays the officers and crew; and one of the captains is called the general, and carries the royal ſtandard of Spain at the top-gallant-maſt-head. The trade from Manila to Acapulco conſiſts of ſuch commodities, collected in China and different parts of India, as are intended to ſupply the kingdoms of Mexico and Peru. Theſe are ſpices, all ſorts of Chineſe ſilks and manufactures, particularly ſilk ſtockings, of which the annual ſhip uſually carries no leſs than fifty thouſand pair, vaſt quantities of Indian ſtuffs, as calicoes and chints, together with other minuter articles, as goldſmith's work, &c. which is performed at Manila by the Chineſe, of whom there are no leſs than twenty thouſand who conſtantly reſide there. However this trade is not open to all the inhabitants of Manila, but is reſtrained by regulations ſimilar to thoſe of the regiſter ſhips from Cadiz to the Weſt Indies. The value of this trade is limited by the royal edicts, as it has been ſaid by ſome, to ſix hundred thouſand dollars; but it is reaſonable to conclude that the return of it cannot be much ſhort of three millions of dollars. The tonnage of the ſhips employed in this trade is divided into a certain number of bales of the ſame ſize, which are diſtributed among the convents at Manila, but principally to the Jeſuits for the ſupport of their miſſions; and theſe convents have a right to embark ſuch a quantity of goods on board the Manila ſhip, as the tonnage of their bales amounts to, or to ſell this privilege to others. This ſhip, having diſpoſed of its effects at Acapulco, returns for Manila ſome time in March, where it generally arrives in June; ſo that the whole voyage takes up near a year. The principal return from Acapulco to Manila is always made in ſilver, the reſt of the cargo being inconſiderable, and conſiſting of cochineal and ſweet-meats, the produce of the American ſettlements, European millinery ware for the women at Manila, and ſome Spaniſh wines, as tent and ſherry, which are intended for the uſe of their prieſts in the adminiſtration of the ſacrament. The galleon in its return is much leſs incumbered with her cargo than in her paſſage thither; and therefore her crew is conſiderably augmented and her lower tier of guns is mounted, which before was carried in her hold, at leaſt till ſhe came near cape St. Lucas and California, and apprehended an enemy. Anſon's Voyage, chap. x. p. 232—248.

Theſe are all ſhips of war, and go on the king's account; but they are ſo loaden and embarraſſed with merchandizes, that, in caſe of an attack, they find it difficult to defend themſelves.

Beſide the king's galleons, there are uſually twelve or ſixteen merchants ſhips, called regiſter ſhips, belonging to private perſons, who obtained leave for the ſame, or rather buy it; there being no Weſt India company in Spain.

The galleons are loaded at Cadiz, from whence they may put out at any time. They were formerly appointed to be out in January, that they might coaſt along the firm land, and come about the middle of April to Porto Bello, where, the fair being over, they might take aboard the plate, and be at the Havannah with it about the middle of June, where the New Spain fleet would ſoon join them, and they might come together more ſafely to Spain. For this purpoſe, the viceroy of Peru was to take care that the plate ſhould be at Panama by the middle of March; the plate is fifteen days in removing from Potoſi to Arica; eight days generally from thence, by ſea, to Callao, and twenty from Callao to Panama, taking in by the way the plate at Faita and Truxillo. But it has been found by experience, that the month of September is the fitteſt for the fleet to ſail: they are about two years in the whole voyage. However often or ſeldom the galleons go out, the next fleet never go out till the laſt are returned. When the galleons and flota put out together, they ſeparate about the Antilles iſlands; the galleons for Carthagena and Porto Bello: and the flota for Vera Cruz. At their return, they rejoin at the Havannah in the iſle of Cuba.

The loading of the galleons is always the richeſt: an eſtimate of the yearly returns or cargoes, both of the flota and galleons, was formerly as follows:

Of gold, the galleons bring yearly about two or three millions of crowns, and the flota about one. Of ſilver, the galleons bring eighteen or twenty thouſand crowns, and the flota ten or twelve. Of precious ſtones, the galleons bring as follow: two hundred thouſand crowns worth of pearls; two or three hundred thouſand crowns of emeralds; and twenty or thirty thouſand crowns worth of bezoards, amethyſts, and other ſtones of leſs value: the flota brings none at all. Of wools, the galleons bring forty or fifty thouſand crowns: the flota, none. Of quinquina, the galleons bring the value of twenty thouſand crowns: the flota, none. Of ſkins and leather, the galleons bring ſeventy thouſand crowns worth: the flota as much. Of Campechy wood, the galleons bring ſixty thouſand crowns worth: the flota, none. Of ſkins and leather from Buenos Ayres, the regiſter-ſhips may bring to about two hundred thouſand crowns; of cochineal about a million of crowns; and of indigo, about ſix hundred thouſand crowns.

By a general ordinance in Spain, it has been eſtabliſhed that there ſhould be twelve men of war and five tenders fitted out annually for the armada of galleons; eight ſhips of ſix hundred tons burthen each; and three tenders, one of a hundred tons, for the iſland Margarita; and two of eighty each to follow the armada. For the New Spain fleet two ſhips of ſix hundred tons each, and two tenders of eighty each; and for the Honduras fleet, two ſhips of five hundred tons each; and in caſe no flota happened to ſail any year, three galleons and a tender ſhould be ſent to New Spain for the plate.

But the number of galleons has been different at different times; it has increaſed in time of war and diminiſhed in time of peace.

GALLIOPOLIS, in *Geography*, a poſt-town in the ſtate of Ohio, ſituated on the high north bank of the river Ohio, nearly 90 miles below Marietta, and three miles below the mouth of the Great Kanhaway; ſaid to contain about 100 houſes, inhabited by French people, who built it in the year 1792. They laid out gardens and encompaſſed them with hedges; and planted vineyards and orchards, which have been productive. The firſt ſettlers found the ſituation unhealthy, and endangered by the Indian war in its vicinity, and after a reſidence of about four years diſperſed to other ſettlements, and particularly to Louiſiana. Thoſe who remained obtained of Congreſs a grant of 20,000 acres, about 24 miles lower down the river, oppoſite to Little Sandy Creek, whither they removed. It is diſtant about 240 miles E. of Columbia, and 559 S. W. of Philadelphia. N. lat. 38° 49′ 12″. W. long. 83° 9′.

GALLIOT, a ſmall galley or a ſort of brigantine, built very ſlightly, and deſigned only for chace.

She hath but one maſt, and can both ſail and row. She uſually carries two or three pedreros, and hath ſixteen or twenty oars.

Some alſo call the bomb-ketches galliots.

GALLIPOLI, in *Geography*, a ſea-port town of European Turkey, in Romania, on the ſea of Marmora, with a good harbour; the reſidence of a pacha, and the ſee of a Greek biſhop, ſuffragan of Heraclea; taken from the Chriſtians in the year 1357 by Soliman, 80 miles S. of Adrianople, and 108 W. S. W. of Conſtantinople. N. lat. 40° 24′. E. long. 26° 44′.

GALLIPOLI, a ſea-port town of Naples, in the province of Otranto, ſeated on a rock; ſurrounded by the ſea and connected with the land only by a bridge; the ſee of a biſhop, ſuffragan of Otranto. The chief articles of its commerce are olives and cotton, produced by trees which are planted in its environs; but the oil not being of the beſt kind, is principally purchaſed for manufactures, 25 miles W. S. W. of Otranto. N. lat. 40° 29′. E. long. 15° 58′.

GALLITRICHUM, in *Botany*, a name by which ſeveral authors call the *horminum ſativum*, or garden-clarey.

GALLIVATS, in *Naval Language*, are large row-boats uſed in India. They are built like *Grabs* (which ſee), but of ſmaller dimenſions; the largeſt rarely exceeding 70 tons. They have two maſts, of which the mizen is very ſlight; the main-maſt bears only one ſail, which is triangular, and very large, the peak of it, when hoiſted, being much higher than the maſt itſelf. In general, theſe veſſels are covered with a ſpar-deck, made for lightneſs of ſlit bamboos; and they carry only pettararoas, which are fixed on ſwivels in the gunnel of the veſſel; but thoſe of the largeſt ſize have a fixed deck, on which they mount ſix or eight pieces of cannon, from 2 to 4-pounders; they have 40 or 50 ſtout oars, and may be rowed four miles an hour.

GALLIUM. See GALIUM.

GALLO, or PUNTA DE GALLO, in *Geography*, a ſmall iſland in the Pacific ocean, near the coaſt of Peru, which furniſhes veſſels with wood and water, but is uninhabited. N. lat. 2° 28′. W. long. 76° 47′.

GALLO, a country of Africa, in the Indian ſea, about S. lat. 17°.

GALLO, *Cape*, a cape on the N. coaſt of Sicily. N. lat. 38° 17′. E. long. 13° 2′.—Alſo, a cape on the S. coaſt of the Morea. N. lat. 36° 48′. E. long. 21° 53′.

GALLOGLASSES, a kind of militia or ſoldiery, in Ireland.

Camden, in his "Annals of Ireland," p. 792, relates, that the Iriſh militia conſiſts of cavalry, or horſemen, called galloglaſſes, or galloglaſſii, who uſe a very ſharp ſort of hatchet: and infantry, called kernes.

GALLOMEW, in *Geography*, a town of Pegu, on the Ava; 60 miles S. of Lundſay.

GALLON is either a *Meaſure* or a *Weight*, of both of which there are ſeveral diſtinct kinds in uſe in England, *viz.*

GALLON *of Ale, Beer, or Vinegar Meaſure*, according to the acts of the 12th of Hen. VII. and 12th of Charles II., &c. often called the Wincheſter gallon, contains, or is equal to 4 ale quarts = 8 ale pints = 32 ale gills = 282 cubic inches Engliſh = .1631944 cubic feet = .00604424 cubic yards = 1.220779 wine gallons = 1.049107 dry gallons = .1311384 malt buſhels = .5676408 cubic links. It has been ſaid that this gallon ſhould hold 10$\frac{1}{2}$lb. of pure water?

GALLON *of Malt*, or *Dry Meaſure*, = $\frac{1}{8}$ of a malt buſhel, according to the firſt and ſubſequent acts for levying a duty on the making of malt; it contains 2 pottles = 4 dry quarts = 8 dry pints = 268.8 cubic Engliſh inches = .155555 cubic feet = .005761317 cubic yards = 1.163636 wine gallons = .9531914 ale gallons = .5410704 cubic links. It has been ſaid that this gallon holds 8lb. Troy of good dry wheat, or 46080 of ſuch grains of wheat, or 9.7187lb. of pure water.

GALLON *of Wine, Cyder, Spirits, Oil, Milk, &c.* according to the act of the 5th of Ann. chap. 7. ſect. 7. contains 4 wine quarts = 8 wine pints = 32 wine gills = 231 cubic Engliſh inches = .1336806 cubic feet = .004951132 cubic yards = .8191490 ale gallons = .8593750 dry gallons = .1074219 malt buſhels = .4649823 cubic links. The act of 1706 directed the wine gallon to be a cylinder of 7 inches diameter, and 6 deep, which contains 230,907 inches, or 231 as above. It has been ſaid to hold 8.3542lbs. of pure water? Caſks for packing fiſh, beef, and pork are to be meaſured or gauged by the wine gallon, by the 38 Geo. III. chap. 89.

GALLON, *Apothecaries*, or *Congius*, in *Pharmacy*, = 8 pints = 128 ounce-meaſures = 1024 dram-meaſures = 231 cubic inches, or the wine gallon, as above. In the tranſlation of the Pharmacopeia by Dr. Powell, the gallon or congius = 8 pints; the pint = 16 fluid-ounces; the fluid-ounce = 8 fluidrachms; and the fluidrachm = 60 minims. With regard to meaſures, the ſtandard wine gallon of the exchequer is divided into 61,440 parts, now called *minims*, according to the glaſs meaſures originally invented by the late Mr. Timothy Lane, F.R.S. By 14 Ann. the wine gallon is fixed at 231 cubic inches, and the weight of the ſtandard exchequer gallon of water, at a temperature of 63° and barometrical preſſure = 29.52, is 58,176 Troy grains. The proportional meaſures are as follow: *viz.* 1 pint = 16 fluid-ounces = 128 fluidrachms = 7680 minims; and 1 fluid-ounce = 8 fluidrachms = 480 minims: and 1 fluidrachm = 6 minims.

GALLON, *Scotch*, = 4 Scotch quarts = 8 Scotch pints = 16 chopins = 32 mutchkins = 128 Scotch gills. The pints in different parts of Scotland, or according to the determination of different experimenters, (from whence they raiſe or deduce their other meaſures of capacity,) are very various; we have ſeen 796.48, 827.2, 828, 840, 869.312, 872, and perhaps others, at different times, ſtated, as the number of Scotch cubic inches in their pint.

GALLON, a *Weight*, is 12lb. of honey at the cuſtom-houſe; of train oil 7$\frac{1}{2}$lb. make a gallon; and of coal, in the port of Newcaſtle, according to Mr. Eddington, "Eſſay on the Coal Trade, 1803," p. 51, 6.87lbs. avoirdupoiſe, or $\frac{33}{16}$ths of a Wincheſter peck, ſtricken or level meaſure,

make a gallon, in calculating the tonnage of veſſels on the Tyne river.

A gallon of wheat formerly (9th Hen. III. 51ſt Hen. III. 12th Hen. VII. &c.) or 8 pints, was 8lbs. Troy = 6.5828lbs. of our avoirdupoiſe weight.

GALLONIUS, ANTHONY, in *Biography*, a native of Rome, where he died in 1605. He excelled in theology, and was prieſt of the congregation of the oratory. His works, which were numerous, were connected with his profeſſion, but he is chiefly known by "A Treatiſe on the different Kinds of Cruelties inflicted by the Pagans on the Martyrs of the primitive Church, illuſtrated with Engravings of the Inſtruments of Torture made uſe of by them." This work was firſt publiſhed in Italian in the year 1591: it was compiled, not only from the accounts of the acts of the martyrs, many of which are of unqueſtionable authority; but alſo from ancient authors of indiſputable credit, profane as well as eccleſiaſtical. In 1594, the author tranſlated his work into the Latin language, and publiſhed it at Rome, under the title "De Sanctorum Martyrum Cruciatibus, &c." illuſtrated with wood cuts. It has ſince gone through many editions on the continent. Moreri. Bayle.

GALLOO, in *Geography*, a town of Africa, in Bambarra. N. lat. 14° 43'. W. long. 5° 10'.

GALLOON, in *Commerce*, a thick narrow kind of ferret ribband, or lace, uſed to edge or border cloaths.

The term is ordinarily underſtood of that made of wool; ſometimes that of thread, or even gold or ſilver.

GALLOP, in the *Manege*, is the ſwifteſt natural pace of a horſe, performed by reaches or leaps; the two fore-feet being raiſed almoſt at the ſame time; and when theſe are in the air, and juſt ready to touch the ground again, the two hind-feet are lifted almoſt at once.

The word is borrowed from the barbarous Latin *calupare*, or *calpare, to run*. Some derive it from *caballicare*; others from the Greek καλπαζειν, or καλπαν, *to ſpur a horſe*.

In galloping, the horſe may lead with which fore-leg he pleaſes; the moſt uſual way is that with the right, in which caſe the gallop is ſaid to be *juſt*; but which-ſoever it be, the hind-leg of the ſame ſide muſt follow it next, which forms an *even* or *equal* gallop; otherwiſe the legs are ſaid to be *diſunited*, and the gallop to be *falſe*; to remedy which diſorder, the rider muſt ſtay the horſe a little on the hand, and help him on the ſpur on the contrary ſide to that on which he is diſunited.

However, this rule has not been always ſtrictly obſerved; for hunting horſes have been trained to lead indifferently with both legs, becauſe it has been found, that a horſe which has never been ſuffered to gallop but with his right fore-leg, has been worn out on one ſide, when he has been freſh and ſound on the other. In order to make a ſtop in a gallop ſtraight forwards, the rider ſhould carefully put his horſe together, without altering or diſturbing the appuy, and throw his body back a little to accompany the action, and to relieve the horſe's ſhoulders. In doing this, he ſhould ſeize the time of making the ſtop, keeping the hand and body quite ſtill, exactly when he feels the horſe put his fore-feet to the ground, in order that by raiſing them immediately by the next motion which he makes, he may be upon his haunches. When horſes do not put out their ſtrength ſufficiently, they ſhould be gallopped briſkly, and then ſlowly again by turns, and they will thus be compelled to obey the hand and heel. In the ſlow gallop, as well as in the trot, it is ſometimes neceſſary to cloſe the heels to the horſe's ſides, which is called *pinchery*; but this ſhould be done in ſuch a manner as not to make the horſe abandon himſelf upon the hand, and care muſt be taken that he be upon his haunches, and not upon his ſhoulders: and, therefore, when he is pinched, he ſhould be kept in the hand. To put a horſe well together, and make him bring his hinder legs under him, the rider muſt cloſe his legs upon him, putting them very much back; this will oblige him to ſlide his legs under him; at the ſame inſtant let the hand be raiſed a little to ſupport him before, and yielding again immediately. Let him be thus ſupported, and have the rein again from time to time, till he begins to play and bend his haunches, and gallops leaning and ſitting down, as it were, upon them; let the rider then preſs him with the calves of his legs, and he will thus become quick and ſenſible to the touch. If a horſe has too fine a mouth, gallop him upon ſloping ground; this will oblige him to lean a little upon the hand, in order the better to put himſelf upon the haunches; and through fear of hurting his bars, he will be prevented from reſiſting the operation of the bit. If the horſe is heavy in hand, gallop him up ſloping ground; and when his appuy is too ſtrong, this will lighten him. The gallop ſerves to aſſure and make ſteady a weak and delicate mouth, and alſo to ſupple a horſe and make him ſteady and active in his limbs. Berenger's Hiſt. and Art of Horſemanſhip, vol. ii. p. 104. &c.

In a circle the horſe is confined always to lead with his fore-leg, within the turn; otherwiſe he is ſaid to gallop *falſe*. But here, too, the hind leg of the ſame ſide muſt follow.

We ſay, a *hand-gallop*, a *Canterbury-gallop*, a *ſchool-gallop*, &c. A ſmooth gallop, cloſe to the ground, the French call the Engliſh gallop, *galop à l'Angloiſe*.

GALLOP *Iſlands*, in *Geography*, a cluſter of ſmall iſlands in the river St. Lawrence. N. lat. 44° 55'. W. long. 75° 18'.

GALLOPAVO, the *Turkey*, in *Ornithology*, a ſpecies of *Meleagris*; which ſee.

GALLOPER, in *Artillery*, is the name of a carriage which ſerves for a pound and a half gun. This carriage has ſhafts ſo as to be drawn without a limber, and is thought by ſome to be more convenient and preferable to other field carriages; and it may likewiſe ſerve for our light three and ſix pounders. See CARRIAGE.

GALLOT, in *Ichthyology*, the *Wraſſe*. See LABRUS *tinca*.

GALLOWAY, in *Geography*, a diſtrict of Scotland, comprehends the two ſhires or ſtewartries of Kirkcudbright and Wigton; for an account of which ſee under their reſpective names.

GALLOWAY, *New*, a royal burgh in the ſtewartry of Kircudbright, is ſeated in a vale, on the banks of the Ken river. From its centrical ſituation its market is much frequented. King Charles I. created it a royal burgh, and advanced the lord of the manor, ſir John Gordon, to the title and dignity of viſcount Kenmure. In the year 1793 this place contained 480 inhabitants.

GALLOWAY, a townſhip of America, in Glouceſter county, New Jerſey.

GALLOWAY, *Mull of*, a cape of Scotland, on the ſouth coaſt of the county of Wigton, at the eaſt entrance into Glenluce bay. N. lat. 54° 44'. W. long. 4° 56'.

GALLOWAYS, is the name of a peculiar ſort of horſes, ſo called from the county of Galloway in Scotland, where they are bred. Tradition reports that this kind of horſes ſprung from ſome Spaniſh ſtallions, which ſwam on ſhore from ſome of the ſhips of the famous Spaniſh Armada, wrecked on the coaſt; and coupling with the mares of the country, furniſhed the kingdom with their poſterity. They were much eſteemed,

eſteemed, and of a middling ſize, ſtrong, active, nervous, and hardy. Berenger's Hiſt. and Art of Horſemanſhip, vol. ii. p. 205.

Galloway *Dyke*, in *Agriculture*, a ſort of fence that is compoſed of earth and ſtone. See Fence.

GALLOWS, an inſtrument of puniſhment, whereon perſons convicted capitally of felony, &c. are executed by hanging.

Among our anceſtors it was called *furca*, a *fork*: a name by which it is ſtill denominated abroad, particularly in France and Italy. In this latter country, the reaſon of the name ſtill ſubſiſts; the gallows being a real fork driven into the ground, acroſs the legs whereof is laid a beam, to which the rope is tied.

Gallows, in *Rural Economy*, a term applied to a ſort of wooden frame formed by nailing pieces of timber together in a tranſverſe direction, and which is employed for different uſes.

Gallows *of a Plough*, ſignifies that part of it which is called the head, and that conſiſts of three pieces of timber, one of which is placed tranſverſely over the heads of the other two, ſo as to have ſomewhat the appearance of a common gallows. See Plough.

GALLS, or Gall-*Nuts*. See Gall and Gall-*Nut*.

Galls, in *Agriculture*, a term uſed to ſignify the baſe or vacant ſpots in crops of grain.

GALLSTAD, in *Geography*, a town of Sweden, in Weſt Gothland; 50 miles E. of Gothenburgh.

GALLUS, Cornelius, in *Biography*, a Roman of conſiderable rank in life, and celebrated as a man of letters and poet. He was born about the year 69 B. C. Little is known of the events of his life; the moſt intereſting occurrence was, perhaps, his intimacy with Virgil, who is thought to have been introduced to Mæcenas by his means. That poet has inſcribed his 10th eclogue to Gallus, whoſe deſertion by Lycoris is the ſubject of the compoſition. Gallus was paſſionately fond of his ſlave Lycoris, and wrote four books of elegies to her honour, which became very popular, and which raiſed him to conſiderable reputation for this kind of verſe. He is referred to by Ovid as having eſtabliſhed an immortal celebrity:

> "Gallus from Eaſt to Weſt ſhall ſpread his name,
> And fair Lycoris ſhare her poet's fame."

He is mentioned alſo with [illegible] Propertius, Martial, and other writers of antiquity. Lycoris was probably a feigned name for Cytheris, who captivated Marc Antony. Gallus, as well as the other poets of the age, was in high favour with Auguſtus, by whom he was appointed to the government of Egypt after the death of Antony and Cleopatra. His future conduct proved that he was unworthy of this high honour. He forgot the duties of his office, and, ungrateful for the diſtinguiſhed favours of his ſovereign, he conſpired againſt his government and authority, and pillaged the province, for which he was baniſhed by the emperor. This diſgrace operated ſo powerfully upon him, that he killed himſelf in deſpair A. D. 26. Some fragments of his poetry remain, which prove that he excelled in elegiac compoſition. He tranſlated into Latin verſe ſeveral books of the Greek poet Euphorbion. Virgil is ſaid to have written an eulogium on his friend, and inſerted it at the end of his Georgics, but that through fear of Auguſtus he ſuppreſſed it, and ſubſtituted the epiſode reſpecting Ariſtæus and Eurydice. Moreri. Suetonius, &c.

Gallus, C. Vibius Trebonianus, emperor of Rome, roſe to that high office, from being one of the chief commanders under Decius, at the time when that emperor loſt his life in an action with the Goths. He aſcended the vacant throne in the year 251, and diſplayed his attachment to the memory of his former maſter by placing him in the rank of the gods, and by aſſociating his ſurviving ſon Hoſtilianus with him in the empire. At this period the Goths overwhelmed the empire, and Gallus was obliged to purchaſe the retreat of theſe formidable enemies by ſuffering them to retain their booty and captives, and agreeing to pay them an annual tribute. The emperor, having accompliſhed this object, returned to Rome, where he abandoned himſelf to an effeminate and voluptuous life, which rendered him contemptible and odious to his ſubjects. The public calamities were aggravated by a terrible peſtilence, which carried off numbers of people, and among them probably the young emperor, his coadjutor, Hoſtilianus. The death of the prince was, however, imputed to Gallus, and, having once given vent to their ſuſpicions, the people now imputed the calamities of the former reign to the perfidious councils of the preſent emperor. The tranquillity which the empire enjoyed during the firſt year of Gallus's adminiſtration ſerved to inflame rather than appeaſe the public diſcontent, and as ſoon as the apprehenſions of war were removed, the infamy of peace was more deeply felt; and the more ſo when it was diſcovered that they had not thereby even ſecured their repoſe, though it had been purchaſed at the expence of their honour. "The dangerous ſecret," ſays the hiſtorian, "of the wealth and weakneſs of the empire had been revealed to the world. New ſwarms of barbarians, encouraged by the ſucceſs, and not conceiving themſelves bound by the obligation of their brethren, ſpread devaſtation through the Illyrian provinces, and terror as far as the gates of Rome." The defence of the empire, abandoned by the emperor, was aſſumed by Æmilianus, governor of Pannonia and Mœſia, who attacked and vanquiſhed the barbarians, whom he purſued beyond the Danube. In the mean time Gallus was indulging himſelf in all the pleaſures which his country could afford, and was, almoſt at the ſame moment, informed of the ſucceſs obtained over his enemies, and of a revolt of the conquering army. He marched againſt his rival; but when the armies came in ſight of each other, the ſoldiers of Gallus compared the ignominious conduct of their ſovereign with the glory of his rival. A civil war was prevented by the murder of Gallus and his ſon Voluſianus. This event took place the year 253, after he had reigned about two years. Univer. Hiſt. Gibbon.

Gallus, Cæsar, nephew of Conſtantine the Great, was born about the year 326. He with his brother Julian, the former 12, and the latter about ſix years of age, were the only princes of the collateral Flavian race who were ſpared in the maſſacre that took place after the death of Conſtantine. They obtained a precarious and dependent life, from the affected pity of Conſtantius, who was ſenſible that the execution of theſe helpleſs orphans would have been eſteemed by all mankind as an unneceſſary act of the moſt deliberate cruelty. Different cities of Ionia and Bithynia were aſſigned for places of their exile and education, till they arrived at ſuch an age as to excite the jealouſy of the emperor; he then judged it prudent to ſecure the unhappy princes in the ſtrong caſtle of Macellum, near Cæſarea. The treatment which they experienced was partly ſuch as might be expected from a careful guardian, and partly ſuch as they might dread from a ſuſpicious tyrant. At length the emergencies of the ſtate compelled the emperor to inveſt Gallus, in the 25th year of his age, with the title of Cæſar, and to cement this political connection by his marriage with the princeſs Conſtantina. Antioch was now appointed for his reſidence, and he was charged with the government of the eaſtern pro-

vinces, and their defence againſt the Perſians. In this he was ſucceſsful; but either his own bad temper or that of his wife plunged him into all ſorts of extravagancies, and his adminiſtration was marked with moſt deteſtable cruelty, pride, and rapacity. When Conſtantius was appriſed of his conduct, he ſent two delegates to admoniſh him and reform his government: theſe he cauſed to be ſeized, bound, and, after other acts of ignominy, thrown into the river. He now had nothing to expect from the emperor Conſtantius but the ſevereſt puniſhment; he was therefore obliged unwillingly to comply with an invitation to viſit him at Milan. At length he ſet out with a numerous train, but ſoon found himſelf narrowly watched by the imperial miniſters. Upon his arrival at Adrianople, an order met him to leave behind him his retinue and advance with a few poſt-carriages, and, almoſt immediately after, he was arreſted by a military officer, ſtript of his enſigns of dignity, and carried away to impriſonment at Pola in Iſtria. The horror which he felt ſoon increaſed by the appearance of his enemy Euſebius, who proceeded to interrogate him concerning the adminiſtration of the Eaſt. Conſcious of his own demerits, he ſunk under the weight of ſhame and guilt, and confeſſed his criminal actions. The ſentence of death was ſpeedily ſigned, diſpatched, and executed; and the nephew of Conſtantine, with his hands pinioned, was beheaded in priſon like the vileſt malefactor. This cataſtrophe took place in the year 354, the fourth year of his reign. Univer. Hiſt. Gibbon.

GALLUS, in *Ornithology*, the *Cock*, a ſpecies of *Phaſianus*; which ſee. See alſo COCK and POULTRY.

GALLUS *Indicas*, the *Alector*, a ſpecies of *Crax*; which ſee.

GALLUS, in *Ichthyology*, a ſpecies of *Zeus*; which ſee. See alſo ABACATUAJA.—Alſo, a ſpecies of *Labrus*; which ſee.

GALLUS *Marinus*, a name given by many writers to the fiſh called in Engiſh the *doree*, and more commonly in Latin by the name of *faber*, a ſpecies of *Zeus*; which ſee.

GALLUS *Marinus* is alſo a name by which ſome have called the fiſh more frequently known by the name of the *orbis piſcis*.

GALLY, on *Ship-board*, a place in the cook-room, where the grates are put up, fires lighted, and the victuals boiled and roaſted.

GALLY, HENRY, in *Biography*, was born at Beckenham, in Kent, in the year 1606. He was deſtined for the church, and ſtudied with that view at Bene't college, Cambridge; and in 1721 he took his degree of M. A. and was ſhortly after choſen lecturer of St. Paul's, Covent-garden. About the ſame time he was preſented with a rectory in Buckinghamſhire; and in 1725 appointed domeſtic chaplain to the lord-chancellor King, who in 1728 gave him a prebend in the cathedral church of Glouceſter. He now took his degree of doctor in divinity at Cambridge; and ſoon after was diſtinguiſhed by other valuable inſtances of church preferment. In 1735 he was nominated chaplain in ordinary to his majeſty. He died in 1769, leaving behind him ſome ſingle ſermons; a tranſlation of "The Morals of Theophraſtus, with Notes, and a critical Eſſay on Characteriſtic Writing;" "The Reaſonableneſs of Church and College Fines aſſerted, &c.;" "A Diſſertation againſt pronouncing the Greek Language according to Accents;" "A ſecond Diſſertation on the ſame Subject, in anſwer to Mr. Forſter's Eſſay on the different Nature of Accent and Quantity," and other works. Gen. Biog.

GALLY-HEAD, in *Geography*, a cape on the ſouthern coaſt of Ireland, in the county of Cork. W. long. 8° 54'. N. lat. 51° 3'.

GALLY-*worm*, in *Zoology*, an inſect known by moſt writers under the name *julus*. It is a land-inſect with a long body, compoſed of a great number of rings, and furniſhed with a great number of feet. It is found very frequently in gardens, and when touched has the power of rolling itſelf up into a ball.

It has been eſteemed by ſome a valuable medicine in the jaundice, and in ſuppreſſion of urine.

This animal is very common with us among rubbiſh, and is by ſome referred to the ſcolopendræ, but improperly; for though they agree in the great number of legs, our's is a harmleſs animal, and the ſcolopendræ are miſchievous creatures, armed with dangerous forceps. It is ſuppoſed by Liſter that this creature, common with us, would, on diſtillation, yield the ſame ſort of animal acid that is procured from the ant. The reaſon of the conjecture is, that the ant and this creature both agree in emitting a ſharp and pungent ſmell on being bruiſed; but theſe are not eaſily procured in plenty enough to make the experiment, as they are not a gregarious inſect like the ant. Poſſibly ſome more of the inſects may be found, on trial, to have the ſame acid. Phil. Tranſ. N° 68.

GALNEIKIRCHEN, in *Geography*, a town of Auſtria; 5 miles N. of Steyregg.

GALOMBATZ, a town of Servia; 20 miles W.S.W. of Orſova.

GALOPINA, in *Botany*, a name concerning whoſe derivation or meaning its author Thunberg has not vouchſafed to give any account, and which no other perſon has, as yet, ventured to explain. Can it poſſibly be formed out of *Galium*, with the adjective *opina*, *thought of?* Its fructification ſtrongly ſuggeſts to the imagination that of the rough-fruited kinds of *Galium*, both in appearance and character; and Thunberg, from the compariſon which he makes between the two genera, evidently appears to have had this reſemblance in his mind. We only attempt to account for, not to juſtify, the name.—Thunb. Nov. Gen. 3. Schreb. 91. Willd. Sp. Pl. v. 1. 706. Mart. Mill. Dict. v. 2. Juſſ. 198. Claſs and order, *Tetrandria Digynia*. Nat. Ord. *Stellatæ*, Linn. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* none. *Cor.* of one petal, ſuperior, in four revolute ſegments. *Stam.* Filaments four, capillary, ſpreading, inſerted into the receptacle, deciduous; anthers oblong, erect. *Piſt.* Germen inferior, two-grained; ſtyles two, rather ſhorter than the ſtamens, ſubſequently elongated; ſtigmas ſimple. *Peric.* none. *Seeds* two, nearly globoſe, with a prickly coat.

Eſſ. Ch. Calyx none. Corolla four-cleft, ſuperior, revolute. Seeds two, prickly.

1. G. *circæoides* is the only ſpecies which Thunberg recently, in Prodr. Pl. Cap. 32, reduces to the genus *Anthoſpermum*, retaining *galopina* as a ſpecific name. This plant grows in ſeveral woods at the Cape of Good Hope, flowering in December and January, and is deſcribed as follows. "*Root* annual. *Stem* herbaceous, about two feet high, erect but weak, round, red, ſmooth, rarely alternately branched. *Leaves* oppoſite, on foot-ſtalks, oblong, acute, entire, ſmooth, an inch or rather more in length; pale at the back; accompanied by ſome ſmaller axillary leaves. *Panicle* terminal, looſely ſpreading; its ſtalks oppoſite, capillary, ſmooth, bearing pairs of oppoſite briſtle-ſhaped bracteas. *Flowers* of a browniſh green."—This account of the herbage comes very near *Anthoſpermum herbaceum*, Linn. Suppl. 440, which, having been communicated by Thunberg, we preſume is the *lanceolatum* of his *Prodromus*, p. 32, though not there cited. Having never ſeen either a ſpecimen or figure of the *Galopina*,

we

we cannot decide reſpecting its genus. Notwithſtanding Willdenow's ſuggeſtion concerning the fruit of *Anthoſpermum*, we find no generic diſtinction there, Pontedera having apparently deſcribed it wrong. See Schreb. Gen. 679. Juſſieu rightly ſays, "it ſeparates into two ſeeds." By the ſpecific name it ſhould ſeem that *Galopina* has the habit of a *Circæa*, than which nothing can be leſs like an *Anthoſpermum* or a *Galium*. S.

GALOPPE, in *Geography*, a town of France, in the department of the Lower Meuſe, and chief place of a canton in the diſtrict of Maeſtricht. The place contains 1318, and the canton 10,733 inhabitants, on a territory of 137½ kiliometres, in 11 communes.

GALOTS, the loweſt of the falls on the river St. Lawrence, in Canada; between which and the neck of land called La Galette, are an excellent country and foreſts.

GALOTS, *Iſle aux*, an iſland in the river St. Lawrence; 3 leagues beyond l'Iſle aux Chevres, in N. lat. 43° 33′.

GALOUWAH, or GHALVAH, a town of the country of Nubia, ſeated on the Nile.

GALSTA, a town of Sweden, in Weſt Gothland; 23 miles E.N.E. of Uddevalla.

GALTEES, mountains of Ireland, between the counties of Cork, Tipperary, and Limerick, ſome of which are of conſiderable height. They generally conſiſt of a coarſe pudding ſtone, being quartz pebbles of various ſizes, imbedded in a hard argillaceous cement.

GALTELLI, a town of Sardinia, formerly the ſee of a biſhop, but now decayed; 14 miles S. of Lode.

GALTEN, a ſmall iſland on the weſt ſide of the gulf of Bothnia. N. lat. 62° 12′. E. long. 17° 17′.

GALVANI, LEWIS, in *Biography*, from whoſe name the appellation of *Galvaniſm* was given to a ſuppoſed new principle in nature, which has been alſo called animal electricity, was born in 1737 at Bologna. In his early youth he ſhewed a great propenſity to religious auſterities; but being diſſuaded from entering into an order of monks, whoſe convent he frequented, he directed his attention to the ſtudy of medicine. He purſued this ſtudy under able maſters, and gained their eſteem, eſpecially that of profeſſor Galeazzi, who received him into his houſe, and gave him his daughter in marriage. In the year 1762, after having ſuſtained an inaugural theſis, "De Oſſibus," he was appointed public lecturer in the univerſity of Bologna, a reader in anatomy to the inſtitute in that city. By the excellence of his method of teaching he obtained crowded audiences, and by his reſearches and experiments in phyſiology and comparative anatomy he eſtabliſhed a high reputation throughout the ſchools of Italy. A ſingular accident is ſaid to have given birth to the diſcovery which has immortalized his name. His wife, to whom he was moſt tenderly attached, being in a declining ſtate of health, uſed a ſoup made from frogs as a reſtorative: and ſome of theſe animals, ſkinned for the purpoſe, happening to lie on a table in Galvani's laboratory, on which was placed an electrical machine, one of the aſſiſtants in his experiments, by accident, brought the point of a ſcalpel near the crural nerves of a frog lying not far from the conductor. Inſtantly the muſcles of the limb, were agitated with ſtrong convulſions. The experiment was repeated, the fact aſcertained, and a long ſeries of new experiments, ingeniouſly varied, were put in execution, by which he inveſtigated the law of nature, of which accident had thus given him a glimpſe. His firſt publication on the ſubject was printed for the inſtitute at Bologna in 1791, and entitled, "Aloyſii Galvani de viribus Electricitatis in motu Muſculari Commentarius." This work immediately excited the attention of philoſophers both in Italy and other countries, and the experiments were repeated and extended. In the hands of the celebrated Volta the agent was increaſed in power to a great extent, and, directed by the genius of Mr. Davy, it has already led to moſt important diſcoveries in regard to the compoſition of many ſubſtances, heretofore deemed elementary, and bids fair to change the whole face of chemical ſcience.

In conjunction with his phyſiological inquiries, the duties of his profeſſorſhip, and his employment as a ſurgeon and accoucheur, in which practice he was very eminent, gave full occupation to the induſtry of Galvani. In addition to a number of curious obſervations on the urinary organs, and on the organ of hearing in birds, which were publiſhed in the Memoirs of the Inſtitute of Bologna, he drew up various memoirs on profeſſional topics, which have remained inedited. He regularly held learned converſations with a few literary friends, in which new works were read and commented upon. He was a man of moſt amiable character in private life, and poſſeſſed of great ſenſibility, inſomuch that the death of his wife, in 1790, threw him into a profound melancholy. His early impreſſions on the ſubject of religion remained unimpaired; he was always punctual in practiſing its minuteſt rites; and from this cauſe, no doubt, he ſteadily refuſed to take the civic oath exacted by the new conſtitution of the Ciſ-alpine republic, and was conſequently deprived of his poſts and dignities. In a ſtate of melancholy and poverty he retired to the houſe of his brother James, a man of very reſpectable character, and fell into an extreme debility. The republican governors, probably aſhamed of their conduct towards ſuch a man, paſſed a decree for his reſtoration to his profeſſional chair and its emoluments: but it was now too late. He expired on the 5th of November 1798. Gen. Biog.

GALVANIC BATTERY. See BATTERY.

GALVANISM. This valuable and intereſting branch of ſcience has been named after its illuſtrious diſcoverer, profeſſor Galvani, late of Bologna; and compriſes all thoſe electrical phenomena ariſing from the chemical agency of certain metals with different fluids.

When we view the numerous facts which have been added to the labours of Galvani, his diſcoveries form a very ſmall part of the great maſs. If, however, we recollect that the inveſtigation began with him, and was in a great degree promoted by his own perſeverance, we muſt ever conſider him as a principal in this extenſive field of reſearch.

Some have been inclined to give the greateſt merit to ſignior Volta, who was the diſcoverer of the means of multiplying the effects, which Galvani produced by a ſimple metallic communication; but ſurely Galvani has the greateſt claim, ſince Volta only improved upon what he had diſcovered.

The whole of the hiſtory which led Galvani to this diſcovery we conſider of little importance. Suffice it to ſay, that he by accident found that common electricity had the property of producing muſcular contractions in the limbs of animals a conſiderable time after death.

Of this he more clearly convinced himſelf by aſcertaining that from whatever ſource the electricity was drawn the effect was the ſame.

In one inſtance, however, he found that by the mere agency of a metallic ſubſtance, where he had no reaſon to ſuſpect the preſence of electricity, the limbs of a recently killed frog were convulſed. After making a number of experiments, he aſcertained that the convulſions were produced only when diſſimilar metals were employed.

The experiments of Galvani were repeated by many philoſophers,

loſophers, both on the continent and in this country. None, however, added any thing new to what Galvani had diſcovered, excepting the celebrated Volta.

We have not, perhaps, in the hiſtory of any ſcience, more abundant proof of the bad effects of too early entering into theoretical ſpeculations upon new diſcoveries, than are preſented in the hiſtory of Galvaniſm.

About 40 years prior to Galvani's diſcovery, a perſon of the name of Sultzer gave an account of the following fact. If a piece of lead and a ſimilar piece of ſilver be laid together, and the edges of both be brought in contact with the tongue, a taſte is perceived ſimilar to that of vitriol of iron, at the ſame time that the metals applied ſeparately produce no effect. The obſerver of this fact does not appear to have been ſurpriſed at the effect. At that time the doctrine of vibrations was employed to explain all natural phenomena. He therefore concluded that ſome peculiar vibrations took place from the contact of the metals, which produced the peculiar ſenſation on the tongue. All the world were ſatisfied with this explanation; and thus a prominent fact had ſlept in obſcurity from the time of Sultzer to the time of Galvani.

Fortunately, however, for the philoſophical world, the age in which Galvani made his diſcovery was not an age of conjecture and fancy; for the time had arrived when experiment was deemed the only teſt of truth.

It appears that Galvani, at the time of his diſcovery, was enthuſiaſtic in the application of electrical theory to animal economy; and when he found the metallic ſubſtances were capable of exciting muſcular motion, he was confirmed in the opinion, that the inherent electricity of the animal was tranſmitted from the nerves to the muſcles by the metals employed. Had this opinion been generally received, in all probability this ſubject would not have received much improvement.

About this time, however, ſignior Volta took up the ſubject, and philoſophy has to rejoice that his mode of theorizing, although not ſtrictly true, has contributed principally to its rapid advancement. He ſet out with the idea, contrary to Galvani, that the electricity in queſtion did not belong to the animal, but to the different metals employed. Galvani, therefore, was unlikely to produce any greater effect than what two pieces of metal could effect, becauſe he believed the electricity to be in the animal. Volta was led to the diſcovery of the battery by combining a number of pieces of metal together, becauſe he was perſuaded that the electricity was in the metals and fluids employed.

He repeated the experiments of Galvani, and found that when two pieces of metal of different kinds were placed in different parts of an animal at the ſame time that the metals were brought in contact, or were connected by a metallic arc, as often as the contact was made, convulſions were obſerved. He found that the greateſt effect was produced when the metals were zinc and ſilver. When ſeveral pairs of metals were employed, having pieces of moiſt cloth between them, the effect appeared to increaſe as the number of pairs.

This important diſcovery of accumulating the effects of this ſpecies of electricity was made by Volta in 1800, and hence has been denominated the Voltaic pile. The apparatus, as firſt made by Volta, conſiſted of a certain number of pairs of zinc and ſilver plates, ſeparated from each other by pieces of wet cloth. Hence the arrangement was as follows: zinc, ſilver, wet cloth; zinc, ſilver, wet cloth, and ſo on. The ſilver plates were chiefly ſilver coins, the plates of zinc and the pieces of cloth being of the ſame ſize. He found this pile much more powerful when the pieces of cloth were moiſtened with a ſolution of common ſalt inſtead of pure water. A pile conſiſting of forty pairs of plates he found to poſſeſs the power of giving a very ſmart ſhock, ſimilar to that of a ſmall electric jar; and that this effect took place as often as a communication was made between each end of the pile, and as long as the pieces of cloth remained moiſt.

An account of this diſcovery was communicated to the Royal Society, and publiſhed in the Philoſophical Tranſactions.

We do not hear of this celebrated philoſopher making any further diſcovery after the invention of the pile, and aſcertaining the nature and extent of its effects upon animals.

The firſt experiments made upon the pile in this country appear to have been made by Meſſrs. Nicholſon and Carliſle. After obſerving the effects then already aſcribed to the piles on bringing the wires from each end of the column in contact with a drop of water, they obſerved a diſengagement of bubbles of ſome elaſtic fluid.

On cloſer examination they found the gas to be hydrogen. They then took a glaſs tube, about half an inch in diameter, into each end of which a cork was inſerted, the tube being filled with water. Through each cork was introduced a braſs wire, ſo that the ends of the wires in the glaſs were about $1\frac{3}{4}$ of an inch. The pile employed conſiſted of 36 half crowns, and as many ſimilar pieces of zinc, and wet paſteboard. The zinc end of the pile was then connected with one of the wires in the tube, and the ſilver end with the other; ſo that the circuit formed by the pile and the wires was ſeparated by the water in the tube placed between them. A ſtream of bubbles was obſerved at the end of the wire, in the tube connected with the ſilver end of the pile. No gas was diſengaged from the oppoſite wire, but it ſpeedily became tarniſhed, firſt of an orange colour, and ultimately black. The tube was then reverſed, when it was obſerved that the wire, which in the firſt experiment became tarniſhed, gave out bubbles, while that which had before given out gas, in its turn became tarniſhed.

The emiſſion of gas from the wire connected with the ſilver end of the pile was conſtant and uniform, except when a metallic circuit was formed between the ends of the pile, during which no gas whatever appeared. It was obſerved that when this metallic conductor was removed, the appearance of the gas was not immediate, ſince there was an interval of about two ſeconds between removing the wire, and the appearance of bubbles. After the proceſs had continued two hours and a half, a bulk of gas was produced equal to two-thirds of a cubic inch. This gas was mixed with an equal bulk of common air, and exploded on the application of a lighted taper.

Theſe ingenious experimenters, ſuppoſing the phenomena in queſtion to ariſe from the decompoſition of the water, thought it ſurpriſing that the hydrogen ſhould make its appearance at a diſtance of $1\frac{3}{4}$ of an inch from the point where the oxygen was diſpoſed of.

They then made the experiment with a longer tube, but no appearance of gas was obſerved at the diſtance of thirty-ſix inches. When they introduced an infuſion of litmus inſtead of pure water, they obſerved that the fluid in the vicinity of the wire connected with the zinc end of the pile became red, and hence were led to ſuppoſe that an acid had been produced. The fluid at the other wire was not changed, but gas, as uſual, was evolved.

Mr. Nicholſon aſcertained that the zinc end of the pile was in the plus ſtate of electricity, and the oppoſite end in the minus ſtate.

They next varied the experiment by inſerting into the tube

tube of water wires of platina inſtead of braſs. Under this circumſtance, both the wires gave out gas, but neither of them were tarniſhed. There appeared to be a larger volume of gas from the ſilver end than from the zinc. The apparatus was ſo arranged that the gaſes were ſeparately collected. On examination, the gas from the ſilver end was found to be hydrogen, as before, and that from the zinc end oxygen. Their proportions were found to agree with the component parts of water.

The Galvanic energy, evinced in the decompoſition of bodies, was further proſecuted by Mr. Cruickſhank of Woolwich. He employed in his experiments a pile conſiſting of from 40 to 100 pairs of plates of ſilver and zinc about $1\frac{1}{2}$ inch ſquare.

He alſo provided a glaſs tube, into each end of which a cork was inſerted, one of which was cloſely cemented ſo as to be air-tight; through each of the corks a ſilver wire was paſſed, the ends in the tube being at a certain diſtance from each other. The tube, being filled with water, was placed perpendicularly in a cup containing water, with the uncemented cork downwards.

On the wires being connected with the ends of the pile, bubbles began to appear at the wire connected with the ſilver end of the pile. At the end of the other wire bubbles alſo appeared, and at the ſame time a white cloud, which became of a darker colour, and ultimately purple or black. The gas was collected and found to conſiſt of oxygen and hydrogen in the proportion of one to three. The wire from the zinc end of the pile was much corroded and even diſſolved, which fully accounted for the deficiency of oxygen in the gaſſeous form. Mr. Cruickſhank very truly conjectured, that the cloud which became black was the murat of ſilver, the muriatic acid having been derived from ſome muriatic ſalt in the water employed.

With a view to aſcertain how far his conjecture was right, he filled the tube with diſtilled water, containing an infuſion of litmus. The appearances, with reſpect to the evolution of gas, were ſimilar to the laſt experiment; but the fluid in the vicinity of the wire coming from the zinc end of the pile, became of a red colour, while the fluid about the other gradually loſt its purple tinge, and became of a deeper blue. In ſhort, an acid appeared to be produced about the former wire, and an alkali about the latter. An infuſion of Brazil wood underwent ſimilar changes to thoſe obſerved by an acid and an alkali. In all theſe experiments a quantity of ſilver was oxyded, and when water was employed, a portion was always diſſolved, ſome of which was precipitated at the wire from the ſilver end of the pile by the alkali which was produced.

This ingenious experimenter, knowing that hydrogen in its naſcent ſtate was capable of reducing moſt metallic oxyds, filled the tube with a ſolution of acetat of lead, and found that the hydrogen all diſappeared, being employed in the reduction of the metal. By this means he alſo obtained pure oxygen gas. The ſame was obſerved when ſolutions of nitrat of ſilver and ſulphat of copper were employed. When a ſolution of muriat of ammonia was employed in the tube, the ſilver became oxydated, the oxyd combined with the muriatic acid of the ſalt, and the liquor afterwards ſmelt ſtrongly of ammonia. In a ſimilar way the muriat of ſoda and nitrat of magneſia were decompoſed.

Mr. Cruickſhank repeated the above experiments, but inſtead of ſilver wires, he inſerted into the tube wires of gold. The proportion of oxygen gas was now much greater than with the ſilver wires, the gold wire not being ſuſceptible of oxydation in the proceſs.

His next attempt was to collect the gaſes ſeparately; this he effected by a tube about ten inches long, which was bent into the form of the letter V; the wires were paſſed through corks firmly cemented into the ends of the tube, coming near to the angular point. A ſmall hole was made in the angular point of the tube, by which it was filled with water. The tube was then inverted in a cup of water, and the connection made with the other ends of the wires and the pile. By this contrivance the hydrogen gas aſcended into one leg of the tube, and the oxygen into the other. He next filled the tube, firſt employed, inſtead of water, with muriat of lime; the rapidity of the proceſs was much increaſed. The gold wire on the zinc ſide became partly diſſolved, and the fluid in its vicinity aſſumed a yellow colour. When the tube was opened, a ſtrong ſmell of aqua regia was perceived. Similar phenomena were obſerved when muriat of ſoda was employed.

Having tried the effect of Galvaniſm upon acid ſolutions of metals, he was induced to try what effect was produced upon alkaline ſolutions, for this purpoſe he added an exceſs of ammonia to a ſolution of nitrat of ſilver. He found, as might be expected, that metallic ſilver was formed at the wire from the ſilver ſide, and a dark grey ſubſtance depoſited upon the oppoſite wire, which he afterwards found to be the fulminating ſilver of Berthollet. When an ammoniacal ſolution of copper was employed, the copper became reduced upon the wire from the ſilver ſide.

In addition to the ingenious experiments made by Mr. Cruickſhank, we are indebted to him for the diſcovery of what is called the Galvanic trough. This conſiſted of a wooden box, of a width and depth agreeable to the ſize of the plates, and of convenient length for handing about. The inſide was furniſhed with grooves, paſſing acroſs the ſide and bottom, for the reception of the plates, at ſuch a diſtance, that when the plates were cemented into the grooves, the trough was divided into a number of cells about $\frac{3}{8}$ths of an inch wide; each of theſe plates were compound, two plates, one of zinc, and the other of copper or ſilver, ſoldered together. The order in which they were placed was ſuch that all the zinc ſides of the plates faced one way, and the copper ſides the other. In fact the trough was the pile placed horizontally, the cells being for the reception of a fluid, to anſwer the purpoſe of pieces of wet cloth.

This apparatus was found ſo much more convenient in making the different experiments than the pile, that it was generally adopted in this country.

The trough conſtructed by Mr. Cruickſhank conſiſted of fifty plates each of zinc and ſilver, each plate being $2\frac{1}{4}$ inches ſquare. This trough was found very powerful in giving the ſhock. A ſmall piece of ſteel wire being employed to unite the end of the trough as ſoon as the end of the ſmall wire came in contact with a piece of metal connected with the other, a vivid ſpark was obſerved with ſlight ſcintillations: a ſmall piece of phoſphorus being placed at the end of the wire, on the contact being made, inſtantly inflamed.

When the contact was made with a ſlip of leaf gold, it was deflagrated with a bright flame, of a white colour, leaving a dark ſtain upon the metal touched by the gold leaf.

Batteries of much larger ſize were ſoon conſtructed by different philoſophers, by which it was found that all the metals, reduced into thin leaves, were deflagrated with brilliant, though differently coloured flames.

It was in this ſtage of progreſs of Galvaniſm, that ſome uncertainty exiſted reſpecting the preciſe nature of the fluid to which theſe ſurpriſing effects were attributed. Although it was generally ſuppoſed the effects were purely electrical, ſome were inclined to doubt the identity of the two fluids,

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particularly ſo far as regarded the chemical effects of Galvaniſm. This matter, however, was finally ſet at reſt by a courſe of ingenious experiments made by Dr. Wollaſton.

He introduced into each of two glaſs tubes of very ſmall bore a piece of very fine gold wire. He then fuſed the glaſs at one end of each and drew it out, ſo that the glaſs compleatly enveloped the gold wire in that part. Each of theſe ends of the tube were ground off ſmooth and flat, ſo that the bare ends of the wire were preſented to the water. The ends of the tubes ſo prepared were introduced into water, and the oppoſite ends connected with an electric machine, the one with a negative conductor, the other with the poſitive conductor. The wire connected with the former gave out bubbles of hydrogen, while that connected with the latter afforded bubbles of oxygen gas. When theſe wires were immerſed in a metallic ſolution, the metal became reduced at the negative ſide. Indeed all the effects were produced by nitric acid, metal, ſulphuret, water, nitric acid, metal, and ſo on. He afterwards made a pile even without metal, by ſubſtituting charcoal in the latter arrangement inſtead of metal.

From the ſteady and perpetual action of the Galvanic battery, it was expected by phyſiologiſts that ſomething important would be effected by it as a medical agent. Theſe inquiries, however, were not attended with great ſucceſs, and in conſequence gave way to reſearches connected with the effects of Galvaniſm, as a chemical agent.

In the experiments of Cruickſhank, it may be remembered, that when the wires coming from each end of the battery terminated in a glaſs tube, ſtrong ſigns of acidity were obſerved in the vicinity of the wire from the zinc end, while the preſence of an alkali was detected around the oppoſite wire. The preſence of muriatic acid and an alkali had alſo been obſerved by other experimenters in the experiment where decompoſition of water took place. An account was publiſhed by a Mr. Peel of Cambridge in the Philoſophical Magazine, vol. xxi. p. 279; in which he aſſerts, that during the experiments in which water was decompoſed, a quantity of muriat of ſoda was formed. This experiment was repeated by many philoſophers according to Mr. Peel's deſcription, but without the production of any ſalt whatever. It was afterwards aſſerted, that no ſuch perſon as Mr. Peel could be found, and the experiment was believed to be a groſs impoſition.

In the ſame number of the Philoſophical Magazine M. Pacchioni is ſaid to have produced free oxymuriatic acid from pure diſtilled water, by the Galvanic proceſs, in ſuch quantity as to diſſolve the gold wire which it ſurrounded.

At the time theſe facts were announced, the author of this article took great pains to inveſtigate this point. After repeated experiments made in the manner deſcribed by Peel and Pacchioni, he did not in any inſtance diſcover the preſence of muriatic acid, when pure water was employed. He then tried the experiment as follows: he took a glaſs tube about a quarter of an inch in diameter, and $2\frac{1}{2}$ inches long. Upon one end was tied a piece of thin bladder, ſo as to render the tube capable of holding water. A cork was looſely introduced into the other end of the tube, through which was paſſed a platina wire, reaching within about a quarter of an inch of the bladder. The tube was then placed in a ſmall platina cup, and connected with the zinc end of the battery, while the platina wire was connected with the other end, the tube being filled with diſtilled rain water. In a very ſhort time ſtrong ſigns of acidity were obſerved in the cup, which proved to be the muriatic, and ſoda was found in the tube in ſuch quantity, that when the two portions were mixed together they became neutral.

This experiment was repeated with the ſame apparatus, even without changing the bladder more than twenty times, producing in the ſame time about the ſame quantity of acid; an alkali which had been produced by the Galvanic apparatus, this ingenious experimentaliſt produced by the common electric machine.

Another very valuable diſcovery was made by Dr. Wollaſton, by which we are enabled to aſcertain the relative Galvanic power produced by the contact of different metals in different fluids. He took a piece of zinc and a piece of ſilver, and immerſed each extremity into a veſſel containing very dilute muriatic or ſulphuric acid. The zinc was oxydated and diſſolved in the uſual manner, affording much hydrogen gas, but no action took place upon ſilver. When, however, the two extremities, out of the fluid, were brought in contact, the ſilver began to give out bubbles of hydrogen, which continued ſo long as the connection was formed, and as inſtantly ceaſed when the ends were ſeparated.

When the pieces of metal were ſimilarly placed in a ſolution of copper, the ſilver did not afford hydrogen, but the copper was precipitated in the metallic form upon the ſilver.

The apparent facility with which this ſingle combination produced the chemical effects of Galvaniſm, induced Dr. Wollaſton to try how ſmall a quantity of electricity was capable of effecting the decompoſition of water. For this purpoſe he lined the inſide of a very ſmall glaſs tube with a ſolution of gold in aqua regia, and then by heat expelled the acid, leaving a very fine film of metallic gold upon the inner ſurface. The tube being melted, converted the thin film into a very fine thread of gold. When the ends of this fine thread were expoſed to the water in the uſual manner, it was found that the mere electrical current, excited by the machine, in its paſſage from the negative to the poſitive conductor, effected the decompoſition of water. With a view to aſcertain whether the other chemical effects, ſuch as had been effected by the pile, could be produced by the electric machine, he took a card, coloured with a ſtrong infuſion of litmus, and touched it with two gold points connected with each ſide of the machine, the points being about an inch from each other; the card at the ſame time being nearly dry. Around the point connected with the poſitive ſide, the litmus became red. When, however, the points were reverſed, the negative points being applied to the reddened part, the blue colour became reſtored.

Some valuable experiments were about the ſame time made by Mr. Davy of the Royal Inſtitution, with a view to aſcertain whether two diſſimilar ſubſtances were eſſential to the production of this ſpecies of electricity, which, according to the opinion of Volta, had hitherto been ſuppoſed. This ingenious chemiſt found that a pile could be conſtructed with one metal only, provided one ſide of the plate were in contact with a fluid of deoxydating quality: the other with an oxydating liquid, and the two liquids ſeparated by liquid of a neutral nature. This he effected by the following arrangement: metal, ſulphuret of potaſh, water.

All circumſtances conſidered, ſo ſtrongly favoured the idea of the formation of the acid and the alkali, that the author of this article did not heſitate to publiſh the fact. In a converſation with an eminent chemiſt, it was hinted that the acid and alkali might be derived from the animal ſubſtance ſeparating the two fluid portions, and that the alkali might even be derived from the glaſs tube.

In order to do away the objections of the animal ſubſtance and the glaſs tube, he procured a tube about three inches long and half an inch in diameter, made of tobacco-pipe clay. This tube being filled with diſtilled water, and placed

placed in a platina cup connected with one end of the battery, a platina wire was placed in the tube, and connected with the other end. The action took place very rapidly, and the acid and alkali formed as uſual. An account of this experiment was publiſhed in Nicholſon's Journal for Auguſt 1806.

Theſe experiments are not noticed by any philoſopher till they were atteſted by Mr. Davy, in the very valuable paper entitled "Some Chemical Agencies of Electricity," which was read by him to the Royal Society, Nov. 20, 1806, and publiſhed in their Tranſactions for 1807, part i. vol. 17. Supplement.

Mr. Davy, after alluding to the experiments of Peel and Pacchioni, mentions the experiment, above deſcribed, with the clay tube. He does not object to the reſults of the experiment, but thinks the concluſions are objectional. Firſt, becauſe the alkali was only teſted by turmeric paper, which would have aſſumed the ſame appearance with lime; and, ſecondly, that the clay might even contain potaſh. The argument of Mr. Davy may very ſufficiently account for the alkaline appearances, but he does not even hint how the muriatic acid was formed.

Mr. Davy procured two agate cups, each having the capacity of about a quarter of a cubic inch. Theſe cups were boiled for ſome hours in diſtilled water. The cups were then filled with diſtilled water, and connected together with a piece of very white amianthus, previouſly moiſtened. A piece of platina wire was introduced into each of the cups, and connected with a battery conſiſting of 150 pairs of plates four inches ſquare, and charged with a ſolution of alum. After the proceſs had gone on 48 hours, the water in the cups was examined, when it was found that the water of one of them contained ſoda, and the other muriatic acid.

Mr. Davy repeated the experiment in the ſame cups ſeveral times, and found that acid and alkali diminiſhed in every experiment. By continuing the proceſs for three days, he found very little alkali; but in the other tube was an abundance of acid, which proved to be the nitric acid.

After theſe reſults, he concluded that the agate tubes contained ſome ſubſtance capable of affording the acid and alkali. But independent of the tubes, he ſuppoſed that the alkali was derived from ſome other ſource, ſince it continued to appear to the laſt in quantities ſufficiently diſtinguiſhable after every precaution had been obſerved.

Mr. Davy now began to ſuſpect the purity of the water, although it had been diſtilled. It appeared pure by the teſts of nitrat of ſilver and muriat of barytes; but as potaſh and ſoda are capable of riſing by rapid diſtillation, and as the water was from the New River, which contains animal and vegetable matter, he thought that potaſh or ſoda might be furniſhed by the neutral ſalts they contained.

To do away the objection of the agate tubes, he employed two cones of pure gold, each holding about 25 grains of water. The cones being filled with diſtilled water, and connected with the ſame piece of amianthus, which was employed for the agate tubes, they were made to communicate with a battery of 100 pairs of copper and zinc plates of ſix inches ſquare. In ten minutes the water in the negative cone, or that connected with the copper ſide of the battery, gave ſigns of an alkali. In 14 hours the acid produced in the other cone was very conſiderable, but the alkali did not appear greater than in the firſt trial. The alkali was a fixed one, and the acid appeared to be nitrous. This experiment was repeated, and carried on for three days, but the alkali did not increaſe.

Mr. Davy was now of opinion, that the water contained ſome ſubſtance capable of furniſhing the ſmall and limited portion of alkali in this experiment. And to be more ſatisfied of this, he evaporated a quart of the diſtilled water at the temperature of 140° Fahrenheit in a ſilver ſtill. The ſolid matter was equal to $\frac{7}{10}$ths of a grain. He did not enter into a particular analyſis of this reſiduum, but believed it to conſiſt of nitrate of ſoda and nitrate of lead, ſuppoſing the latter to have been derived from the worm of the common ſtill. On filling the gold cones with the water uſed in the firſt experiments, the maximum of effect was ſoon produced; but upon introducing ſome of the reſidual matter obtained from the water, in leſs than two minutes the effects were evident, and in five minutes it changed turmeric paper to a deep brown.

By ſubmitting the water to a ſecond ſlow diſtillation it was obtained ſo pure, that when acted upon in the cones by the battery for two hours, only ſlight ſigns of the alkali were evinced, which after heating ſtrongly for a few minutes diſappeared; a proof that the alkali was ammonia. Hence Mr. Davy concludes that the fixed alkali is not formed in the experiment, but afforded by the water or other ſubſtance employed.

This indefatigable experimenter made a ſeries of experiments, in which he employed cups of different ſubſtances, with the pure water. Tubes of wax afforded potaſh, ſoda on one ſide, and ſulphuric and muriatic acids on the other. With tubes of reſin, the alkaline matter was principally potaſh. Carrara marble afforded lime and a fixed alkali, but the latter decreaſed in every experiment, till nothing but lime was produced. Mr. Davy uſed many other mineral ſubſtances, from moſt of which he obtained more or leſs fixed alkali.

He had before ſuppoſed, that when glaſs veſſels were employed, the fixed alkali was derived from the glaſs. To ſtrengthen this conjecture, he arranged the apparatus with the gold cones, as before, with pure water, and after a quarter of an hour no change was produced. On introducing into the cones a bit of glaſs, however, the fluid in the negative cone became highly ſenſible to turmeric paper. Mr. Davy here obſerves, that he had in every experiment a portion of nitric acid formed, and in quantity proportionate to the length of time the proceſs was continued. It appears alſo that ammonia was produced at the ſame time, but its limit was ſoon attained.

Suppoſing theſe reſults to ariſe from the nitrogen of the common air exiſting in the water, he repeated the experiments under the receiver of an air pump, exhauſted to $\frac{1}{64}$ of an atmoſphere. In 18 hours no ſigns of alkali were obſerved, but the acid in the oppoſite cone gave a perceptible red tinge to litmus paper. On repeating the experiment in an atmoſphere of hydrogen gas, he did not perceive any ſigns of acid or alkali. Hence he concluded, that the nitrous acid and the ammonia had owed their formation to the water, and the nitrogen of the atmoſpheric air.

The numerous important facts brought to light by the above inveſtigation induced Mr. Davy to extend his enquiries, particularly ſo far as related to the transference of the elements of compound bodies by the Galvanic proceſs.

He took two cups of compact ſulphat of lime, into which he introduced pure water, and connected them, as in the above experiments, with amianthus previouſly moiſtened: into each cup was introduced a platina wire connected with a battery of 100 pairs of ſix-inch plates. In five minutes the liquid in the poſitive cup, or that connected with the zinc end, became acidulous, and the other contained lime. Two ſimilar cups of ſulphat of ſtrontian afforded a ſimilar reſult, the earth being found pure in the negative cup, and

the acid in the poſitive. In a ſimilar manner veſſels of fluat of lime afforded lime and fluoric acid.

On trying the ſame experiment with ſulphat of barytes, he found that the acid and baſe were more obſtinate in giving way to the electrical power. By uſing a greater power, however, in four days he obtained portions of the earth and acid.

He then made a number of experiments with different mineral ſubſtances, which by analyſis afforded alkali or acid. His firſt experiment was upon the fine grained baſalt, from Portruſh, which by analyſis afforded ſoda, muriatic acid, and lime. Two cups were expoſed as in the laſt experiment. In ten hours oxy-muriatic was found in the poſitive cup, and ſoda and lime in the other. The mineral called lapidolite gave potaſh in this way; and a piece of vitreous lava from Ætna gave lime, potaſh, and ſoda.

From the reſults produced upon inſoluble bodies, it was natural to expect that ſimilar decompoſitions and transfers would take place with the ſoluble ſaline compounds. The ſubſtances to be operated upon were diſſolved in water, and introduced into the two agate tubes mentioned in the firſt experiments, and the connection formed between them by moiſtened amianthus. The baſe of the ſalt was transferred to the negative cup, and the acid to the poſitive. The ſalts which Mr. Davy employed, and which underwent this change, were ſulphats of potaſh, ſoda, and ammonia, nitrats of potaſh and barytes, phoſphat of ſoda, the ſuccinat, oxalat, and benzoat of ammonia, and a ſolution of alum.

The muriats, when ſubjected to this proceſs, afford oxymuriatic acid. This was occaſioned by the oxygen of the water, which was decompoſed at the ſame time.

When a ſolution of a number of compatible ſalts was expoſed in the agate cups, all their baſes were transferred together to one ſide, and the acids collectively to the other, without any regard to their order of affinity.

The decompoſition appears to have been more compleat in the metallic ſalts, ſince the oxyd of the metal is alſo decompoſed; the oxygen and the acid arranging themſelves around the poſitive wire, and the metal in cryſtals adhering to the negative wire. Mr. Davy aſcertained, that in theſe experiments the decompoſition was capable of being compleat. In an experiment made with ſulphat of potaſh no acid was found in the alkaline cup, nor any trace of alkali in the acid one.

Here Mr. Davy alludes to an experiment made by Mr. Gautherot, Annales de Chimie, vol. xxxix. page 203, in which he obſerved that the oxyd of zinc was transferred to the negative wire. Another fact is alſo mentioned by M. M. Hiſinger and Berzelius, in the ſame, vol. li. page 171. They had in one leg of a ſyphon a ſolution of muriat of zinc, and in the other diſtilled water, the former leg being connected with the poſitive ſide of the battery, and the latter with the negative. The diſtilled water, after a certain time, they found to contain lime.

Mr. Davy took a cup of agate and another of ſulphat of lime, into which he introduced diſtilled water, and connected them as in the former experiments, the agate cup being made negative. In four hours the diſtilled water in the agate cup contained lime, and the other had an exceſs of ſulphuric acid. The order was now reverſed, when it was found, in a ſimilar length of time, that the agate cup contained ſulphuric acid, and the other an exceſs of lime.

In order to aſcertain whether it was eſſential that the wires from the battery ſhould be in abſolute contact with the ſaline ſolution, he filled two glaſs tubes with diſtilled water, and placed between a third veſſel, containing a ſolution of muriat of ſoda, the ſurface of the latter fluid being lower than thoſe of the water in the tubes. The wires were brought into the tubes containing pure water, and in ſixteen hours the poſitive tube became ſtrongly acid, and the other very alkaline, with muriatic acid and ſoda.

Finding the acid and alkali to be really tranſmitted from the middle veſſel, through the pieces of amianthus, to the wires in the tubes, he filled one of the tubes with a ſolution of ſulphat of potaſh, and the other with diſtilled water: the middle veſſel contained diſtilled water tinged with litmus. Some ſlips of moiſtened litmus paper were placed above and below the amianthus in the circuit. The connection being formed, making the ſaline tube negative, the redneſs began to appear on the poſitive ſide of the arrangement, and gradually diffuſed itſelf to the middl of the intermediate veſſel; but no change took place on the negative ſide, although the acid had been all the while paſſing from the negative to the poſitive ſide. The order was now reverſed, making the ſaline ſolution to occupy the poſitive ſide; but inſtead of litmus, turmeric was employed in the intermediate veſſel. The alkali exhibited the ſame myſterious appearance in its paſſage from the poſitive to the negative ſide. The turmeric became brown on the negative ſide only, while the poſitive ſide of the intermediate veſſel underwent no change.

In another experiment two glaſs tubes were filled with a ſolution of muriat of ſoda, and the intermediate veſſel with ſulphat of ſilver. Turmeric paper was placed on the poſitive ſide, and that of litmus on the negative: as ſoon as a communication was formed, ſoda began to appear in the negative tube, and oxymuriatic acid in the poſitive tube. In the intermediate veſſel the muriatic acid marked its effects on the poſitive ſide by a denſe precipitate, and the ſoda was diſtinguiſhed on the other ſide by producing a lighter precipitate.

In the firſt of the two laſt experiments, it appears that the acid paſſed through the litmus, and the alkali through the turmeric, without producing any viſible effect upon them; and in the ſecond the muriatic acid had paſſed through ſulphat of ſilver without producing any precipitate, which tends to prove that the power by which the transfer is effected exceeds the chemical affinity of the bodies, which ſhould on this occaſion have been exerted. Several ſtriking experiments were made to clear up theſe apparent anomalies. Into one of the tubes uſed in the laſt experiment was put a ſolution of ſulphat of pot-aſh, into the other pure water, and into the intermediate veſſel a weak ſolution of ammonia. The ſaline ſolution being placed on the negative ſide, and the connection formed, the acid ſoon became viſible in the poſitive tube, ſo that it appears the power of transfer was greater than the affinity of ammonia for ſulphuric acid. This experiment was varied by uſing ſtrong and even ſaturated ſolutions of potaſh and lime with ſimilar reſults. In other experiments alkalies and earths were tranſmitted through acid ſolutions in the intermediate veſſel. It does not appear, however, that this power is adequate to the force of combination in all inſtances. Mr. Davy found that barytes did not paſs through ſulphuric acid without producing ſome ſulphat of barytes, and the ſame took place when the acid was attempted to be paſſed through a ſolution of barytes; ſimilar effects took place with ſtrontian and ſulphuric acid.

It was obſerved that the metallic oxyds were transferred with more difficulty than the alkalies and earths.

In an experiment in which the green ſulphat of iron was placed in the poſitive tube, pure water in the negative, and a ſolution of muriatic acid intermediate, in ten hours the green oxyd of iron began to appear upon the connecting

amianthus, and in three days it was in the negative tube. Similar refults were obferved with folutions of copper, lead, and tin.

When Mr. Davy made various animal and vegetable fubftances the connecting media inftead of amianthus, he found that the elements of the faline bodies which they contained were transferred. Thus he found that a leaf-ftalk of the polyanthus afforded nitric acid in the pofitive tube, and foda in the negative; and a piece of mufcular flefh afforded muriatic acid and foda.

The refult of thefe experiments appears to fhew, that the decompofition of bodies employed arifes from their different elements being attracted to the wires or other metallic fubftances connected with the ends of the Galvanic battery. When faline bodies are decompofed, the acid is attracted to the pofitive wire, and the bafe to the negative. If acids or other oxyds be fubjected to the fame procefs, the oxygen is attracted to the pofitive fide of the battery, and the inflammable bafe to the negative.

Mr. Davy fucceeded in producing fimilar refults of tranfference by common electricity. In the electrical current the fame arrangements were obferved with refpect to the transference. The acids and oxygen wire attracted that connected with the conductor, and which is pofitive; while the inflammable bafes and the bafes of falts were attracted to the fide connected with the negative conductor.

It had already been difcovered by Bennet and Volta that when certain bodies were brought in contact, a difturbance of electricity took place, by one of the bodies giving fome of its electricity to the other, and thus rendering one of them redundant or pofitive, and the other deficient or negative. Bennet found that when two flat polifhed plates, one of zinc, and the other of copper, were brought in contact face to face, the zinc received a portion of electricity from the copper. The plates were provided with infulating handles, and when they were feparated as quick as poffible, the relative ftates of electricity acquired by contact were rendered apparent by the fenfible gold leaf electrometer, invented by the fame ingenious philofopher.

It was afterwards difcovered by Volta that the difturbance of electricity took place from the contact of different fluids with metals, and it was on this principle that he endeavoured to explain the energy of the pile which he invented, and the effects produced in the experiments of Galvani.

Mr. Davy, with much ingenuity and great induftry, has refumed this enquiry, by obferving the electrical changes arifing from the contact of many different bodies.

He found that when an alkali was in contact with a metal, the latter gave fome of its electricity to the former. But an acid in a fimilar fituation gave its electricity to the metal. In the firft inftance the metal became negative, and the alkali pofitive; but in the latter the metal was pofitive, and the acid negative. It was on this principle that Mr. Davy conftructed a pile with one metal only, by placing an alkali, or what is better, a fulphuret of an alkali on one fide of the plate, an acid on the other fide, and water between each ftratum of alkaliand acid. By this means one fide of the plate was negative, and the other fide pofitive, fimilar to a compound plate of different metals.

Mi Davy made an attempt to eftablifh the relative quantities of electricity produced by the contact; but he did not fucceed with any other bodies than fuch as were perfectly dry. Thofe, however, which he did make were very conclufive, and tended much to fubftantiate the theory he had projected.

The folid and dry acids, either in powder or in cryftals, when brought into contact with metals, become themfelves negative, by giving their electricity to the metal, which, in confequence, become pofitive: fuch of the earths, and fuch of the alkalies as could be obtained dry, were tried upon metal. Lime, ftrontian, magnefia, and foda, by contact with metal, became pofitive, and the metal negative: fulphur, by contact with metal, becomes pofitive, and the metal the contrary. Mr. Davy found that fulphurated hydrogen became pofitive, and that the oxymuriatic acid became more negative than the common muriatic acid; and hence infers, that the contact of oxygen and hydrogen muft render the hydrogen pofitive, and the oxygen negative.

It was fair to conclude, that when bodies undergo different changes, with refpect to the fame body, they muft produce fome effect on each other. He found dry oxalic acid become negative with lime, which it rendered pofitive: the fame muft neceffarily follow between the acids and alkalies.

We may infer from this theory, that any two bodies are oppofed to each other in their electrical energies, in proportion as one becomes negative and the other pofitive, when they are brought in contact; and that, if we are to reafon from the common phenomena of electrical attraction and repulfion, we may expect that thofe bodies, which produce the greateft change upon each other, will have the ftrongeft attraction for each other. If the bodies, by contact, produce no change, we may infer that they will have no attraction for each other; but that if the pofitive or negative parts of two bodies, by contact, be prefented to one in the fame ftate, they muft abfolutely repel each other. All this has been fhewn to be the cafe in the experiments of decompofition of transfer.

Mr. Davy fuppofes, with much plaufibility, that the relative ftates of the electricity of bodies may be the caufe of chemical affinity, and of compofition and decompofition. It appears that bodies which have a ftrong affinity for oxygen, are, in their electrical ftates, ftrongly oppofed to that body. It alfo happens that acids, which combine with earths, alkalies, and metallic oxyds, are in a contrary ftate to the latter bodies. Another ftrong proof of the truth of this doctrine is, that the chemical affinity of bodies is altered by altering their electrical ftates. Thus, platina precipitates copper from its folutions when the platina is rendered negative; becaufe the copper in that fituation becomes more negative, and, in confequence, has a lefs affinity for oxygen. If, in the Galvanic circuit, zinc be made negative, it does not combine with oxygen, even if an acid be prefent. On the contrary, filver, being in a fituation where it becomes pofitive, acquires the power of decompofing water.

From thefe facts, and their conclufions, Mr. Davy has pointed out a path, which has already led to very important difcoveries. The elements of every compound, it is fair to conclude, are in different ftates of electricity, fo long as they exift in combination. If, therefore, by the artificial application of electrified furfaces, the elements of the compound are more ftrongly and truly attracted by fuch furfaces than they attract each other, a decompofition of the body muft be effected. And fince this artificial power can be accumulated to any extent, we may, with great confidence, expect that the ultimate elements of bodies may fome time be known.

Mr. Davy did not lofe much time in applying the principles he had already laid down. His firft experiment was upon potafh, a fubftance long fufpected by many chemifts to be a compound. His firft trial was upon a folution of alkali, but without fuccefs: he then tried it in a ftate of igneous fufion. The potafh was fufed in a platina fpoon, and was connected with one fide of a powerful battery, while a pla-

tina wire was made to touch the ignited alkali. A violent action took place; a brilliant light was obſerved on the negative ſide, as if ſome combuſtible matter were produced, and burned as it was evolved; when the ſpoon was negative, acriform globules were ſeen to riſe to the ſurface, and inflame on contact with air. He then made uſe of potaſh, ſlightly moiſtened by expoſure to the air: the potaſh was placed upon a plate of platina connected with the negative ſide of the battery, and a platina wire from the other end of the battery was brought in contact with the upper ſurface of the potaſh: a violent effervеſcence took place about the wire at the upper ſurface; no gas appeared on the under ſurface; but ſmall globules, having high metallic luſtre, and the general appearance of quickſilver, began to appear. Some of theſe globules burnt in the air with exploſion, and bright flame; others remained, becoming tarniſhed, and ultimately covered with a white film. Theſe metallic globules proved to be the ſubſtance for which Mr. Davy was in ſearch, and which appears to be the baſe of the alkali; ſo that it appears potaſh conſiſts of oxygen, united to a peculiar inflammable baſe. This decompoſition was, therefore, effected in conſequence of the oxygen of the alkali being attracted to the poſitive wire, and the inflammable baſe to the negative ſide. (See POTASH and ALKALI, and Phil. Tranſ. for 1808, part i. page 1.) By a ſimilar proceſs, Mr. Davy decompoſed ſoda, ammonia, and ſeveral of the earths; reſolving them, into oxygen and peculiar inflammable baſes.

An extenſive field is here opened for chemical reſearch, too vaſt for human conception, by the introduction of this powerful agent. More diſcoveries have been made in one year, than, perhaps, any one century can boaſt.

Having given an hiſtorical account of the moſt prominent facts of Galvaniſm, chiefly drawn from the detailed eſſays of the diſcoverers, we ſhall now proceed to the inveſtigation of the beſt means of exciting Galvanic energy, and the conſtruction of Galvanic apparatus. This part, however, we ſhall preface, with detailing ſome preliminary experiments, calculated to throw light upon the principles of this intricate ſubject, as well as to point out the beſt means of examining thoſe bodies fitted for the production of Galvaniſm. Bennet was the firſt who diſcovered that a certain number of bodies, when brought into contact, cauſed a diſturbance in their latent electricities: for inſtance, if a plate of copper be brought in contact with a plate of zinc, a portion of electricity is tranſmitted from the copper to the zinc, rendering the latter poſitive and the former negative. If the plates have inſulated handles, they may be ſeparated, and their reſpective ſtates may be ſhewn by Bennet's electrometer. When it was diſcovered that ſilver and zinc, or copper and zinc, were the beſt exciters of Galvaniſm, Volta, the diſcoverer of the pile, took advantage of the above fact to explain the phenomena. In the arrangement of the pile, which conſiſted of a certain number of pairs of plates of ſilver and zinc, with plates of wet cloths interpoſed between them, he conſiders the electricity generated by the contact as conſtituting the whole of the energy of this apparatus, the fluid of the wet cloths being a mere conducting medium from one pair of plates to another. Volta, however, himſelf acknowledges, that when he made uſe of water as the connecting medium, he had the ſame quantity of electricity indicated by the electrometer, as when the interpoſed fluid contained common ſalt, although the ſhock, in the firſt inſtance, was ſcarcely perceptible, while, in the latter, it was very ſevere.

Mr. De Luc has lately publiſhed an account in Nicholſon's Journal, which is to be continued, in which he has proved that the quantity of electricity indicated by the electrometer formed almoſt an imperceptible part of the Galvanic effect. Mr. Davy, in his account of the chemical agencies of electricity, already given, has endeavoured to account for the Galvanic effect on the principle of contact, without allowing any of the effect to the chemical actions of the ſubſtances employed. He conſiders the firſt effect to be produced by the contact of the diſſimilar metals, the zinc acquiring exceſs, and the copper becoming deficient. The elements of the water employed, he ſuppoſes, are in the ſame unequal ſtate, by being in combination; the oxygen being deficient or negative, and the hydrogen redundant or poſitive If a neutral ſalt be employed he alſo ſuppoſes that the acid and alkali are differently diſpoſed in their electrical tendencies by the former being negative, and the latter poſitive. Accordingly, therefore, in ſuch an arrangement, there would be the united electrical energy of the acid, of the ſalt, the oxygen of the water, and the copper plate, all of which are negative. Theſe would be oppoſed to the poſitive powers of the baſe of the ſalt, the hydrogen of the water, and the zinc plate. He ſuppoſes that during the action of a battery conſiſting of the above arrangement, the chemical action, ſo far from being the cauſe of the electrical energy, may be conſidered as the means of reſtoring the equilibrium between the bodies in different ſtates. The oxygen deſerts the hydrogen to combine with the zinc, forming oxyd of zinc, thus deſtroying the negative ſtate of a quantity of oxygen, and the poſitive ſtate of a quantity of zinc. The hydrogen repairs to the copper, which is in a contrary ſtate to itſelf. This contact leſſens the negative ſtate of the former, and the poſitive ſtate of the latter. In this ſtate of the proceſs the baſe of the ſalt and the oxyd of zinc are attracted to the copper ſurface, while the acid of the ſalt is attracted to the zinc plate; the former tending to annihilate the negative ſtate of the copper, and the latter the poſitive ſtate of the zinc plate.

If an acid be preſent in the fluid inſtead of a ſalt, which is capable of decompoſition, its elements are in contrary ſtates, and have an effect ſimilar to the water; but if the acid is not decompoſed, it can only contribute to the proceſs by diſſolving the zinc. In the electrical experiments of Mr. Davy, he has ſhewn that acids and oxygen become negative by being brought in contact with alkalies, earths, and inflammable matter, in the ſame way that certain metals alter their ſtates. In the experiments of Bennet and Volta we are diſpoſed to place the greateſt confidence. At the ſame time, however, we cannot believe that ſo ſmall a quantity of electricity can be capable of producing the powerful effects produced by Galvaniſm. We ſhall detail ſome experiments which will prove that the Galvanic proceſs depends in a great meaſure upon the chemical agents employed, and that in no inſtance is Galvaniſm produced without water. A metallic ſurface is capable of oxydation, and another metallic ſurface is kept free from oxydation, at the ſame time when the two metallic ſurfaces are unconnected. The electricity produced by the contact of bodies appears to be quite diſtinct from that produced by the chemical proceſs, and may be aſcertained by the electrometer. In a Galvanic ſeries, compoſed of fifty pairs of plates of zinc and copper, with a fluid medium of pure water, the electricity, as meaſured by the electrometer, will be juſt the ſame as if a quantity of muriatic acid were added to the water. Yet in the firſt inſtance no perceptible Galvanic effect will be perceived, while in the latter a very ſevere ſhock may be felt.

According to Mr. Davy's doctrine the electrical energies are the ſame in both inſtances, ſince the acid is not decompoſed, and of courſe cannot contribute to the effect. If it therefore does no more than diſſolve the oxyd of zinc, it can-

only

only be ſaid to keep up the original energy, and therefore the firſt effect of both muſt be the ſame, which is contrary to the fact. Agreeable to this hypotheſis, a ſolution of a neutral ſalt ought to produce the greateſt poſſible Galvanic effect from the additional agency of the oppoſite electrical ſtates of the acid and alkali. Mr. Davy aſſerts that in the firſt inſtance the effect is greater, but that in a little time the alkali gets to the copper plate, and tends to deſtroy its negative ſtate, and in conſequence the energy becomes much weakened or deſtroyed. As a proof of this, he obſerves, that if the trough be ſhaken, ſo as to mix the different ſubſtances in the cells, the power becomes much revived. Several aſſertions here are not ſupported by fact. In the firſt place no ſaline ſolution, even in the firſt beginning, produces ſo great an effect as a free acid, diluted with water, particularly the nitric acid.

Mr. Davy would account for the great effect of the nitric acid from the acid undergoing decompoſition. From ſimilar reaſonings nitrat of potaſh ſhould produce the greateſt effect poſſible, becauſe both the ſalt and the acid are decompoſed. This, however, does not agree with experience, ſince muriat of ſoda produces a greater effect than nitrat of potaſh, although the latter, conſiſtent with Mr. Davy's hypotheſis, ſhould produce a greater effect than nitric acid, by the additional electrical power of the acid and the alkali.

With reſpect to the permanence of the effect, it will be found in practice that acids which produce the greateſt effect in the firſt inſtance are the leaſt permanent, and that ſaline ſolutions, which act upon zinc very ſlowly, are found to be more permanent. Thoſe ſalts will be found moſt efficacious which form triple ſalts with zinc. Hence the reaſon why muriat of ſoda acts more powerfully than nitrat of potaſh, and why muriat of ammonia is ſtill more energetic than muriat of ſoda, ſince it oxydates, and combines with metals with very great facility. There are other facts which militate ſtrongly againſt Mr. Davy's theory: the free alkalies are found to have a greater Galvanic effect than the neutral ſalts. A ſolution of cauſtic of potaſh is much more powerful than any ſalts formed with that alkali. This may be accounted for from the facility with which alkalies diſſolve moſt oxyds of metals. Independent of the proofs already brought forward, we ſhall introduce ſome experiments which cannot fail to demonſtrate that the phenomena of Galvaniſm do not depend upon the ſlight electric effects produced by contact, but upon the chemical action of the bodies employed. Mr. Davy, in the paper to which we have before alluded, obſerves, that if electricity were produced during chemical changes, it ought to be appreciated by the electrometer; but till we are better acquainted with the connection between electricity and caloric, the latter of which is always diſturbed during chemical change, nothing concluſive can be drawn from ſuch argument. Mr. Davy mentions another experiment to prove that the Galvanic effect is not the reſult of the chemical effect. He ſtates that in the Galvanic combination of zinc, copper, and nitric acid, the zinc is poſitive. But on a combination of zinc, nitric acid, and water, the ſide of the zinc next the acid is negative. If, he obſerves, the Galvanic effect was dependent on the chemical action, the zinc would be poſitive in both inſtances. That the zinc in contact with the nitric acid is negative, Mr. Davy's own experiments and reaſoning contradict. The very contact of the acid, by his own hypotheſis, ought to make the zinc poſitive, which would alſo tend to increaſe its affinity for oxygen. Perhaps in all caſes in which water is decompoſed by the agency of a metal and an acid, the advantage of the preſence of the acid may in this way be accounted for.

Galvanic Combinations.—No ſubſtance can poſſibly enter into any Galvanic combination except it be a good conductor of electricity. The moſt common and ſimple Galvanic combination conſiſts of two ſurfaces of diſſimilar metals and a fluid containing oxygen placed between them. One of the metals ſhould be ſuſceptible of oxydation by the fluid, and the other leſs ſuſceptible of oxydation by the fluid. A communication made between the two metallic ſurfaces, either by bringing the metals together, or by connecting them by a metallic ſubſtance, will ſhew the effect of the combination by ſuch teſts as will hereafter be mentioned. A Galvanic combination, as Mr. Davy has ſhewn, may be formed of one metal only, by its being ſo ſituated that one part of it may undergo oxydation in a greater degree than the other. This Mr. Davy effected by placing dilute nitrous acid on one ſide of the metal and ſulphuret of potaſh on the other, having a ſtratum of water between the fluids. Well-burnt charcoal and plumbago are found to have the ſame effect with metals in Galvanic combinations. The moſt ſenſible teſt of any Galvanic combination is the muſcles of a recently killed frog: if the limbs are placed in the circuit, which connects the two metallic ſurfaces, at the ſame time the metals touch one another, the muſcles are violently convulſed. If the metals be in any degree diſſimilar between which the limbs are placed, at the ſame time that the part is moiſtened with water, convulſions will be perceived as often as a metallic communication is made between the diſſimilar metals. If the tongue be made to touch the two metals which form a Galvanic combination, at the ſame time that the metals are brought in contact, a taſte will be perceived, not much unlike that of an acid: and if the metals be very diſſimilar, ſuch for inſtance as ſilver and zinc, at the moment of contact, a flaſh of light will be perceived ſimilar to that produced by a blow about the eye. In ſpeaking of Galvanic combinations in future, we ſhall call that metallic ſurface which is undergoing oxydation the poſitive ſurface; the other metal, which muſt be leſs ſuſceptible of oxydation, we ſhall denominate the negative ſurface; and the oxydating medium, the interpoſed fluid.

In aſcertaining the power of any Galvanic combination we ſhall make uſe of a teſt different from either of thoſe above-mentioned, ſince it will be found more convenient and regular. It was diſcovered by Dr. Wollaſton, as we have before ſtated, that in every Galvanic combination, the negative ſurface, ſo long as the circuit is complete, is obſerved to give out bubbles of gas, which is found to be hydrogen, but that this gas ceaſes to be evolved as ſoon as the metals are ſeparated. The moſt convenient way of making theſe experiments, is with wires of the metals: the fluid in which the wires are immerſed ſhould conſiſt of water, containing $\frac{1}{10}$th or $\frac{1}{12}$ of muriatic or ſulphuric acid. The wires are firſt put into the fluid, and kept ſeparate. The zinc will be violently acted upon by decompoſition of the water, but the leſſer oxydable wire, if of platina, gold, ſilver, copper, or braſs, will not exhibit any change. If, however, the ends of the wires out of the liquid be brought into contact, an abundance of gas will be evolved from the negative wire. Zinc, with platina, gold, ſilver, and palladium, affords the greateſt quantity of hydrogen from the negative wire during contact. Zinc with copper the next. Zinc with iron very little leſs than zinc with copper. By gueſſing at the quantity of gas given out from the negative ſurface in different combinations, we have in the following table ſome idea of their relative power. The maximum is made 10, and a quantity of bubbles, which could juſt be deſcried by a magnifying glaſs, is called 1.

Poſitive

Positive Metal.	Negative Metal.	Interposed Fluid.	Effect produced.
Zinc.	Platina.	Dilute sulphurie acid.	10
Ditto.	Gold.	Ditto.	10
Ditto.	Silver.	Ditto.	10
Ditto.	Palladium.	Ditto.	10
Ditto.	Copper.	Ditto.	8
Ditto.	Iron.	Ditto.	7
Iron.	Platina.	Ditto.	3
Ditto.	Ditto.	Dilute Nitric Acid.	3
Ditto.	Copper.	Dilute sulphuric acid.	None.
Tin.	Platina.	Ditto.	4
Ditto.	Copper.	Ditto.	None.
Ditto.	Iron.	Solution of Caustic Potash.	1
Ditto.	Copper.	Ditto.	½
Ditto.	Platina.	Ditto.	2
Zinc.	Ditto.	Ditto.	3
Ditto.	Copper.	Ditto.	2
Ditto.	Antimony.	Dilute sulphuric acid.	2
Ditto.	Bismuth.	Ditto.	4
Ditto.	Platina.	Nitric acid.	10
Ditto.	Copper.	Ditto.	8
Tin.	Platina.	Ditto.	3
Copper.	Ditto.	Ditto.	1
Silver.	Ditto.	Ditto.	¾

We are under a necessity of referring the further account of this subject to the article VOLTAISM.

GALVEAS, in *Geography*, a town of Portugal, in the province of Alentejo; 24 miles W.N.W. of Estremoz.

GALVETTES, in *Navigation*, ships of war in the East Indies, on the Mahratta coast, which are constructed for carrying four, and sometimes six guns. Their chief employment is to scour the coasts of a class of pirates, named "Chamchas," who sally from the bottom of the gulf of Guzurat, and commit depredations upon trading vessels which they happen to surprise in those seas..

GALVEZIA, in *Botany*, so named by the unfortunate Dombey, in honour of the Spanish minister for Indian affairs Don Galvez, who was concerned in his appointment, and who alone of all those who had it subsequently in their power to do him justice, testified any inclination to relieve his distress; by offering him a sum of money, which however was not accepted. See DOMBEY. Juss. 119. Class and order, *Didynamia Angiospermia*. Nat. Ord. *Personatæ*, Linn. *Scrophulariæ*, Juss.

Gen. Ch. "*Cal.* Perianth small, inferior, in five segments. *Cor.* tubular, somewhat swelling at the base; limb of two lips, the upper two-lobed, the lower deeply three-cleft. *Stam.* not prominent beyond the corolla. *Stigma* one. *Peric.* Capsule globose.—A branching shrub, found in Peru, with alternate *leaves*, and solitary, axillary *flowers*." *Jussieu*, from his own herbarium and the manuscripts of Dombey.

GALUPPI. See BURANELLO.

GALUTA, in *Geography*, a town of the Arabian Irak; 5 miles N. of Shehrban.

GALWAY, a very large county of Ireland, in the province of Connaught, which is inferior in size only to the county of Cork, but the last in population of the thirty-two. It lies immediately south of Mayo, which, with part of Roscommon, forms its northern boundary; on the east it has the county of Roscommon, the King's county, and county of Tipperary; on the south, the county of Clare, and Galway bay; and on the west, the Atlantic ocean. It extends 43 Irish miles (54½ English) from north to south, and 76 Irish (96½ English) miles from E. to W. containing 989,950 acres, which are 1546 square miles Irish (in English measure 1,739,591 acres, or 2718 square miles). In this vast tract are only 116 parishes, which contain, on an average, 8534 acres each. Yet there are only 28 benefices, and as many churches, which would give upwards of 35,000 Irish acres to the care of each rector! These parishes are in the archbishopric of Tuam, and the bishoprics of Clonfert, Kilmacduagh, Elphin, aud Killaloe. The number of houses in the county of Galway, according to the last official return of the inspector-general of hearth-money in 1791, was 24,268, though Dr. Beaufort has given it as 28,212; above 20,000 of which number are exempt from the hearth-tax. Reckoning the population at six to a house, it will be about 145,000, or one person for near seven acres. "This very scanty population," says Dr. Beaufort, "may be, in some measure, accounted for, by the rude state of the three baronies on the west of lough Corrib, which amount to a third part of the county." The extensive country on this side of the lake, according to the same writer, (almost the only authority to be relied on respecting this county, and from whose memoir, therefore, the present article is chiefly extracted,) is flat, with the exception of a few fertile hills of no great height, and some low mountains on the borders of Clare. The soil is warm and fertile, covering, at no great depth, a stratum of lime-stone rock, which, in the parts adjoining the county of Clare, rises so thick above the surface as to render those parts unfit for tillage, though they are excellent for pasture. The richest part of the county is between Loughren and Portumna, thence to Eyrecourt, Clonfert, and Aghrim. Few ditches are to be seen in Galway, the fields being chiefly inclosed with dry stone-walls, which gives the country a dreary aspect. The western part of the county is of quite a different character from the rest. The district called Jarconnaught contains some good land on the sea-coast, and along the beautiful shore of lough Corrib. But the heart of this district is an assemblage of unreclaimable rock and mountain; and beyond Oughterard, mount Leam stands very high above the lake. The rocks at Oughterard, and in the bed of the river Fuogh, of which there are immense masses, are all a black and white marble, equal, at least, in beauty, to that of Kilkenny; yet, when Dr. Beaufort wrote, there was seldom employment for more than one solitary artist, in working up a few chimney-pieces. Lough Corrib somewhat resembles lough Erne in its form, and extends 20 miles in length, being

being 11 wide in the broadeſt part: in the middle it is contracted to a ſmall channel, which is croſſed by a ferry at Knock. The large barony of Ballinahinch, which is better known by the name of Connamara, abounds with fine harbours, but is alſo extremely mountainous. The hills of Ourred and Caſhel are very high, and the vaſt ridge called Beanbeolla, or the Twelve Pins, which is a well known ſea-mark, conſiſts of almoſt perperdicular rock. At the foot of this ridge, cloſe to the little village of Ballinahinch, a charming lake ſpreads itſelf for ſome miles; and on the river which runs from it into Roundſtone bay, there is a great ſalmon fiſhery. On the ſides of hills, and in the valleys, which are watered by rivers and ſmall lakes, and ſheltered, in ſome places, by the venerable remains of ancient woods, the ſoil is moſtly inclined to a black bog; but gravel, ſand, or rock, lie at no greater depth than from one to three feet below the ſurface. Great quantities of kelp are made all along the coaſt, and, by manuring with ſea-wrack, the land is rendered very productive to the ſcattered families that inhabit it, who are all little farmers and hardy fiſhermen. The northern part of this diſtrict is called Joyce's Country, and is chiefly inhabited by a clan of that name. It is alſo extremely rough; Mamtraſna, on the borders of Mayo, is very high, and Ben-Levagh, at the north-weſt angle of lough Corrib, is a ſtupendous mountain. Yet the borders of the lake, the ſhore of Killeries, and the valley through which the river Bealnabrack runs, are pretty well peopled, and the ſoil ſuch as would amply repay the pains and expence of good cultivation. This county does not appear, from the report of Mr. Donald Stewart, itinerant mineralogiſt to the Dublin Society, to promiſe much addition to the mineral treaſures of Ireland. Lime-ſtone and marle are, indeed, valuable to the agriculturiſt, and theſe are in abundance; but the only ores ſeem to be lead and manganeſe; and there is little proſpect of coal. The lead is moſt abundant in the mountains near lough Corrib. A very particular account of the rare plants found in this county, and eſpecially the wild weſtern diſtrict, was publiſhed by Dr. Wade, profeſſor of botany to the Dublin Society, in the Tranſactions of that body. To detail all of them would be tedious; but it may be uſeful to notice a few of the moſt uncommon. Aſperula cynanchia, galium boreale, alchemilla alpina, rhamnus catharticus, pimpinella magna, droſera anglica, erica daboecia (very common) andromeda polifolia, arbutus uva urſi, ſaxifraga umbroſa, and hyperoides, cratægus arica, ſorbus aucuparia, myagrum ſativum, lavatera arborea, lobelia dortmanni, are found there, with a great variety of cryptogamics. This county, which reaches from the ſea to the Shannon, is well watered by rivers and lakes: ſeveral of the rivers are, in part of their courſe, ſubterraneous. The Black river, on the bounds of Mayo, dips for about three miles near the village of Shrule. The Clare and the Moyne unite their waters under ground, alternately appearing and retiring from view in the Turlachmore; which, in winter, form a lake, and in ſummer a beautiful and found ſheep-walk, upwards of ſix miles in length, and two in breadth. Near Gort there are a vaſt number of theſe ſwallows; in which ſome part of almoſt every river and brook in the neighbourhood is ingulphed. The river Gurtnamakin dips ſeveral times, and, after a concealed courſe of two miles, riſes on the beach below high water-mark, and diſcharges itſelf among the rocks in the bay of Kinvarra. Lough Rea is a fine piece of water; and lough Coutra, near the borders of Clare, is ſaid to poſſeſs all the beauties that hills, woods, and iſlands can impart to water. The maritime advantages of this county muſt not be omitted. The vaſt bay of Galway is ſheltered at the entrance by the three ſouthern iſles of Arran. The ſound between theſe iſlands is a ſafe road; and a number of inlets on the coaſts, as well as the harbour of Galway, are ſufficiently deep for the reception of merchant ſhips; but are more frequented by coaſters and fiſhing-boats, than by veſſels in the foreign trade. The indented ſhores of Connamare abound in well-ſheltered havens. With reſpect to the agriculture of Galway, it is ſaid that tillage is rapidly increaſing: the ſoil, as before obſerved, is naturally fertile; manures are abundant; and their agriculture tolerably judicious. We here find moſt of thoſe practices, which have long diſgraced the huſbandry of the weſtern counties, no more ſtubbornly purſued; the reſident landholders generally ſet examples of enlightened tillage in their reſpective demeſnes; and, in addition to lime-ſtone, lime-ſtone gravel, and marle, ſea-wrack, and even fern and other weeds, which the inhabitants collect and rot, prove good manures. The fruits of labour are rich crops of oats, barley, potatoes, and ſometimes wheat. But the climate of this hilly and weſtern region is too variable, humid, and tempeſtuous even to permit crops of grain to grow and ripen here, ſo happily as in the ſouthern and eaſtern parts of Ireland. Nor have the inhabitants of Galway acquired thoſe vigilant and enlightened habits of induſtry ſo eſſentially requiſite to enſure ſucceſs to their mode of huſbandry. The linen manufacture has of late years increaſed in this diſtrict, eſpecially near lough Rea, and bleach greens in proportion. The fiſheries on the coaſt alſo add conſiderably to the means of employment and ſupport. The villages in the eaſtern part are numerous and cheerful, but in the higher, or weſtern regions, there are very few, and theſe the abode of poverty and miſery. Nothing, however, ſtrikes a ſtranger more forcibly than the vaſt number of old caſtles and churches in ruins, or on the brink of decay, that occur in this diſtrict, "pourtraying," ſays a late writer, "the warlike character of former inhabitants, their noble eſtabliſhments, their religious zeal, or the power of their chieftains, and inſpiring a train of reflections agreeably diſpelled by the numerous modern manſions, that direct to ſcenes of natural beauty, rural improvement, or to a tenantry enjoying the bleſſings of proſperity and peace. The county of Galway is repreſented in parliament by three members, two for the county, and one for the town of Galway. Beaufort's Memoir of Meſſrs. Robertſons' View of Ireland.

GALWAY, the chief town of the county of the ſame name in Ireland; and formerly, when each province had a diſtinct governor, the capital of Connaught. It is ſituated on the broad and ſtony river by which lough Corrib empties itſelf into the ſea. It does not cover a very large ſpace, but being very compact, and having little waſte ground within its ancient and mouldering walls, it contains a great number of inhabitants. They may be eſtimated at 12,000, though there are but 950 houſes; for the greater part of this ancient town conſiſts of ſquare edifices at leaſt 200 years old, with each a ſmall court in the centre. Several diſtinct families occupy theſe large houſes; an arched way, leading from the ſtreet to the court, with a ſtone ſtaircaſe on each ſide. The ſtreets are long and narrow. This was formerly the moſt commercial town in Ireland; but the ſpirit of enterpriſe has long ſince forſaken it; and though it has ſtill ſome commerce, it has been left behind by many other places. No veſſels come up as far as the town; but the goods are conveyed backward and forward by lighters. The linen manufacture, and the various fiſheries along the coaſt, are the chief employment of the inhabitants. The collegiate church, of which the conſtitution and privileges are unique in Ireland, is very large. The government of the town is placed in a mayor, ſheriffs, and recorder; and the freemen return a member to the imperial parliament. The public buildings in Galway,

beſides

beſides the collegiate church already mentioned, which is of Gothic ſtructure, are an exchange, three nunneries, three monaſteries, commodious barracks for two or three regiments of infantry, a charter ſchool, and an hoſpital. Galway is a poſt and fair-town, and is ſituated 102 miles weſt from Dublin. N. lat. 53° 14′. W. long. 8° 5′ from Greenwich. Beaufort. Robertſon's Book of Roads.

GALWAY *Bay*, a large bay in the weſt of Ireland, twenty miles long, and ſeven miles broad, the north ſide of which has ſeveral ſhoals and blind rocks, ſome of which are called the ſtags of Arran, but the north ſide of it is ſafer. The three iſles of Arran ſhelter the entrance, and cauſe no leſs than four paſſages into the bay.

GALWAY, a poſt town of America, in the county of Saratoga, New York; W. of Ballſtown, and containing 2310 inhabitants.

GALYBE, in *Ancient Geography*, a town of Africa Propria, ſituated between the two Syrtes, according to Ptolemy.

GALZHA, in *Geography*, a town of European Turkey, in Bulgaria, on the Black ſea; 10 miles S. of Varna.

GAMA, VASCO, VASQUEZ DI, in *Biography*, a celebrated navigator, was born at Synes, a maritime town in the Portugueſe province of Alentejo, and being of an enterpriſing ſpirit he was devoted to the ſea-ſervice, in which he ſoon diſtinguiſhed himſelf. When king Emanuel determined to puſh his diſcoveries in the Eaſt, Di Gama was fixed on to conduct the expedition. He accordingly ſet ſail from Liſbon with a ſquadron of four ſmall veſſels in July 1497. Such, however, was the ſtate of navigation at that time, that he was four months contending with contrary winds before he reached the Cape of Good Hope. At length he was fortunate enough to double that cape, which had hitherto baffled the attempts of all his countrymen, and which had been the conſtant object of their terror and anxious hope. Thence he proceeded along the ſouth-eaſt coaſt of Africa, till he arrived at Melinda; where he had the high ſatisfaction to find a people far advanced in civilization, and engaged in active commerce with the remote countries of Aſia. Here he procured a Mahometan pilot, who conducted him to the Malabar coaſt, and on the 22d of May he arrived at Calicut. He was received in a friendly manner by the prince, and Gama conducted himſelf with ſo much prudence and reſolution in his intercourſe with the natives, that he was allowed to freight his ſhip with many of the moſt valuable productions of the Eaſt. At length the Mahometan merchants, jealous of his ſucceſs, laid a plot for his deſtruction; upon the diſcovery of which Di Gama embarked with all his treaſures, and returned to Portugal, where he was received with every teſtimony of gratitude and reſpect by the king and nation. He entered the port of Liſbon in September 1499, having had, however, the misfortune to loſe the greater part of his crew by diſeaſe and fatigue. This expedition completely eſtabliſhed the practicability of a new road to the Indies, and other naval commanders were ſent out upon ſimilar expeditions.

Di Gama was employed in a ſecond voyage, in which he had the command of a conſiderable fleet, and was honoured by his ſovereign with the title of admiral of the Indian, Perſian, and Arabian ſeas. In the courſe of this voyage, which he commenced in 1502, he compelled tribute from, or an alliance with, the petty princes that he met with in his route: when he arrived at Cochin he received a deputation from the Chriſtians of St. Thomas, to whom he promiſed protection. The prince, who began to be ſuſpicious of the motives of his viſitors, fitted out a fleet to intercept them in their courſe, hoping, no doubt, to put an end to their future projects; but Di Gama, underſtanding their intentions, began the attack with a degree of ardour little expected by the combatants, and boarded and took two of the largeſt ſhips, which proved to be prizes of immenſe value. After this ſucceſs he returned, and landed at Liſbon in September 1503. The ſucceſs of this voyage occaſioned great rejoicings in Portugal, and the government ſet about the means of ſecuring the eſtabliſhments it had made in India, and of extending them by conqueſt. We hear little more of Di Gama till the year 1524, when he was prevailed on to undertake a third voyage, with the rank of viceroy of the Indies. He proceeded to Cochin, was victorious againſt the people of Calicut, who attempted to fruſtrate his deſigns, and achieved other things of importance, when he died December 25, 1525. He left two ſons, Don Stephen and Don Chriſtopher, who were afterwards viceroys of the Indies, and who are noticed with applauſe and honour in hiſtory. Robertſon's Hiſt. of America. Mod. Univer. Hiſt.

GAMACHES, STEPHEN SIMON, was born at Meulan about the year 1672, and, being educated for the church, he obtained the office of canon of the Holy Croſs de la Bretonniere, and acquired ſo much reputation by his proficiency in ſcience and literature that he was elected a member of the French Academy of Sciences. He died in the year 1756 in the 84th year of his age, leaving behind him, beſides other works, "Phyſical Aſtronomy," in two vols. 4to.; "Literary and Philoſophical Diſſertations;" "The Syſtem of a Chriſtian Philoſopher;" "The Elegancies of Language reduced to their Principles." This laſt has been recommended as deſerving the peruſal of every perſon who is deſirous of a good ſtyle: it has been denominated "A Dictionary of fine Thoughts." Nouv. Dict. Hiſt.

GAMACHES, in *Geography*, a town of France, in the department of the Somme, and chief place of a canton in the diſtrict of Abbeville; 12 miles S. of Abbeville. The place contains 1037, and the canton 10,093 inhabitants, on a territory of 165 kiliometres, in 21 communes.

GAMALA, or GAMAL, in *Ancient Geography*, a town of Paleſtine, beyond Jordan, in the Gaulanitis, ſo called becauſe, being ſituated on a high mountain, its form reſembled that of a camel. It was part of the kingdom of Agrippa; but as the inhabitants refuſed to ſubmit to him, it was beſieged, firſt by the forces of Agrippa and afterwards by the Romans, who, after a long ſiege, took and ſacked it. It was afterwards fortified, and taken by Veſpaſian, who put the inhabitants to death, precipitating many of them from the ſummit of the citadel. Herod repaired it, and changed its name into "Herodium," but the ancient appellation prevailed.

GAMALIBA, a town of India, on this ſide of the Ganges, mentioned by Ptolemy.

GAMALIEL, ſurnamed the *Aged*, in *Scripture Biography*, an eminent Jewiſh rabbi in the firſt age of Chriſtianity, ſuppoſed to be St. Paul's maſter, and mentioned by him, Acts, xxii. 3, and in chap. v. 34, to be "one of the council, a phariſee and doctor of the law, had in reputation with all the people." Accordingly he appears from other teſtimonies to have been held in high eſtimation by the Jewiſh people, and he is often mentioned in the Miſhna. We have ample evidence that Gamaliel was never converted to Chriſtianity, as ſome Chriſtians, eſpecially of the church of Rome, have fondly and weakly imagined. Indeed, from the account given of him by St. Paul in the paſſage above cited, it may be argued that he was ſtill a firm Jew; otherwiſe it had not been to the purpoſe to take notice of his education under him, in the critical circumſtance in which he was then ſituated.

Gamaliel's argument in favour of the apoſtles (Acts, v. 37, &c.), which ſome interpreters have miſunderſtood, is thus ſtated by the judicious Dr. Lardner (Works, vol. i. p. 255.): Theudas and his meaſures came to nothing. After him Judas roſe up; he himſelf periſhed, and his people were diſperſed: but yet his principles prevail. You likewiſe may now puniſh theſe men, and put an end to their lives; but if their principles be of God, they will prevail notwithſtanding; and all the iſſue will be, that you will contract guilt, fight againſt God, but in vain. And to this ſeems to be owing the great ſucceſs of Gamaliel's reaſoning, and the ſervice he did the apoſtles at this time. He inſinuates ſome hopes, that their deſign might be of the ſame nature with Judas's. This may be inferred from his way of expreſſing himſelf, "leſt haply ye be found to fight againſt God." This was Judas's peculiar principle, that they were to own no mortal lords, but God only. And it is not unlikely, that Gamaliel intended hereby to inſinuate, not only that there was danger of oppoſing a deſign which came from God, and of oppoſing it with no other effect but that of contracting guilt to themſelves, but alſo of oppoſing the very kingdom and government of God, to which they wiſhed to be ſubject. It deſerves likewiſe to be obſerved, that Gamaliel mentions Theudas with contempt and indignation: "Before theſe days roſe up Theudas, boaſting himſelf to be ſomebody." But nothing like this follows the mention of Judas. Gamaliel concludes, upon the whole, that they ſhould "let theſe men alone." We have no occaſion to meddle in this matter; it is not unlikely but the Romans, our preſent governors, will be jealous of theſe men. But it ſeems to me an affair, in which we have no reaſon to concern ourſelves.

GAMAREA, in *Ancient Geography*, a ſmall country of Media, according to Diodorus Siculus.

GAMAZE', in *Geography*, a town of Egypt; 12 miles N. of Atſieh.

GAMBA, *Ital. the leg;* as *viol di gamba*, a baſe viol, that reſts on the *leg*, to diſtinguiſh it from *viola di braccia*, or a tenor viol, that reſts on the arm.

GAMBACH, in *Geography*, a town of Germany, in the principality of Solms Braunfels; 2 miles W. of Munzenberg.

GAMBALONE, or GAMBUOLO, a town of Italy, in the department of the Upper Po.

GAMBARA, LORENZO, in *Biography*, was born at Breſcia about the year 1496, and became diſtinguiſhed as a Latin poet. He acquired conſiderable celebrity among his contemporaries, and is mentioned with reſpect and honour by Manutius, Lipſius, Gyraldus, and others. He lived to the great age of ninety. His works are numerous, and they have paſſed through many editions. Among his larger pieces, his "Columbus," a poem in four cantos, is the beſt known. The ſubject of it is, as its title imports, the diſcovery of America, and it follows the order of events as they are recorded of the great navigator, without any decorations of fiction, and therefore is ſcarcely to be admitted among the rank of epic poems. In his youth he had written a great number of poems which were evidently injurious to the cauſe of morality: theſe, in his advanced years, he committed to the flames, and in his treatiſe "On the Art of Poetry," he not only condemns every thing injurious to virtue, but prohibits the uſe of heathen mythology. Moreri.

GAMBARA, VERONICA, an Italian literary lady, was born at Breſcia in the year 1485. She received a good education, and was aided and encouraged in her literary purſuits by a correſpondence with cardinal Bembo. In 1509 ſhe married Giberto, the lord of Corregio, with whom ſhe lived nine years, and after his death ſhe devoted her time and talents to the education of her two ſons, and to the compoſition of thoſe works which have given celebrity to her name. In 1528 ſhe fixed her reſidence in Bologna, and at the time of the coronation of the emperor Charles V. her houſe was the reſort of a number of the moſt diſtinguiſhed characters in Europe, who followed that prince's court. She died at Corregio in 1550, and in 1559 her poems, which had hitherto been printed in varions collections, were publiſhed with her letters in a complete edition at Breſcia. Gen. Biog.

GAMBARA, in *Geography*, a town of Italy, in the department of the Mela; 18 miles S. of Breſcia.—Alſo, a town of Italy, on the Brenta; 5 miles S. W. of Venice.

GAMBARA, a town of Italy, in the duchy of Piacenza; 24 miles S. of Piacenza.

GAMBASCA, a town of France, in the department of the Stura, ſeated on a ſmall river which runs into the Po; 6 miles W. of Saluzzo.

GAMBESON, GAMBEYSON, *Gambeſo*, in the *Ancient Military Language*, was a kind of coat or doublet, worn under the cuiraſs, to make it ſit eaſy, and prevent its hurting the body.

It was made of wool or cotton, quilted between two ſtuffs; and was likewiſe called counter-point.

Others define the gambeſon a kind of ſoft quilted waiſtcoat, worn under the coat of mail, and hanging down over the thighs.

"Pectora tot coriis, tot gambeſonibus ornat."

GAMBET, in *Ornithology*, the Engliſh name of TRINGA *Gambetta*, which ſee.

GAMBIA, in *Geography*, a country of Africa, which takes its name from the river that paſſes through it; ceded to England by the peace of 1783. The river, called alſo Gambra and Gamba, empties itſelf into the Atlantic, and is ſuppoſed by ſome to be a branch of the Niger. Its ſource is not known, but it is navigable for ſloops 600 miles into the interior of the country. It annually overflows its banks like the Nile, and probably from the ſame cauſe. Its mouth is in N. lat. 13° 30'. W. long. 16° 30'.

GAMBIER'S ISLANDS, a group of ſmall iſlands diſcovered by captain Wilſon of the Duff, in the miſſionary voyage, May 1797; about 5 or 6 leagues in length, ſituated N.E. by N. and S.W. by S. A reef, lying about three leagues from the largeſt of theſe iſlands, and probably encircling the whole group, extended as far as the eye could reach, on which were ſeveral dry ſpots bearing cluſters of trees. The inhabitants oppoſed every attempt to land. The main iſland, and thoſe about it are all high; and as the reef kept the ſea calm about them, they preſented a romantic, though barren appearance. The vallies, however, were covered with trees. "Duff's mountains," ſo called by Capt. Wilſon from the name of his ſhip, are two lofty mountains, viſible at the diſtance of fourteen or fifteen leagues, which lie in the centre, and are ſituated in S. lat. 23° 12'. E. long. 225°.

GAMBINO, a river of Italy, formed by ſeveral ſtreams, which run into the Oglio, near Torne d'Oglio.

GAMBLE'S STATION, an American fort, about 12 miles from Knoxville, in Teneſſee.

GAMBOGE, or CAMBOGIA *Gutta*, is a concrete, gummy, reſinous juice of a certain tree growing wild in Cambogia or Cambodia, Ceylon, Siam, and Cochinchina, and called by botaniſts "Stalagmitis gambogioides." The Siameſe gamboge occurs in ſmall tears, formed by the concretion of the drops of juice as they fall from the leaf-ſtalks and young

young ſhoots when they are broken off from the tree. In Ceylon the juice is procured by deep inciſions in the bark, and is afterwards inſpiſſated by the heat of the ſun, and moulded into cakes or rolls. Its colour, when pure, is a deep, rather dull orange; its fracture is conchoidal and ſomewhat ſhining. It has no ſmell, and very little taſte, but after remaining for ſome time in the mouth gives a ſlight impreſſion of acrimony. When applied to the flame of a candle it melts and blazes, throwing out ſparks, and emitting a denſe black ſmoke. Gamboge, though not properly ſoluble, is very diffuſible in water, and forms with it an opake yellow-coloured infuſion; and if the liquor be filtered ſome reſin is obtained; but the fluid remains coloured and turbid. With alcohol, which is a more effectual ſolvent than water, gamboge forms a clear gold-coloured fluid; and on the addition of water the alcoholic ſolution becomes turbid like the watery infuſion. Of 16 ounces of gamboge, water, according to Neumann, will take up 13 ounces; and two ounces of the reſidue are ſoluble in alcohol: of an equal quantity alcohol will firſt diſſolve 14 ounces, and one ounce of the reſidue is ſoluble in water: and in both caſes the inſoluble matter amounts to one-ſixteenth of the whole. Both the fixed alkalies and ammonia effect almoſt a total ſolution of gamboge, and produce a clear liquor, of a deep and rich red-brown colour; the reſidue, being pure gum, is entirely ſoluble in water. The addition of an acid to the alkaline ſolution throws down a copious yellow precipitate, which, dried, preſents an earthy fracture, is combuſtible with difficulty, and does not melt like the pure reſin. Aikin's Chem. Dict.

If this ſubſtance be mixed with an equal quantity of ſalt of tartar, it readily diſſolves in common water in a few hours digeſtion; the ſolution, if kept over the fire, ſoon becomes a ſort of ſmooth glue or jelly: and this, by adding a large quantity of water, is readily reduced into a red clear liquor, in a warm digeſtion: this liquor, evaporated over a gentle fire, yields a greyiſh ſalt, which eaſily imbibes moiſture from the air, if not kept in a glaſs well ſtopped; and this extract purges in a ſmaller doſe than the gum itſelf, and yet with leſs irritation; its taſte, however, is extremely acrimonious and fiery, and it muſt therefore be well diſguiſed before it is given. There is, however, another method of giving it, yet more to be recommended than this for general uſe; this preparation is as follows: Tie up the gum in a piece of linen cloth, and put it into a loaf juſt drawn from the oven; the loaf muſt be cut open for this purpoſe, and afterwards tied cloſe together, and ſet in ſome place where it will remain warm four and twenty hours; after this the gum is to be taken out and reduced to powder, and this powder tied up again, and put into another loaf and ſo on to the fourth or fifth time; after which it is to be powdered and kept for uſe. By this eaſy preparation this medicine loſes its violent operation, both as a purgative and emetic, and may be given with great ſafety; and the crumb of the firſt loaf, if eaten, proves purgative. Mem. Acad. Par. 1701.

In ſuch hydropic caſes as require the briſker cathartics, and in other diſorders accompanied with a redundance of ſerous humours, it is an uſeful and ſafe hydragogue; in hot, dry, bilious conſtitutions, it is never to be adminiſtered. In all caſes it is apt, on firſt uſing it, to vomit as well as purge.

The doſe is from two grains to twelve. The emetic power of this medicine is reſtrained by joining it to mercurius dulcis. The compound pills of gamboge are prepared in the following manner: Take of gamboge powdered, extract of ſpike aloe powdered, compound cinnamon powder, of each a drachm; and hard ſoap, two drachms. Mix the powders together; then, having added the ſoap, beat the whole together until they are thoroughly incorporated. The doſe is from five grains to a ſcruple. Pharmac. Lond. 1809.

Solutions of gamboge in alkalized water, and in dulcified alkaline ſpirits, act only by ſtool and urine, and much more mildly than the juice in ſubſtance. The watery tincture is ſtill milder; but the ſpirituous tincture operates with extreme irritation both upwards and downwards. Lewis's Mat. Med.

Gamboge, diſſolved in water, forms a beautiful yellow pigment, and is much uſed as ſuch by painters. Its tincture in alcohol is one of the ingredients of the gold coloured lacquer with which moſt of the modern articles that are made of braſs are overlaid. It is alſo employed by the inlayer and cabinet-maker to ſtain white wood in imitation of box. Dr. Lewis ſays, that it gives a beautiful and durable citron yellow ſtain to marble, whether rubbed in ſubſtance on the hot ſtone, or applied, as dragon's blood ſometimes is, in form of a ſpirituous tincture. When it is applied on cold marble, the ſtone is afterwards heated, to make the colour penetrate. Neumann's Chem. by Lewis, p. 300. note *m*.

GAMBOLD, John, in *Biography*, a pious Engliſh divine, was born at Haverfordweſt in Pembrokeſhire, and at a proper time became a member of Chriſt college, Oxford. In 1734 he took his degree of M.A., and was made chaplain of the college. About the year 1739 he was preſented to a living by Dr. Secker, but previouſly to this he had acted as interpreter to Peter Boehler, a diſciple of count Zinzendorf. This perſon held frequent conferences with the two Weſleys and others of the party, who in 1738 were laying the foundations of methodiſm. Boehler explained his miſſion and doctrines in the Latin language; theſe Gambold interpreted in his diſcourſe to the mixed meetings of learned and unlearned perſons who aſſumed the title of "awakened people." This was the foundation of his own converſion to the Moravian ſyſtem of religion, into which he ſo fully entered, as to abandon his preferment in the eſtabliſhed church, and publicly to join himſelf to the new ſect, which by a public act of the legiſlature was permitted to erect its eſtabliſhments in this country. For many years he was the regular miniſter of the congregation that met in Fetter-lane, London. In 1768 he retired to his native country, where he died, univerſally reſpected, in the year 1771. He was a ſingular, zealous, but innocent enthuſiaſt; but notwithſtanding his avowal of doctrines incompatible with thoſe in which he had been brought up, he reckoned among his friends ſeveral of the Engliſh biſhops who had been his contemporaries at Oxford. Among the Moravians he himſelf had been conſecrated a biſhop at an Engliſh provincial ſynod held at Chelſea. He was a good ſcholar, and was frequently applied to by Mr. Bowyer to aſſiſt in correcting the preſs, in which capacity he ſuperintended, among other valuable publications, the beautiful and accurate edition of Bacon's works in 1765, and in 1767 he was editor, and in part tranſlator, of Crantz's "Hiſtory of Greenland." He was editor of a neat edition of the Greek Teſtament, and publiſhed, as an original author, ſeveral theological pieces; an account of which, with other particulars of his life and labours, may be found in the Anecdotes of Bowyer, by Nichols.

GAMBON, in *Geography*, a river of France, which runs into the Seine, near Andely.

GAMBRON, or Gambroon, or *Bender-Abbas*, a ſea-port town of Perſia, in the province of Lariſtan, ſituated on the Perſian gulf, and formerly belonging to the Perſian monarch. After the death of Nadir-ſhah, a Perſian, named

Naſer-Khan, made himſelf maſter of the province, and conſequently of the city. He acknowledges himſelf vaſſal to Vakeil Kerim Khan of Schiraz, but pays no tribute, and unleſs he is compelled by an army, manifeſts no reſpect for the Vakeil's authority. This city was famous, in the 17th and beginning of the 18th centuries, as the port of Schiraz, and of the ſouth of Perſia, and then its trade was very extenſive. At preſent, ſays Niebuhr, it is very low; nor is there a ſingle European counting-houſe in the city. This decline has been occaſioned by the domeſtic diſturbances in Perſia, and the wars and diſputes between the French and Engliſh. The Dutch for a while continued to carry on a petty trade here; but ſince they formed a ſettlement in the iſle of Karek, they have entirely deſerted Gambron. N. lat. 27° 7'. E. long. 56° 44'.

GAMBROVISSA, a town of Iſtria; nine miles E. of Capo d'Iſtria.

GAMBS, a bailliage and town of Switzerland. This bailliage, which lies S. of Appenzel, and E. of the Rhine, is ſubject to the cantons of Schweitz and Glarus; and, together with Gaſter and Urnach, comprehends 149 ſquare geographical miles, with a population of 9000 perſons. Gambs has a medicinal ſulphurous ſpring; five miles S. of Appenzel.

GAME, Ludus, a regular diverſion, or a ſport preſcribed and limited by rules.

Games may be diſtinguiſhed into thoſe of exerciſe and addreſs; and thoſe of chance or hazard.

To the firſt belong tennis, billiards, cheſs, bowls, cudgels, wreſtling, quoits, ſhooting with bows, &c.

To theſe alſo belong the ancient juſts and tournaments.

Under the ſecond come cards and dice, &c.

Under cards, again, come ſeveral ſubordinate games; the principal of which are ombre, picquet, baſſet, whiſt, &c.

Games, *Ludi*, in the plural, were ſhews, or public repreſentations, uſed among the ancients on religious, funerary, and other ſolemn occaſions.

Such, among the Greeks, were the Olympic, Pythian, Iſthmian, and Nemæan games.

Among the Romans there were three ſorts of games, *ſacred*, *honorary*, and *ludicrous*: and Auſonius obſerves a difference, ſomewhat of the ſame kind, among thoſe of the Greeks; two of their celebrated games being dedicated to gods, and two to heroes.

Games, *Sacred*, were thoſe inſtituted immediately in honour of ſome deity: of which kind there were the ludi Cereales, Florales, Martiales, Apollinares, Megalenſes, Romani, conſuales or Circenſes, Capitolini, Seculares, Plebeii, Compitalitii, Auguſtales, Palatini, and Votivi. See each deſcribed in its place.

To this claſs may alſo be referred thoſe celebrated in memory of ſome illuſtrious perſon or action; as the ludi Neroniani, and Actiaci, &c.

Authors mention a decree of the Roman ſenate, by which it was enacted, that the public games ſhould be conſecrated, and united with the worſhip of the gods, as a part thereof; and, accordingly, feaſts, ſacrifices, and games, appear to have made up the greateſt part, or rather the whole, of the external worſhip or ſervice offered to the deities of the Romans.

Games, *Funeral*. See Funeral *games*.

Games, *Honorary*, *ludi honorarii*, were thoſe exhibited by private perſons out of their own purſe, in order to gratify the people, or ingratiate themſelves with them, to make way for their own preferment. Such were the combats of gladiators, ſcenic games, tragedies, comedies, and other theatrical and amphitheatrical ſports.

Games, *Ludicrous*, were of the ſame kind with the games of exerciſe and hazard among us. Such were the ludus Trojanus, or Pyrrhius; the teſſeræ, and tali or dice; and the latrunculi, or cheſs; the diſcus, or quoit; the pila, ball; trocheus, top; nuces, or par impar, odd and even, with nuts; harpaſtum, foot-ball; capita vel navem; croſs and pile, &c.

Others diſtinguiſh the ancient games into three claſſes, *viz.* races, combats, and ſpectacles. The firſt were called equeſtrian, or curule games, ludi equeſtres, or curules; being races of horſes and chariots, performed in the circus in honour of the Sun and Neptune.

The ſecond were called agonales, or gymnici; being combats of men or beaſts in the amphitheatre, dedicated to Mars and Minerva.

The laſt, called ſcenici, poetici, and muſici, were tragedies, comedies, balls, &c. repreſented on the theatres, ſacred to Venus, Bacchus, Apollo, and Minerva.

Homer gives us a fine deſcription of the games which Achilles inſtituted at the funeral of his friend Patroclus, in his Iliad; and others of the different games held among the Pheaces, Ithacans, and at the court of Alcinous, in his Odyſſey. And Virgil's deſcription of the games celebrated by Æneas, at the funeral of old Anchiſes, is not inferior to any of them.

Games, *Secular*. See Secular.

Games, *Muſical*, in the *Greek Antiquity*, games, in almoſt all which there were muſical contentions, and honours and prizes conferred on ſuperior merit.

At all the four principal public games in Greece, it appears that poetry and muſic had their heroes. Indeed muſical contentions for ſuperiority, both vocal and inſtrumental, are of ſuch high antiquity, as to have preceded the regular eſtabliſhment of public games. The ſinging was ſometimes alone, and ſometimes accompanied by inſtruments, and particularly by ſtringed inſtruments; as poets who compoſed verſes for muſic were called lyrics, that is, ſuch as accompanied themſelves on the lyre. (See Pauſanias Meſſenic. cap. 83.) But the inſtruments which uſually accompanied the voice, were the cithara, the lyre, the flute, trumpet, and buccina. As all ancient poetry was ſung, poets repeating their verſes without inſtrumental accompaniments, always did it to vocal melody, not in the indeterminate tones of common ſpeech, but in ſuch ſounds as belonged to the Μελος or Μελοποιια. We ſhould ſuppoſe that when any voice, except that of Stentor himſelf, was accompanied by a trumpet or buccina, it muſt have been in *ritornels*, or repetitions of portions of the ſame melody, as had been previouſly ſung, in order to afford the ſinger time to breathe.

From Plutarch we learn that occaſional muſical conteſts preceded the regular eſtabliſhment of any of the public games. (Quæſt. Conviv.) The ſame author (de Muſica) after enumerating the airs which Terpander had compoſed, and to which he had given names, continues to ſpeak of his other compoſitions, among which he deſcribes the proems, or hymns for the cithara, in heroic verſe. Theſe were uſed in after-times, by the rhapſodiſts, as prologues, or introductions to the poems of Homer, and other ancient writers. But Terpander rendered his name illuſtrious, no leſs by his performance, both upon the flute and cithara, than by his compoſitions. This appears by the marbles; by a paſſage in Athenæus, from the hiſtorian Hellanicus, which informs us that he obtained the firſt prize in the muſical conteſts at the Carnean games; and by the teſtimony of Plutarch, who ſays, that "no other proof need be urged of the excellence of Terpander, in the art of playing upon the cithara, than what is given by the regiſter of the Pythic games, from

which it appears that he gained four prizes, ſucceſſively, at thoſe ſolemnities."

After ſpeaking of the victories obtained by this venerable bard, at the public games, it ſeems neceſſary to be ſomewhat minute in deſcribing theſe memorable inſtitutions, as far as they concern muſic. And, in order to convey to the reader as clear an idea as we are able, of the rank which muſic and muſicians held at theſe aſſemblies, we ſhall give ſome account of each of the four principal or ſacred games, ſeparately; and firſt, *of the Olympic games*.

Thucydides tells us that in very remote antiquity there were "games of bodily exerciſe, and of muſic, in which cities exhibited their reſpective choruſes;" and, in teſtimony of this, he quotes the following verſes from Homer's hymn to Apollo:

"To thee, O Phœbus, moſt the Delian iſle
Gives cordial joy, excites the pleaſing ſmile;
When gay Ionians flock around thy fane;
Men, women, children, a reſplendent train,
Whoſe flowing garments ſweep the ſacred pile,
Whoſe grateful concourſe gladdens all the iſle,
Where champions fight, where dancers beat the ground,
Where chearful muſic echoes all around,
Thy feaſt to honour and thy praiſe to ſound."

That there was alſo, continues Thucydides, a muſical game, to which artiſts reſorted to make trials of ſkill, Homer fully ſhews in other verſes to be found in the ſame hymn: for having ſung the Delian chorus of females, he cloſes their praiſe with theſe lines, in which he makes ſome mention of himſelf;

"Hail! great Apollo, radiant god of day!
Hail Cynthia, goddeſs of the lunar ſway!
Henceforth on me propitious ſmile! and you,
Ye blooming beauties of the iſle, adieu!
When future gueſts ſhall reach your happy ſhore,
And refug'd here from toils, lament no more;
When ſocial talk the mind-unbending chears,
And this demand ſhall greet your friendly ears—
Who was the bard, e'er landed on your coaſt,
That ſung the ſweeteſt, and that pleaſed you moſt?—
With voice united, all ye blooming fair,
Join in your anſwer, and for me declare;
Say—the blind bard the ſweeteſt notes may boaſt,
He lives at Chios, and he pleaſ'd us moſt."
Smith's Thucydides.

We cannot help pointing out another circumſtance in this hymn, which is really curious, as it implies the cultivation of a talent for imitation, at a time when ſimplicity and original genius ſeem moſt likely to have ſubſiſted, pure and untainted, by ludicrous ſimilitudes.

Homer, in verſe 162, deſcribing the employment of the Delian prieſteſſes, or nuns of the order of Saint Apollo of Delos, tells us, that they were great adepts in the art of mimickry; and that part of the entertainment which they afforded to the numerous people of different nations, who formed their congregation, was, as the poet expreſſes it, from their being ſkilled to imitate the voices and the pulſation, or meaſure, of all nations: and ſo exactly was their ſong adapted, that every man would think he himſelf was ſinging.

Homer ſeems to ſketch out the order of the performance in theſe old Pagan conſervatorios, v. 158: firſt they ſung a hymn in praiſe of Apollo: then another in praiſe of Latona and Diana: then they deſcended to the celebration of human heroes and heroines of ancient times; and it ſeems to have been in this part of their performance that they exerted their mimetic powers, and charmed the nations.

Though Mr. Weſt, in his "Diſſertation on the Olympic Games," publiſhed with ſome of the odes of Pindar, tells us, that theſe aſſemblies were frequented by perſons of the greateſt eminence in all the arts of peace, ſuch as hiſtorians, orators, philoſophers, poets, and painters; who perceiving that the moſt compendious way to fame lay through Olympia, were there induced to exhibit their beſt performances, at the time of the celebration of the Olympic games; yet he has wholly omitted to mention poetical and muſical conteſts, though both can be proved to have had frequent admiſſion there. Indeed theſe were not the principal contentions at Olympia, as they were at Delphos, and in ſome other public games; being ſubordinate to the athletic and gymnaſtic exerciſes, and no part of the pentathlon, or five bodily exerciſes, of leaping, running, throwing the quoit or dart, boxing and wreſtling; though even theſe were accompanied by the flute; for Pauſanias ſays that Pythocritus of Sicyon played ſix times upon the flute during the exerciſe of the pentathlon at Olympia; and in teſtimony of the ſkill and abilities which he manifeſted in his art, a pillar and ſtatue were erected to him with this inſcription:

ΠΥΘΟΚΡΙΤΟΥ
ΚΑΛΑΙΝΙΚΟΥ
ΜΝΑΜΑΤΑ
ΑΥΛΗΤΑ

"To the memory of Pythocritus, victor upon the flute." We have the ſame authority for the horſe-race being accompanied by the trumpet; and many ancient writers tell us that the chariot-race was likewiſe accompanied by the flute.

Pauſanias alſo remarks, that there was a Gymnaſium near Olympia, called Lolichmium, which was open at all times to thoſe who were deſirous of trying their powers in literary combats of every kind, where muſic, as the conſtant companion of poetry, could not have been excluded.

Ælian tells us likewiſe, that, in the 91ſt Olympiad, 416 B. C., Xenocles and Euripides diſputed the prize of dramatic poetry at the Olympic games. Now dramatic poetry was at this time always ſet to muſic, ſung, and accompanied by inſtruments, when performed on the ſtage; it is probable, therefore, that the caſe was the ſame at a public recital; at leaſt with reſpect to the lyric part of the drama.

In the 96th Olympiad, 396 B. C. a prize was inſtituted at the Olympic games for the beſt performer on the trumpet. The firſt performer on this inſtrument, who gained a prize at theſe celebrations, was Timæus of Elis (Αναγεφ, Olym. ad Calc. Chron. Euſeb.). His countryman Crates obtained one there the ſame year, on the cornet, or horn. Archias of Hybla, in Sicily, was victor on the trumpet at three ſeveral Olympiads, after this period. Theſe premiums ſeem not to have been temporary, but to have been continued long after their firſt eſtabliſhment; for Athenæus informs us, that the famous trumpeter, Herodorus of Megara, was victor at the Olympic games ten ſeveral times. Jul. Pollux ſays fifteen. Theſe writers muſt mean that he obtained ſo many prizes at the different games of Greece; as Athenæus informs us, that he was victor in the whole circle of ſacred games, having been crowned at the Olympian, Pythian, Nemean, and Iſthmian, by turns.

Theſe performers on the trumpet appear to have been heralds and public cryers; who not only gave the ſignals at the games for the combatants to engage, and announced their

their ſucceſs, but proclaimed peace and war, and founded ſignals of ſacrifice and ſilence, at religious ceremonies.

As Herodorus is allowed to have been cotemporary with Demetrius Poliorcetes, he may be placed about the 120th Olymp. 300 B. C. According to the authors already cited, he was as remarkable for his gigantic figure and enormous appetite, as for the ſtrength of his lungs, which were ſo powerful in blowing the trumpet, that he could not be heard with ſafety, unleſs at a great diſtance. But, upon theſe occaſions, the danger was not always confined to the hearers; the performers themſelves, ſometimes, ſeem to have exulted, and to have been very thankful that they found themſelves alive and well, when their ſolos were ended. An epigram of Archias, the Hyblæan trumpeter, is preſerved in Jul. Pollux, in which he dedicates a ſtatue to Apollo, in gratitude for his having been enabled to proclaim the Olympic games with his trumpet, three times, without burſting his cheeks, or a blood-veſſel, though he ſounded with all his force, and without a capiſtrum, or muzzle.

Even the flute had its dangers, if Lucian may be credited, who relates, with the appearance of great gravity, that Harmonides, a young flute-player, and ſcholar of Timotheus, at his firſt public performance, in order to aſtoniſh his hearers, began his ſolo with ſo violent a blaſt, that he breathed his laſt breath into his flute, and died upon the ſpot.

This account is ſo extraordinary, that it ſeems to require the teſtimony of the author's own words: εναπεπνευσεν τω αυλω, *breathed his laſt breath into the flute;* and εν τα σκηνη απεθανε, *he died upon the ſtage.*

Plutarch, and ſeveral ancient writers, ſpeak of a kind of paſticcio performance at the public games among the rhapſodiſts, who uſed to collect together favourite paſſages of poetry and muſic of different ſtyles and maſters, and ſing them to the cithara. Cleomenes the rhapſodiſt, however, according to Athenæus, ſung by memory at the Olympic games an entire poem, called the expiations, compoſed by Empedocles. See RHAPSODIST.

As a further proof of muſical conteſts forming a part of the Olympic games, we ſhall only obſerve that the emperor Nero, who regarded every great muſician as his rival, diſputed the prize in muſic there, in all its forms: firſt, entering his name with the common candidates, and ſubmitting to all the uſual preparatory diſcipline, as well as to the rigour of the theatrical laws, during performance; and, afterwards, ſupplicating the favour of the nomodictai, or umpires, by all the ſeeming ſubmiſſion and anxiety of a profeſſed muſician; as if an emperor, and ſuch an emperor, had any thing to fear from the ſeverity of his judges.

The victors in every ſpecies of combat were diſtinguiſhed upon all occaſions, and had every where the moſt honourable reception: poets and muſicians of the greateſt eminence were ambitious of celebrating their praiſe; and it is to their triumphs that we owe the odes of Pindar. Other panegyrics of this kind have not come down to us, though every ſucceſsful hero had a bard to record his victory, and to chant his virtues. Both Simonides and Bacchylides compoſed hymns in honour of king Hiero, as well as Pindar; but we ſhall give ſufficient teſtimony hereafter of innumerable compoſitions of the like ſpecies having been produced, and ſung upon ſimilar occaſions, by the greateſt poets and muſicians of antiquity.

The *Pythic games*, Pauſanias informs us, conſiſted, in ancient times, of the poetical and muſical conteſts, and the prize was given to him who had written and ſung the beſt hymn in honour of Apollo. At their firſt celebration, Chryſothemis of Crete, the ſon of Carmanor, who purified Apollo, after he had killed the Python, was victor. After him Philammon, the ſon of Chryſothemis, won the prize; and the next who was crowned, was Thamyris, the ſon of Philammon. Eleutherus is recorded to have gained the prize there by the power and ſweetneſs of his voice; though the hymn which he ſung was the compoſition of another. It is ſaid, likewiſe, that Heſiod was refuſed admiſſion among the candidates, on account of his not having been able to accompany himſelf upon the lyre; and that Homer, though he went to Delphos to conſult the oracle, yet, on account of his blindneſs and infirmities, he made but little uſe of his talent of ſinging and playing upon the lyre at the ſame time.

Hence it appears, that though muſical conteſts were, perhaps, not ranked among the regular and eſtabliſhed exerciſes of the Olympic games, yet all antiquity agrees, that no others were admitted into the Pythic during the firſt ages of their celebration.

It was at the cloſe of the long and bloody war with the ſacrilegious Criſſæans, 591 years B.C. that Eurylochus, the general of the Amphictyons, who from his valour, and the length of the ſiege of Criſſa, was called the New Achilles, inſtituted the ſeveral kinds of Pythic combats at Delphos, which were afterwards conſtantly repeated on the ſecond year of each Olympiad.

Pauſanias, in his enumeration of the muſical conteſts that were added to the ancient Pythic games, at the cloſe of the Criſſæan war, tells us, that the Amphictyons propoſed prizes, not only for thoſe muſicians who ſung beſt to the accompaniment of the cithara, the only combat at the firſt inſtitution of theſe games, but others, both to ſuch as ſhould ſing beſt to the accompaniment of the flute, and to thoſe who, with the greateſt preciſion and taſte, played on that inſtrument alone, without ſinging. Here began the ſeparation of muſic and poetry. All the trials of ſkill, all the performances at banquets, feſtivals, and ſacrifices, had hitherto been confined to vocal muſic, accompanied by inſtruments indeed, but where poetry had an important concern; at leaſt, no inſtrumental muſic, without vocal, ſince the conteſt between Apollo and Marſyas, is mentioned in ancient authors, before this time, except that of the trumpet; the lyre and flute having, in public exhibitions, been mere attendants on the voice, and on poetry.

This was ſoon after the time when Sacadas is recorded to have played his Pythic air on the flute at Delphos, which reconciled Apollo (or his prieſt) to that inſtrument; who, till then, was ſaid to have had it in abhorrence ever ſince the conteſt with Marſyas. This muſician was not crowned the firſt time he played at the Pythic games, but in the two ſubſequent Pythiads he obtained the prize, which furniſhes a proof that inſtrumental muſic, ſeparated from vocal, began now to be ſucceſsfully cultivated among the Greeks.

After this, the ſame games and combats were eſtabliſhed at Delphos as at Olympia. The Amphictyons retrenched the flute accompaniment, on account of that inſtrument being too plaintive, and fit only for lamentations and elegies, to which it was chiefly appropriated. A proof of this, ſays Pauſanias, is given in the offering which Echembrotus made to Hercules of a bronze tripod, with this inſcription:

"Echembrotus, the Arcadian, dedicated this tripod to Hercules, after obtaining the prize at the games of the Amphictyons, where he accompanied the elegies that were ſung in the aſſembly of the Greeks, with the flute."

At the eighth Pythiad, 559 years B. C. a crown was given to players upon ſtringed inſtruments, without ſinging, which was won by Agelaus of Tegea.

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The prize given to the victors at the Pythic games conſiſted either of apples, conſecrated to Apollo, or, as Pindar informs us, of laurel crowns, which, according to Pauſanias, were peculiar to the Pythic games, in alluſion to Apollo's paſſion for Daphne.

Strabo, ſpeaking of the different kinds of conteſts eſtabliſhed by the Amphictyons, at the firſt Pythic games, after the Criſſæans were ſubdued, mentions a particular ſpecies of compoſition, which was ſung to the hymn in praiſe of Apollo, and accompanied by inſtruments. It was called the Pythian nome; and was a kind of long cantata, conſiſting of five parts, or movements, all alluding to the victory obtained by the god over the ſerpent Python. The firſt part was called the *Prelude*, or preparation for the fight; the ſecond, *the Onſet*, or beginning of the combat; the third, *the Heat of the Battle;* the fourth, *the Song of Victory*, or the inſults of Apollo over the ſerpent Python, compoſed of iambics and dactyls; and the fifth, *the Hiſſing of the dying Monſter.*

This air, Pauſanias tells us, was compoſed, and firſt played at Delphos, by Sacadas, who, according to Plutarch, was an excellent poet as well as muſician, and author of lyric poems, of elegies, and of a compoſition conſiſting of three ſtrophes or couplets, performed ſucceſſively in the three modes chiefly uſed in his time, the Dorian, Phrygian, and Lydian; and this air was called trimeles, on account of its changes of modulation. Both Plutarch and Pauſanias mention his having been celebrated by Pindar; but as we are not in poſſeſſion of all that poet's works, this honourable teſtimony cannot be found at preſent. The reputation of Sacadas muſt doubtleſs have been very great, for Plutarch ſays, that his name was inſerted in the Pythic liſt of good poets; and Pauſanias, that he found his ſtatue, with a flute in his hand, on mount Helicon, and his tomb at Argos.

We are the more minute in ſpeaking of this perſonage, as he is the firſt upon record who detached muſic from poetry, and who, though a good poet himſelf, engaged the public attention in favour of mere inſtrumental muſic; a ſchiſm that has been as ſeverely cenſured as any one in the church. The cenſurers, however, have forgotten that ſuch ſchiſms, in the arts, are as much to be deſired, as thoſe of religion are to be avoided; ſince it is by ſuch ſeparations only that the different arts, and different branches of the ſame art, becoming the objects of ſeparate and excluſive cultivation, are brought to their laſt refinement and perfection.

After Sacadas had pointed out the road to fame, by means of inſtrumental muſic, it was ſo ſucceſsfully purſued by Pythocritus of Sicyon, whoſe ſtatue was erected at Olympia, that he gained the prize at Delphos, as a ſolo player on the flute, ſix different times.

After their regular celebration was eſtabliſhed, a catalogue of more than twenty of the moſt illuſtrious poets and muſicians of antiquity, who by the encouragement of the Pythic games brought muſic and poetry to the higheſt perfection in Greece, has been collected by ſir Iſaac Newton in his Chronology; theſe were Archilochus, Eumelus Corinthius, Polymneſtus, Thaletas, Xenodemus, Xenocritus, Sacadas, Steſichorus, Tyrtæus, Tleſilla, Rhianus, Alcman, Arion, Mimnermus, Alcæus, Sappho, Theognis, Anacreon, Ibycus, Simonides, Æſchylus, and Pindar.

At the *Nemean games*, though the exerciſes were nearly the ſame as at the Olympic, as we learn from the ſubjects of the Nemean odes of Pindar; yet that muſical performances uſually conſtituted a part of the exerciſes and amuſements at this ſolemnity, is a fact ſo fully aſcertained by a paſſage in Plutarch's life of Philopœmen, and corroborated by Pauſanias, that we ſhall give the narration entire, and leave it to ſpeak for itſelf.

"Philopœmen being elected a ſecond time general of the Achæans, ſoon after he had gained the celebrated battle of Mantinea, entered the theatre at the Nemean games, while the muſicians were diſputing the muſical prize. At the moment that Philopœmen entered, the muſician Pylades, of Megalopolis, happened to be ſinging to the lyre, the beginning of a ſong compoſed by Timotheus, called "the Perſians:"

"Behold the hero, from whoſe glorious deeds
Our greateſt bleſſing, liberty, proceeds!"

The ſubject of the verſe, the energy with which it was uttered, and the beauty of the ſinger's voice, ſtruck the whole aſſembly. They inſtantly caſt their eyes on Philopœmen, and, with the moſt violent applauſe and acclamation, animated with the hopes of recovering their former dignity, they aſſumed their ancient ſpirit and confidence of victory. Pauſanias adds, that they unanimouſly cried out, that nothing could be more applicable than this poem was to the brave general, who had undertaken to command their army."

At the *Iſthmian games*, the ſame trials of ſkill were exhibited as at the other three ſacred games, and particularly thoſe of poetry and muſic.

Livy relates a very intereſting event, which happened during the celebration of theſe games, after the Romans had defeated Philip king of Macedon, one of the ſucceſſors of Alexander the Great, who had been in poſſeſſion of the chief part of Greece.

The time, ſays this author, for celebrating the Iſthmian games was now come. There was always a great concourſe of people at them, from the natural curioſity of the Greeks, who delighted in ſeeing all kinds of combats and bodily exerciſes, as well as from the convenience of the ſituation, between two ſeas, for the inhabitants of different provinces to aſſemble. But being at this time anxious to know their own fate, and that of their country, all Greece flocked thither, the greater part ſilently foreboding the worſt, and ſome not ſcrupling openly to expreſs their fears. At length the Romans took their places at the games, and a herald, with a trumpet, in the uſual manner, advanced into the middle of the Arena, as if to pronounce the common form of words; but, when ſilence was ordered, he proclaimed, "that the Roman ſenate and people, and T. Quinctius Flamininus their general, after vanquiſhing Philip and his Macedonians, declared the Corinthians, Phocæans, all the Locrians, the iſland Eubœa, the Magneſians, Theſſalonians, Perrhæbi, Achæans, and Phthiotes, all which ſtates had been poſſeſſed by Philip, free, independent, and ſubject only to their own laws." The joy which this proclamation occaſioned in the aſſembly was, at firſt, too great to be expreſſed. The ſpectators could ſcarce credit what they heard; they regarded each other with aſtoniſhment, as if they had waked out of a dream. Each, diffident of his own ears, with reſpect to what particularly concerned himſelf and his own country, aſked his neighbour what had been ſaid. The herald was even called again, ſo ſtrong a deſire had they all, not only to hear, but to ſee the meſſenger of their liberty, and they had the ſatisfaction of hearing him repeat the decree. When their joy was fully confirmed, they expreſſed it in ſuch loud and reiterated ſhouts of applauſe, that it was evident liberty was dearer to them than all the other advantages of life. After this the games were celebrated, but with the greateſt hurry and confuſion; no one had eyes or attention for

for the ſpectacle; every avenue of inferior pleaſure was obſtructed by joy.

Theſe games, in which the victors were only rewarded with garlands of pine-leaves, were celebrated with great magnificence and ſplendor, as long as paganiſm continued to be the eſtabliſhed religion of Greece; nor were they omitted even when Corinth was ſacked and burned by Mummius, the Roman general, at which time the care of them was transferred to the Sicyonians, but was reſtored again to the inhabitants of Corinth, when that city was rebuilt.

Beſides the four games called ſacred, at which poets and muſicians contended for pre-eminence, there were many others of leſs celebrity, the principal of which, however, were the Panathenæan games in honour of Minerva, inſtituted by the Athenians, the moſt elegant, refined, and voluptuous, people of Greece.

There were two ſolemn feſtivals under this denomination at Athens, where prizes were eſtabliſhed for three different kinds of combat: the firſt conſiſted of foot and horſe races; the ſecond, of athletic exerciſes; and the third of poetical and muſical conteſts. Theſe laſt are ſaid to have been inſtituted by Pericles: and that great patron of arts and literature may have been the firſt who excited emulation in poets and muſicians, at this feſtival, by beſtowing rewards upon the moſt excellent; but, according to Plutarch, who had conſulted the Panathenæan regiſter, muſical performances were of much earlier date there than the time of Pericles. Rhapſodiſts were appointed to ſing the verſes of Homer at theſe games, by Hipparchus, the ſon of Piſiſtratus.

Singers of the firſt claſs, accompanied by performers on the flute and cithara, exerciſed their talents here upon ſubjects preſcribed by the directors of theſe exhibitions. And while the Athenian ſtate was free and independent, the noble and generous actions of Harmodius and Ariſtogiton, who had oppoſed the power of the Piſiſtratidæ, and of Ariſtobulus, who had delivered the Athenians from the oppreſſion of the thirty tyrants, impoſed upon them by the Lacedæmonians, were celebrated in theſe ſongs.

GAME is alſo uſed for all kinds of wild beaſts and birds fit for eating, and which are ſought after on that account.

Game includes wild beaſts of venery and chaſe; and alſo beaſts and fowls of warren.

Some authors divide game into *large*, which include red and fallow deer: and *ſmall*, to which belong hares, rabbits, pheaſants, and partridges.

A foreſt is a place ſet apart for preſerving, feeding, breeding, &c. all ſorts of game, and conſiſts of divers things, *viz.* ſoil, covert, laws, courts, judges, officers, game, and bounds. See FOREST.

A chaſe differs from a foreſt in this, among other things, that it has no variety of game. See CHASE.

Ways of catching game are by hunting, hawking, fowling, &c.

There are a great number of laws made for the ſecurity and preſervation of game. The reſtrictive laws relating to foreſts and game were introduced into Europe at the ſame time, and by the ſame people, as gave birth to the feudal ſyſtem: on the irruption of the northern barbarians, it behoved every conquering general, when he ſettled the economy of a vanquiſhed country, and partitioned it among his ſoldiers and feudatories, on condition of military ſervice, to keep the *ruſtici*, or natives of the country, who were not his military tenants, in as low a condition as poſſible, and eſpecially to prohibit them the uſe of arms. In order to this, it became neceſſary to prohibit hunting and ſporting, and that the conqueror ſhould reſerve this right to himſelf, and to ſuch capital feudatories, or barons, on whom he ſhould beſtow it. This excluſive privilege well ſuited the martial genius of thoſe conquering troops, who delighted in a ſport which bore reſemblance to war: and it is remarkable, that in thoſe nations where the feudal policy remains the moſt uncorrupted, the foreſt or game-laws continue in their greateſt rigour. In France all game was properly the king's: and in ſome parts of Germany it is death for a peaſant to be found hunting in the woods of the nobility. In the times of the Britons our whole iſland was repleniſhed with all ſorts of game, which they all enjoyed in common: but when huſbandry took place under the Saxon government, the beaſts fled into deſert tracts, called foreſts, which our royal ſportſmen reſerved for their own diverſion, on pain of a pecuniary forfeiture for ſuch as interfered with their ſovereign. But every freeholder had the full liberty of ſporting upon his own territories, provided that he abſtained from the king's foreſts; as is expreſſed in the laws of Canute and Edward the Confeſſor: "Sit quilibet homo dignus venatione ſua, in ſylva et in agris, ſibi propriis, et in dominio ſuo: et abſtineat omnis homo a venariis regiis, ubicunque pacem eis habere voluerit:" which indeed was the ancient law of the Scandinavian continent, from whence Canute probably derived it: "Cuique enim in proprio fundo quamlibet feram quoquo modo venari permiſſum." However, upon the Norman Conqueſt, a right of purſuing and taking all beaſts of chaſe, and other animals called game, was held to belong to the king, and to ſuch only as were authorized by him. This doctrine was founded, not only upon the principles of the feudal law, that the king is the ultimate proprietor of all the lands in the kingdom, being held of him as the chief lord, or lord paramount of the fen, and that he has therefore the right of the univerſal ſoil, to enter thereon and to take and chaſe ſuch creatures at his pleaſure; but alſo upon another maxim of the common law, that theſe animals are "bona vacantia," and, having no other owner, belong to the king by his prerogative. As the former reaſon was held to veſt in the king a *right* to purſue and take them any where; the latter was ſuppoſed to give the king, and ſuch as he ſhould authorize, a *ſole* and *excluſive* right. This right was exerted at and after the time of the Norman eſtabliſhment, with the utmoſt rigour. Blackſt. Com. vol. ii. p. 431, &c. See FOREST.

From this principle, that the ſole right of taking and deſtroying game belongs excluſively to the king, if it be admitted, it will follow, that no perſon, who does not derive his right from the crown, is by common law entitled to take or kill any beaſts of chaſe, or other game whatſoever. The principle now ſtated, "that the ſole property of all game is veſted in the king alone," has been rendered queſtionable by Mr. Chriſtian in his learned comment on Blackſtone's Commentary. Mr. Daniel, in his "Rural Sports," has alſo introduced ſeveral obſervations on the game laws, which tend to invalidate the general reaſoning of the learned judge upon this ſubject. The reaſons recited by Blackſtone for eſtabliſhing theſe conſtitutions are as follow: 1. "For the encouragement of agriculture and improvement of lands, by giving every man an excluſive dominion over his own ſoil;" but Mr. D. objects that it cannot eaſily be comprehended how, upon the author's principle, the reſtriction of a natural right to kill animals denominated game on his own grounds, or permiſſively on thoſe of another, and how the forbidding of a freeholder of leſs than 100*l.* a year, to kill a partridge upon his own eſtate, gives every man an excluſive dominion over his own ſoil. It is certainly not ſo obviouſly beneficial in this way as to promote the encouragement of agriculture, and the improvement of lands. Another reaſon is, 2. "For preſervation

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of the ſeveral ſpecies of theſe animals, which would ſoon be extirpated by a general liberty." And again, 3. "For the prevention of idleneſs and diſſipation, in huſbandmen, artificers, and others of lower rank, which would be the unavoidable conſequence of univerſal licence." Theſe reaſons, it is alledged, deſtroy each other. It is plain, that without any reſtrictive laws, the evil would have cured itſelf; for if game would be extirpated by a general licence, it would follow of courſe that all idleneſs and diſſipation ariſing from this cauſe muſt end with the cauſe itſelf, and would require no law for its prevention. Another reaſon aſſigned in favour of the foreſt and game laws is, 4. "The prevention of popular inſurrections and reſiſtance to government, by diſarming the bulk of the people." But that the makers of theſe laws were actuated by this motive, is an opinion which the hiſtory and manners of the times will hardly allow us to admit. Hawks were at this time chiefly uſed to kill birds; and military weapons do not ſeem to have been much uſed in the purſuit of game. Beſides, the firſt qualifying ſtatute, 13 Ric. II. does not mention any inſtrument likely to be very ſerviceable in the hands of ſedition; nor was the government in thoſe days ſo extremely tender of the liberties of the people, as to take this indirect method of diſarming them, and of relieving itſelf from the apprehenſions of revolt. The habits, whatever they were, acquired in the purſuit of game, could not much contribute to initiate the peaſantry in the rudiments of military ſcience. Our author farther examines ſome of the principal early ſtatutes relating to game, and hence he infers that the right to purſue and deſtroy it, was at no time, by the conſtitutional law of this kingdom, held to be *ſolely* and *excluſively* in the ſovereign. It was clearly a *general* right, and did ſubſiſt as ſuch in *fact* and *uſage*, until upon principles of public expediency, it was judged fit to regulate and limit the enjoyment of it. Previouſly to the enactment of any reſtrictive ſtatutes reſpecting it, it ſtood upon the baſis of the common law. Game belongs to the claſs of "feræ naturæ," and of theſe the learned commentator has himſelf affirmed, "that by the law of nature, every man, from the prince to the peaſant, has an *equal right* of purſuing and taking them to his own uſe." Now as every natural right is protected and confirmed by the common law, and forms a part of it, to allow that this is a *natural* and *common right*, and at the ſame time to affirm "that no perſon whatever, but he who has a *derivative right*, is, by the common law, entitled to take or kill any beaſt of chaſe or other game whatever," is utterly repugnant and contradictory. If to kill game be a *natural right* (as it is declared to be), and *equally common* to all the king's ſubjects, it follows that it cannot be the *ſole* and *excluſive prerogative* of the king. If, on the other hand, it is the *ſole* and *excluſive prerogative* of the crown, then it cannot be in its origin a *natural* and *common right*. Lord Coke ſays (1 Inſt. 142.) "the common law is ſometimes called right, *common right*, and common juſtice. Thus, *common law* and *common right* are convertible terms; and ſir William Blackſtone's poſitions controvert each other. The learned judge has alſo been charged with advancing a doctrine wholly unprecedented, and inconſiſtent with the ſtatute (22 and 23 Car. II. c. 25) when he aſſerts, that "the circumſtance of having 100*l. per annum*, and the reſt, are not properly *qualifications*, but *exemptions*." If the king has the *ſole* and *excluſive* prerogative to take and kill game, this prerogative is alike infringed by perſons deſtroying game, whatever be their condition or degree, and *he alone* muſt be the perſon injured by ſuch an unauthorized act; but in the above cited ſtatute we find the ſtealing, taking, and killing of game, by diſorderly perſons, declared to be not to the injury of *the king*, as invading his peculiar privilege, but to the prejudice of *noblemen*, *gentlemen*, and *lords* of *manors*, and *others*, *owners of warrens*. But what prejudice could ariſe to noblemen and gentlemen, if ſuch perſons had not any *right* to take or kill game? If they themſelves could not lawfully enjoy it, but ſtood merely in the condition of perſons *exempted* from *additional* penalties inflicted on ſuch diſorderly perſons as are the immediate objects of the act, how, with any ſort of truth or propriety, could it be affirmed of them, that they were the perſons whoſe property or whoſe privileges were violated or infringed? If we are to conſult the motives of the legiſlature and the policy of the ſtatute, thoſe motives and that policy unqueſtionably were, to preſerve the game to the perſons deſcribed in the preamble of the ſtatute, and to ſuperadd ſuch limitations to the general right to kill game as are therein particularly ſtated. It has been farther alleged, that there is a fallacy in one of the principal arguments which the learned commentator has adopted for enforcing his doctrine with reſpect to the game-laws. That the ſole right of taking and deſtroying game belongs excluſively to the king, appears, we are told, from this; that "he may grant to his ſubjects an excluſive right of taking them, which he could not do unleſs ſuch a right was firſt inherent in himſelf. But here the learned writer omits to diſtinguiſh between "the *grant of an original right*," and "the qualifying by certain reſtrictions a right *previouſly poſſeſſed*."

No admirer, it is ſaid, of a manly, liberal, well-regulated ſyſtem, of public freedom, will be forward to aſſert, that the laws for the preſervation of game do not require to be very thoroughly reviſed. They certainly depart more widely from the line of genuine political juſtice, and expoſe the humble unqualified claſſes of the community more to the hazard of puniſhment and the oppreſſion of power, than any rational advocate of *moral* equality can conſiſtently approve. Their penalties are alſo infinitely too ſevere. That the puniſhment of death ſhould in any caſe be inflicted on an act which in itſelf violates no rule of religion, juſtice, or morality, is a reflection from which the mind revolts with pain and horror. Where is the wrong to individuals that demands ſuch an atonement? Where is the injury to ſociety which requires ſuch an example? That the act of deſtroying game is not *malum in ſe* is evident; for if it were, the legiſlature could not licenſe it. Not only the want of true wiſdom, but the want of common juſtice in theſe ſtatutes, requires the moſt earneſt and attentive conſideration in thoſe who adminiſter in the government of the ſtate. "When the legiſlature ſhall turn its attention to the reviſion of our penal ſtatutes, thoſe which reſpect the preſervation of game will without doubt receive that ſhare of correction which they ſo much need. At preſent the civil penalties which they impoſe are inordinately ſevere and oppreſſive. That they ſhould originally have crept into our code, as they did, at a period when the rights of the ſubject, being neither greatly regarded nor well underſtood, were without much ceremony fettered with reſtrictions, is not ſurpriſing; but that they ſhould be ſuffered to reproach our ſtatute-book in an age when freedom, refined by ſcience, boaſts the enlargement of her empire; when the political and moral rights of all orders of men are ſubmitted to the teſt of reaſon and the touchſtone of philoſophy, and a "patriot ſovereign" ſanctions thoſe rights by his ſupport, and protects them by his power; that at ſuch a period the ſpirit of hardſhip and injuſtice ſhould diſplay itſelf ſo conſpicuouſly in this part of our penal ſyſtem, reflects a diſhonour on our conſtitution, from which its conſiderate admirers muſt moſt ardently wiſh it relieved."

In the preſent ſtate of the game laws, perſons exempted from the penalties which they inflict for killing game, are not only liable to actions of treſpaſs by the owners of the land, but alſo, if they kill game within the limits of any royal franchiſe, they are liable to the actions of ſuch who may have the right of chaſe or free warren therein. Upon the whole it appears, that the king, by his prerogative, and ſuch perſons as have, under his authority, the royal franchiſes of chaſe, park, free warren, or free fiſhery, are the only perſons who may acquire any property, however fugitive and tranſitory, in theſe animals, *feræ naturæ*, while living; which is ſaid to be veſted in them, *propter privilegium*. Moreover, ſuch perſons as may thus lawfully hunt, fiſh, or fowl, *ratione privilegii*, have only a qualified property in theſe animals; it not being abſolute or permanent, but laſting only ſo long as the creatures remain within the limits of ſuch reſpective franchiſe or liberty, and ceaſing the inſtant they voluntarily paſs out of it. Although no man can come upon another man's ground to kill game, without being liable to an action of treſpaſs; and though the common law allows of the hunting of foxes and badgers, being beaſts of prey, in another man's ground, becauſe the deſtroying of them is looked upon as a public benefit; yet in this caſe the digging and breaking of the ground to unearth them is held to be unlawful, and the owner of the ground may maintain an action of treſpaſs. It is held, however, that if a man ſtarts any game within his own grounds, and follows it into another's, and kills it there, the property remains in himſelf; and this is grounded on reaſon and natural juſtice; for the property conſiſts in the poſſeſſion, which poſſeſſion commences by the finding it in his own liberty, and is continued by the immediate purſuit. (11 Mod. 75. Puff. Q. N. l. 4. c. 6.) Thus, alſo, if a ſtranger ſtarts game in one man's chaſe or free warren, and hunts it into another's liberty, the property continues in the owner of the chaſe or warren; this property ariſing from privilege, and not being changed by the act of a mere ſtranger. (L. Raym. 251.) Or, if a man ſtarts game on another's private grounds, and kills it there, the property belongs to him in whoſe ground it was killed, becauſe it was alſo ſtarted there; this property ariſing *ratione ſoli*. (L. Raym ibid.) Whereas if, after being ſtarted there, it is killed in the grounds of a third perſon, the property belongs not to the owner of the firſt ground, becauſe the property is local; nor yet to the owner of the ſecond, becauſe it was not ſtarted in his ſoil; but it reſts in the perſons who ſtarted and killed it, though guilty of a treſpaſs againſt both the owners. (Farr. 18. L. Raym. ibid.)

As the ancient laws relating to game are ſtill in force, it is deemed neceſſary to ſtate, as conciſely as poſſible, the proviſions contained in them.

The firſt qualification relating to game was eſtabliſhed by 13 Ric. II. ſtat. 1. cap. 13. which enacted that no layman, who hath not lands or tenements of 40*s*. a year, nor clergyman without preferment of 10*l*. a year, ſhall keep any greyhound or other dog for hunting, nor uſe ferrets, nets, and other engines for deſtroying game, on pain of a year's impriſonment. See alſo 16 Geo. III. c. 30.

By a ſtatute in 33 Hen. VIII. cap. 6. it is enacted, that no perſon ſhoot with, nor keep in his houſe, any croſs-bow or ſtone-bow, hand-gun or hagbut, under the length of one yard, unleſs he have lands, tenements, annuities, or offices, of the yearly value of 100*l*. on pain of a forfeiture of 10*l*. for every offence: nor ſhall any perſon travel with a croſs-bow bent, or gun charged, or ſhoot within a quarter of a mile of a city or town, except at a dead mark, or in defence of his houſe, under the like forfeiture, to be divided between the king and the proſecutor. This act continues ſtill in force, though the object of it, which was the encouragement of the uſe of the long-bow, doth not now exiſt.

None under the degree of a baron ſhall ſhoot with any hand-gun, within a city or town, or ſhoot at any fowl whatever with hail-ſhot on the ſame forfeiture. (2 and 3 Edw. VI. c. 14.) This act was repealed by 6 and 7 Will c. 13.

Any perſon ſhooting in the night-time, or diſguiſe, ſhall be deemed a felon, if he deny; if he confeſs, he is fineable at the next general ſeſſions. (1 Hen. VII. cap. 7.) This ſtatute is ſuperſeded by the *Black Act*, 9 Geo. cap. 22. No perſon ſhall take any partridge or pheaſant by nets, &c. on the freehold of another perſon, without leave of the owner, under the penalty of 10*l*., half to him that ſues, and half to the owner of the ground. 11 Hen. VII. cap. 17.

No perſon ſhall keep any net, called deer-hays or buck-ſtalls, on pain of 10*l*. a month. (19 Hen. VII. cap. 11.) None ſhall break into an impaled park or incloſed ground and chaſe out and kill any deer, under the penalty of 10*l* to the party aggrieved, or treble damages and coſts, and finding ſureties for ſeven years. 5 Eliz. cap. 21. explained and amended by 3 Jac. cap. 13. and 7 Jac. cap. 13. If any perſon, of what eſtate or condition ſoever, ſhall take, kill, or deſtroy any pheaſants or partridges in the night-time, and be convicted thereof at the aſſizes, ſeſſions, or leet, he ſhall forfeit for every pheaſant 20*s*. and for every partridge 10*s*. half to him that ſhall ſue, and half to the lord of the manor. (23 Eliz. cap. 10). None ſhall kill or take pheaſants or partridges, with any net or engine, in the night-time, on forfeiture of 20*s*. for every pheaſant, and 10*s*. for every partridge, 33 Eliz. None ſhall hunt or hawk with ſpaniels in ſtanding corn, or before it be ſhocked, unleſs on his own ground, on the penalty of 40*s*. half to the king, and the other half to the proprietor of the ground.

He that is convicted of killing or taking a pheaſant, partridge, duck, heron, hare, or other game; or of taking and deſtroying the eggs of ſwans, pheaſants, or partridges; ſhall pay 20*s*. for every ſuch fowl, hare, &c. to the uſe of the poor. 1 Jac. I. cap. 27. This act, as far as it relates to hares, is repealed by 48 Geo III. cap. 93.

Every perſon convicted to have kept a greyhound, dog, or net, to kill or take deer, hare, pheaſant, or partridge, unleſs he have inheritance in his own right, or the right of his wife, of 10*l*. per annum, a leaſe for life of 30*l*. per annum, or be worth 200*l*. in goods, or be the ſon of a knight or lord, or the ſon and heir apparent of an eſquire, and be convicted thereof by confeſſion, on oath of two witneſſes before two juſtices, ſhall be committed to gaol for three months, unleſs he pay 20*s*. for the uſe aforeſaid, or after one month after his commitment become bound with two ſureties not to offend in like manner. This was the ſecond qualification by eſtate or degree for killing game. Nor ſhall any fell, or buy to ſell again, any deer, hare, pheaſant or partridge, on pain of 40*s*. for every deer, 10*s*. for every hare, and 20*s*. for every pheaſant or partridge, half to him that will ſue, and half to the poor. Id. ſtat. cap. 27.

The next qualification relates to deer and conies only: this forbids a perſon not having hereditaments of 40*l*. a year, or goods of 200*l*. value, from uſing any gun or bow to kill deer or conies, or from keeping nets or coney dogs, except he hath incloſed grounds, uſed for the keeping of deer or conies, in which the increaſe of the conies amounts to 40*s*. a year, or be a keeper or warrener, under the penalty of having his guns, nets, &c. liable to be taken away by any perſon having lands or hereditaments of 100*l*. a year in fee or for life. 3 Jac. I. cap. 13.

The lord of a manor, or one having inheritance of 40*l*. per annum, lives-eſtate of 80*l*. or goods worth 400*l*. or their ſervants licenſed by them, may take pheaſants or partridges

tridges within their own lands or precincts, in the day-time, between Michaelmas and Chriſtmas. 7 Jac. I. cap. 11.

Hawking of pheaſants and partridges betwixt the firſt of July and the laſt of Auguſt is prohibited, under the penalty of 40*s.* for every ſuch hawking, and 20*s.* for every pheaſant or partridge deſtroyed. 7 Jac. cap. 11.

They that kill or take away any red or fallow deer, without conſent of the owner, ſhall forfeit 20*l.* to be taken by diſtreſs; one half to the owner, and the other to the informer; or, for want of ſuch diſtreſs, ſhall ſuffer a year's impriſonment. 13 Car. II.

Lords of manors, or other royalties, not under the degree of eſquire, may commiſſion one or more game-keepers who may ſeize all guns, dogs, bows, &c. of perſons not having eſtates, in their own or wife's right of 100*l.* per annum freehold, or for term of life; or 150*l.* per annum leaſehold, for ninety-nine years or upwards; or not being ſons and heirs of eſquires, or other perſons of higher degree; or owners or keepers of a foreſt, park, chaſe, or warren; and deſtroy, or convert ſuch guns, &c. to the uſe of the lord, 22 and 23 Car. II. cap. 25. For this purpoſe it has been judged neceſſary to have a warrant from a juſtice of peace, after information and oath of the offence firſt made. This is the laſt general qualification for killing game, and that which is now moſt to be regarded.

If any enter a coney-warren, uſed and kept for the breeding or keeping of conies, though not incloſed, and chaſe or kill conies, he ſhall forfeit treble damages, and be impriſoned three months: and they that kill conies in the night time upon the borders of warrens, or grounds uſed for keeping conies, ſhall be amerced at the diſcretion of the juſtice of peace, and pay down for the uſe of the poor any ſum not exceeding 10*s.* Id. ſtat.

By 16 G. III. c. 30. (which repeals in whole or in part 9 former acts relating to the ſubject of deer-ſtealing); and by 42 G. III. c. 107. (which repeals the firſt act of the 16 G. III.) it is enacted as follows: If any perſon ſhall courſe or hunt, or ſhall take in any ſlip, nooſe, toyle, or ſnare, or ſhall kill, wound, or deſtroy, or ſhall ſhoot at, or otherwiſe attempt to kill, wound, or deſtroy, or ſhall carry away any red or fallow deer, in the incloſed part of any foreſt, chaſe, purlieu, or ancient walk, or in any incloſed park, paddock, wood, or other incloſed ground, where deer are, have been, or ſhall be uſually kept, without the conſent of the owner, or without being otherwiſe duly authorized; or ſhall be aiding, abetting, or aſſiſting, every perſon ſo offending ſhall be guilty of felony, and adjudged to be tranſported for ſeven years. And every perſon who ſhall commit any of the ſaid offences in the unincloſed part of any ſuch foreſt or other ground, or ſhall be abetting, ſhall for every ſuch offence forfeit 50*l.*: and if the offender ſhall be a keeper of, or intruſted with the cuſtody or care of ſuch deer, he ſhall forfeit double. The proviſions of the 16 G. III. c. 30. reſpecting the ſeizing and conviction of offenders, and the recovery and application of penalties, and the appeal, &c. are extended to the 42 G. III. c. 107. See DEER-*Stealers*.

In caſe any hare, partridge, pheaſant, fiſh, fowl, or other game ſhall be found in any offender's houſe, he ſhall forfeit a ſum not leſs than 5*s.* nor more than 20*s.* to be levied by diſtreſs, half to the informer, and half to the poor; or, in want thereof, he ſhall be committed to the houſe of correction for a ſpace of time not greater than a month, nor leſs than ten days. And if any perſon, not qualified by law, ſhall keep or uſe any bows, greyhounds, ſetting dogs, ferrets, tumblers, ſnares, &c. he ſhall be ſubject to the ſame penalties. 4 and 5 Will. cap. 23.

If any higler, chapman, carrier, inn-keeper, or victualler, ſhall have in his keeping any hare, pheaſant, partridge, heath game, or growſe, not put in his hands by a perſon qualified by law, he ſhall forfeit 5*l.* for every ſuch hare, &c. half to the informer, and half to the poor, to be levied by diſtreſs; or, for want thereof, he ſhall be ſent to the houſe of correction for three months for the firſt offence, and for every other offence four months. 5 Anne, cap. 14.

If any perſon, whether he be qualified or not, ſhall ſell, or expoſe to ſale any hare, pheaſant, partridge, moor, heath game, or growſe, he ſhall be liable to the ſame penalty. 28 Geo. II. cap. 12.

Perſons not qualified, keeping greyhounds, lurchers, ſetting-dog, or engines to deſtroy game; and game-keepers, who, under colour of office, kill and ſell game without their maſter's knowledge; are liable to the like penalty. 5 Anne, cap. 14.

No lord of the manor is to appoint more than one game-keeper, and his name to be entered with the clerk of the peace, who is to give a certificate thereof; otherwiſe he is liable to the penalties againſt higlers. And if any other game-keeper, whoſe name is not ſo entered, who ſhall not be otherwiſe qualified by the laws of this kingdom to kill game, ſhall kill, ſell, or expoſe to ſale any hare, pheaſant, partridge, moor, heath-game, or growſe, he ſhall, on conviction before one juſtice, and on the oath of one witneſs, be liable to the ſame penalty for the firſt offence, and for every other offence to be ſent to the houſe of correction for four months. 5 and 9 Anne, cap. 25.

If any hare, pheaſant, &c. be found in the poſſeſſion of a perſon not qualified, unleſs he be entitled to it by ſome perſon that is qualified, the ſame ſhall be adjudged an expoſing it to ſale. Perſons deſtroying a hare in the night ſhall incur the forfeiture of 5*l.* 9 Anne, c. 25. 28 G. II. c. 12.

Any juſtice of the peace, and lord within his manor, may take away ſuch hare, &c. found in the cuſtody of a perſon not qualified; and any perſon that ſhall deſtroy, ſell, or buy any hare, &c. and ſhall in three months diſcover any higler, carrier, victualler, &c. that hath bought or ſold, or offered to buy or ſell, or had in their poſſeſſion any hare, &c. ſhall be diſcharged of the penalty annexed to his own offence, and receive the ſame benefit as any other informer. 5 Anne, cap. 14.

No lord of a manor ſhall appoint a game-keeper with power to kill or deſtroy game, unleſs he be qualified by the laws of the realm, be truly a ſervant of ſuch lord, or be immediately employed to kill game for the ſole uſe of ſuch lord; nor ſhall any lord authorize a perſon not qualified to keep or uſe gun, greyhounds, &c. and ſuch perſon as ſhall be found offending in either of theſe points, ſhall, for every offence, forfeit 5*l.* (3 Geo. I. cap. 11. repealed by 48 Geo. III. cap. 93.) If any perſon enter a park, paddock, or other incloſed ground where deer are uſually kept, and wilfully wound or kill any red or fallow deer, he ſhall be tranſported to the plantations for ſeven years. 5 Geo. I. See BLACK *Act*. See alſo DEER-*Stealers*.

If any perſon ſhall by hays, tunnels, or other nets, drive and take any wild duck, teal, widgeon, or any other water-fowl, in any place of reſort for wild fowl in the moulting ſeaſon between June 1 and Oct. 1, yearly, he ſhall, on conviction, forfeit for every ſuch fowl 5*s.* half to the informer, and half to the poor, by diſtreſs, or be committed to the houſe of correction for a time not exceeding one month, nor leſs than fourteen days: and the nets ſhall be ſeized and deſtroyed in the preſence of the juſtice. (9 Anne, cap. 25. 10 Geo. II. cap. 32.) And perſons deſtroying the eggs of any duck, teal, or other water-fowl, from March 31 to June 30, ſhall be liable to a year's impriſonment, or forfeiture of one penny for every egg. 25 Hen. VIII. cap. 11.

No perſon ſhall, on any pretence whatſoever, take, kill, carry, ſell, buy, or have in his poſſeſſion or uſe, any partridge,

between Feb. 1 and Sept. 1 (39 G. III. c. 34.); or any pheaſant, between Feb. 1 and Oct. 1. yearly; on pain of forfeiting, on conviction by one witneſs in any of the courts of record at Weſtminſter, 5*l.* for every ſuch fowl, with full coſts. 2 Geo. III. cap. 19.

And if any perſon ſhall ſhoot at, kill, or take any dove-houſe, or pigeon, and be convicted by confeſſion, or oath of one witneſs, before one juſtice, where the offence was committed, or the party apprehended, he ſhall forfeit 20*s.* to the proſecutor, or be committed to gaol or the houſe of correction for a time not exceeding three calendar months, nor leſs than one. Id. ſtat.

If any perſon ſhall knowingly or wilfully kill, take, or deſtroy, or uſe any gun, dog, ſnare, net, or other engine, with intent to kill, take, or deſtroy any hare, pheaſant, partridge, moor game, or heath game, in the night between the hours of ſeven at night and ſix in the morning, from the 12th day of October to the 12th day of February; and between the hours of nine at night and four in the morning, from the 12th day of February to the 12th day of October; or in the day-time, upon a Sunday or Chriſtmas-day; he ſhall, on conviction by oath of one witneſs, before one juſtice, forfeit for the firſt offence a ſum not exceeding 20*l.* nor leſs than 10*l.*; for the ſecond offence not more than 30*l.* nor leſs than 20*l.*; and for the third and every ſubſequent offence 50*l.*; each penalty to be levied by diſtreſs, and to be paid half to the informer, and half to the poor. In caſe of refuſal of payment of the fine of 50*l.* the offender ſhall be committed to the houſe of correction for no leſs than ſix, nor more than twelve calendar months, unleſs ſuch penalty ſhould be ſooner paid; and the offender may be once publicly whipped, if the juſtices think proper. (13 Geo. III. cap. 80.) And, moreover, by 39 and 40 G. III. c. 50. idle and diſorderly perſons, to the number of two or more, who ſhall deſtroy any pheaſant or partridge in the night; or who ſhall be found in any paddock, foreſt, chaſe, &c. between 8 at night and 6 in the morning, from Oct. 1 to Feb. 1, or between 10 at night and 4 in the morning from Feb. 1 to Oct. 1, having any inſtrument for the purpoſe, and with the intent of taking or deſtroying any hare, black or red game, or any of their abettors, &c. ſhall be deemed rogues and vagabonds within the meaning of 17 Geo. II. c. 5.

No perſon ſhall take, deſtroy, carry, ſell, buy, or have in his poſſeſſion any heath fowl, called black game, between Dec. 10 and Aug. 20; nor any growſe, commonly called red game, between Dec. 10 and Aug. 12; nor any buſtard, between March 1 and Sept. 1, in any year, on pain of forfeiting for the firſt offence any ſum not exceeding 20*l.* nor leſs than 10*l.* and for the ſecond, and every ſubſequent offence, not exceeding 30*l.* nor leſs than 20*l.* half to the informer, and half to the poor. (13 Geo. III. cap. 55.) And perſons taking or killing in the New Foreſt any black game between Dec. 10 and Sept. 1, ſhall be liable to the ſame forfeiture. (43 Geo. III. c. 112.) See Fishing, Hawking, Herons, Swans, &c.

By 25 Geo. III. c. 50. every perſon who ſhall uſe any dog, gun, net, or other engine for the taking or deſtruction of game (not acting as a game-keeper) ſhall previouſly deliver in a paper or account in writing, containing his name and place of abode, to the clerk of the peace of the county where he ſhall reſide, and annually take out a certificate thereof, upon which ſhall be charged a ſtamp-duty of 2*l.* 2*s.*: and by 31 Geo. III. cap. 21. 1*l.* 1*s.* more—total 3*l.* 3*s.* Such certificate, iſſued by the clerk of the peace, and bearing date on the day of its being iſſued, ſhall continue in force until the 1ſt day of July next following its date, for which the clerk of the peace ſhall receive 1*s.* for his trouble. And if he ſhall iſſue any certificate otherwiſe than as above ſet forth, or neglect or refuſe to deliver it, he ſhall forfeit 20*l.*, and moreover be liable to pay the duty on ſuch certificate. And if any perſon ſhall uſe any greyhound, hound, pointer, &c. or any gun, net, or other engine, for the taking or deſtruction of any hare, pheaſant, partridge, black or red game, or any other game whatſoever, without having obtained ſuch certificate, he ſhall forfeit 20*l.* A perſon who has obtained a certificate may demand from a perſon uſing any dog, gun, net, or other engine, for the taking or deſtruction of game, an inſpection of his certificate; and if ſuch perſon refuſe to produce it, or to give in his chriſtian and ſurname, and the place of his reſidence, or give in a fictitious name or place of reſidence, he ſhall forfeit 50*l.* But ſuch certificate ſhall not authorize killing game at unlawful times, nor by unqualified perſons. Liſts of ſuch certificates ſhall on or before the 1ſt day of Auguſt in each year be tranſmitted by the clerks of the peace to the head-office of ſtamps; and in every caſe of failure or error they ſhall forfeit 20*l.* Such liſt ſhall be kept at the ſaid office for inſpection; and the commiſſioners ſhall cauſe the ſame to be inſerted in the news-papers circulating in each reſpective county, or in ſuch public news-paper as to them ſhall ſeem moſt proper. Appeals may be made to the next ſeſſions. By 48 Geo. III. c. 55. on every perſon, who ſhall uſe any dog, gun, net, or other engine, for the purpoſe of taking or killing any game whatever, or any woodcock, ſnipe, quail, or landrail, or any conies, if ſuch perſon be a ſervant to any perſon thereby charged in reſpect of ſuch ſervant to the duties granted on ſervants by this act, ſhall be charged the annual ſum of 1*l.* 1*s.*; and if ſuch perſon be not a ſervant, 3*l.* 3*s.*; and upon every other perſon ſhall be charged the annual ſum of 3*l.* 3*s.*

Game, *Black*. See Grouse.

Game-*cock*. See Cock.

Game, *Red*. See Gor-*cock*.

Game, *White*. See Ptarmigan.

Game-*keeper*, is one who has the care of keeping and preſerving the game, being appointed thereto by the lord of a manor. See Game.

By 25 Geo. III. cap. 5. every deputation of a game-keeper ſhall be regiſtered with the clerk of the peace of the county where the manor ſhall lie, and ſuch game-keeper ſhall take out a certificate thereof annually, upon which ſhall be charged a ſtamp-duty of 10*s.* 6*d.*: and by 31 Geo. III. cap. 21. 10*s.* 6*d.* more—total 1*l.* 1*s.* By 48 Geo. III. cap. 149. the annual duty for the deputation of a game-keeper is 1*l.* 10*s.* A game-keeper, who, having obtained a deputation, ſhall for 20 days afterwards refuſe or neglect to regiſter the ſame, and take out a certificate, ſhall forfeit 20*l.* But no ſuch deputation and certificate ſhall authorize any ſuch game-keeper to take or deſtroy game out of the limits of the manor for which ſuch deputation was given. Such game-keeper muſt be a ſervant of the lord of the manor who appoints him, or be immediately employed for him. A perſon not thus qualified is liable to a forfeiture of 5*l.* if under colour of a deputation, &c. he take and kill any hare, pheaſant, partridge, or other game, or keep or uſe any greyhound, &c. ſetting dogs, hays, lurchers, guns or any other engine to kill the game.

GAMELIA, Γαμήλια, a nuptial feaſt, or rather ſacrifice, held in the ancient Greek families on the day before a marriage. It was thus called from γάμος, *marriage*; whence alſo Γαμηλίος, an epithet, or ſurname, given to Jupiter and Juno, conſidered as preſiding over marriages.

GAMELION, Γαμηλιων, in *Ancient Chronology*, the eighth month of the Athenian year. It contained twenty-nine days,

and anſwered to the latter part of our January, and the beginning of February.

This month had its name from being ſacred to Jupiter and Juno, diſtinguiſhed by the epithet Γαμηλιος, becauſe they preſided over marriages.

GAMELION, or *Gamelium*, a poem, or compoſition in verſe, on the ſubject of a marriage; more uſually called an epithalamium.

GAMELORA, in *Geography*, a ſmall iſland in the Mediterranean, near the N.E. coaſt of Tunis; 3 miles E. of cape Zibeeb.

GAMELSBACH, a town of Germany, in the county of Erbach; 7 miles E. of Erbach.

GAMESFIELD, a town of Franconia; 5 miles S.W. of Rothenburg.

GAMET, or *Old Mendoe*, a ſmall iſland in the North ſea, belonging to Denmark, 3 miles from the continent. N. lat. 55 20'. E. long. 8 30'.

GAMETRIA. See GEMATRIA.

GAMGO, in *Geography*, a river of Africa, which runs into the Coanza, 15 miles S. E. of Meopongo.

GAMING, the art or act of performing or practiſing a game, particularly a game of hazard.

All public gaming is ſeverely prohibited; and what money is thus loſt, is recoverable again by law.

In China, gaming is equally prohibited among the common people and the mandarins; and yet this does not hinder their playing and frequently loſing all they have; their lands, houſes, children, and even wives, which are all ſometimes laid on a ſingle card. F. le Compte.

In gaming, as judge Blackſtone very pointedly obſerves, the ſeveral parties engaged caſt lots to determine upon whom the ruin ſhall at preſent fall, that the reſt may be ſaved a little longer. Taken in any light, this is an offence of the moſt alarming nature; tending by neceſſary conſequence to promote public idleneſs, theft, and debauchery among thoſe of a lower claſs; and, among perſons of a ſuperior rank, it hath frequently been attended with the ſudden ruin and deſolation of ancient and opulent families, an abandoned proſtitution of every principle of honour and virtue, and too often hath ended in ſelf-murder. To this paſſion every valuable conſideration has been made a ſacrifice; and it is a paſſion which has lamentably prevailed in our own country, and which we ſeem to have derived from our anceſtors the ancient Germans; who, according to the account given of them by Tacitus (De Mor. Germ. c. 24.), were bewitched with the ſpirit of play to a moſt exorbitant degree. "They addict themſelves, ſays he, to dice (which is wonderful) when ſober, and as a ſerious employment; with ſuch a mad deſire of winning or loſing, that, when ſtripped of every thing elſe, they will ſtake at laſt their liberty, and their very ſelves. The loſer gives into a voluntary ſlavery, and, though younger and ſtronger than his antagoniſt, ſuffers himſelf to be bound and ſold. And this perſeverance in ſo bad a cauſe they call the point of honour; "ea eſt in re prava pervicacia, ipſi fidem vocant." One would think, ſays the learned judge now cited, that Tacitus was deſcribing a modern Engliſhman. Againſt a ſpirit ſo frantic, laws can be of little avail; becauſe the ſame falſe ſenſe of honour, that prompts a man to ſacrifice himſelf, will deter him from appealing to the magiſtrate. Yet it is proper that reſtricting and puniſhing laws ſhould be enacted, and that they ſhould be publicly announced and repeatedly inculcated, if poſſible to preſerve the unwary, if not to reclaim thoſe who are on the brink of ruin. Accordingly we ſhall here recite ſome of the principal ſtatutes which the wiſdom of the legiſlature has formed with a view of preventing this evil.

By 16 Car. II. cap. 7. if any perſon by playing or betting ſhall loſe more than 100*l.* at one time, he ſhall not be compellable to pay the ſame; and the winner ſhall forfeit treble the value, one moiety to the king, and the other moiety to him that ſhall ſue for it, with treble coſts. By 9 Anne, cap. 14. 18 Geo. II. cap. 34. all notes, bills, bonds, judgments, mortgages, or other ſecurities, given for money won by playing at cards, dice, tables, tennis, bowls, or other games, or by betting on the ſides of ſuch as play at any of thoſe games, or for repayment of any money knowingly lent for ſuch gaming or betting, ſhall be void: and where lands are granted by ſuch mortgages or ſecurities, they ſhall go to the next perſon who ought to have the ſame, as if the granter were actually dead, and the grants had been made to the perſon ſo intitled, after the death of the perſon ſo incumbering the ſame. If any perſon playing at cards, dice, or other game, or betting, ſhall loſe the value of 10*l.* at one time, to one or more perſons, and ſhall pay the money, he may recover the money loſt by action of debt within three months afterward: and if the loſer does not ſue, any other perſon may do it and recover the ſame, and treble the value with coſts, one moiety to the proſecutor, and the other to the poor; and the perſon proſecuted ſhall anſwer upon oath, on preferring a bill in equity to diſcover what ſums he hath won. And in any of theſe ſuits no privilege of parliament ſhall be allowed.

Perſons by fraud or ill practice, in playing at cards, dice, or by bearing a ſhare in the ſtakes, &c. or by betting, winning any ſum above 10*l.* ſhall forfeit five times the value of the thing won, and ſuffer ſuch infamy and corporal puniſhment as in caſes of wilful perjury, being convicted thereof on indictment or information; and the penalty ſhall be recovered by action, by ſuch perſon as will ſue for the ſame; and if any one ſhall aſſault and beat or challenge to fight any other perſon, on account of money won by gaming, upon conviction thereof by indictment or information, he ſhall forfeit all his goods, and ſuffer impriſonment for two years. (Stat. 9 Anne.) Alſo by this ſtatute, any two or more juſtices of the peace may cauſe ſuch perſons to be brought before them, as they ſuſpect to have no viſible eſtates, profeſſions, &c. to maintain them; and if they do not make it appear, that the principal part of their expences is got by other means than gaming, the juſtices ſhall require ſecurities for their good behaviour for a twelvemonth, and in default of ſuch ſecurity, commit them to priſon until they find it: and playing or betting during the time, to the value of 20*s.* ſhall be deemed a breach of good behaviour, and a forfeiture of the recognizance. Ibid.

This ſtatute of Anne is farther enforced by ſtat. 18 Geo. II. cap. 34, and ſome deficiencies are ſupplied; the forfeitures of that act may now be recovered in a court of equity: and, moreover, if any man be convicted, upon information or indictment, of winning or loſing at any ſitting 10*l.* or 20*l.* within twenty-four hours, he ſhall be liable to be indicted for ſuch offence in ſix months, either in the king's bench or at the aſſiſes; and being convicted ſhall forfeit five times the ſum won or loſt, which, deducting the charges, ſhall go to the poor. And if any offender ſhall diſcover another offender, the diſcoverer ſhall be diſcharged from all penalties by reaſon of ſuch offence, if not before convicted thereof, and ſhall be admitted as an evidence to prove the ſame. (9 Ann. c. 14.) By ſeveral ſtatutes of the reign of king George II. *viz.* 12 Geo. II. cap. 28. 13 Geo. II. cap 19. and 18 Geo. II. cap. 34. all private lotteries by tickets, cards, or dice, and particularly the games of faro, baſſet, ace of hearts, hazard, paſſage, roly poly, and all other games with dice, except backgammon, are prohibited

hibited under a penalty of 200*l.* for him that ſhall erect ſuch lotteries, &c. and 50*l.* a time for the players. Public lotteries, unleſs by authority of parliament, and all manner of ingenious devices, under the denomination of ſales or otherwiſe, which in the end are equivalent to lotteries, were before prohibited by a great variety of ſtatutes, under heavy pecuniary penalties. 10 and 11 Will. III. cap. 17. 9 Anne, cap. 6. § 56. 10 Anne, cap. 26. § 109. 8 Geo. I. cap. 2. § 36, 37. 9 Geo. I. cap. 19. § 4, 5. 6 Geo. II. cap. 35. § 29, 30.

By 10 and 11 W. c. 17. all lotteries are declared to be public nuiſances; and all grants, patents, and licenſes, for ſuch lotteries, to be againſt law. Any perſon keeping or playing at a lottery ſhall forfeit 500*l.*, one-third to the king, one-third to the poor, and one-third with double coſts to him that ſhall ſue in the courts at Weſtminſter, and the offenders ſhall be proſecuted as common rogues. By 9 Anne, c. 6, any perſon who ſhall ſet up, or publiſh the ſetting up any ſuch unlawful lottery, with intent to have it drawn, ſhall forfeit 100*l.*, one-third to the king, one-third to the poor, and one-third with full coſts to him who ſhall ſue. By 10 Anne, c. 26, any perſon who ſhall keep any office for making inſurances on marriage, births, chriſtenings, or ſervices, or any other office or place under the denominations of ſales, of gloves, fans, &c. for the improvement of ſmall ſums of money, ſhall forfeit 500*l.*, one-third to the king, one-third to the poor, and one-third with full coſts to him who ſhall ſue; and every printer, or other perſon, who ſhall publiſh the ſetting up or keeping of any ſuch office or place, ſhall forfeit 100*l.* in like manner. By 8 Geo. II. c. 2. any perſon who ſhall keep any office or place, under the denomination of ſales of houſes, lands, preſentations to livings, advowſons, plate, jewels, ſhips, goods, &c. for the improvement of ſmall ſums of money; or expoſe to ſale the ſame by way of lottery, or by lots, &c. or publiſh ſchemes for advancing ſmall ſums of money by ſeveral perſons, amounting to large ſums, to be divided among them by the chances of prizes in a public lottery; or ſhall deliver out tickets, entitling them to a ſhare of the money ſo advanced; or ſhall print or publiſh any ſuch ſcheme under any denomination whatever; and ſhall be convicted, on oath of one witneſs, by two juſtices;—ſuch perſon ſhall, over and above any penalties by any former act made againſt private lotteries, forfeit 500*l.*, one-third to the king, one-third to the informer, and one-third to the poor, to be levied by diſtreſs and ſale by warrant of ſuch juſtices, and be by them committed to the county-gaol for one year, and from thence till the ſaid ſum of 500*l.* be paid; and every adventurer in ſuch ſchemes ſhall forfeit double the ſum contributed, with coſts, half to the king, and half to him who ſhall ſue: and by 12 Geo. II. c. 28, ſuch perſon ſhall forfeit 200*l.* Such ſale depending upon any ſhares or lot ſhall be void; and every adventurer ſhall forfeit 50*l.* Any perſon may be ſummoned as a witneſs, notwithſtanding his having played; and in caſe of refuſal to appear, he ſhall forfeit 50*l.*, or be committed to gaol for ſix months, 18 Geo. II. c. 34. By 27 Geo. III. c. 1. all perſons who ſhall deal in lottery tickets or ſhares, without being licenſed, ſhall be deemed rogues and vagabonds within the meaning of the 17 Geo. II. c. 5. and be puniſhed accordingly. By 34 Geo. III. c. 40. on complaint upon oath before one juſtice of any offence committed againſt the act of 27 Geo. III. c. 1. for ſuppreſſing unlawful lotteries in any houſe or place within the juriſdiction of ſuch juſtice, whereby any offenders may be liable to be puniſhed as rogues and vagabonds, doors may be broke open to ſeize ſuch perſons. By 42 Geo. III. c. 119. all games or lotteries called "little-goes" are declared to be public nuiſances; and perſons keeping places for ſuch "little-goes," or other lottery, not authorized by parliament, ſhall forfeit 500*l.* for each offence; and every ſuch perſon ſhall be deemed a rogue and vagabond within 17 Geo. II. c. 5. And perſons employing others to carry on ſuch tranſactions ſhall be puniſhable as rogues and vagabonds. Magiſtrates may authorize perſons to break open doors and ſeize offenders; and the penalty for obſtructing officers is fine, impriſonment, and public whipping at the diſcretion of the court. No perſon ſhall agree to pay money on any contingency in ſuch game or lottery, or publiſh any propoſal for the aforeſaid purpoſes, on pain of 100*l.* for each offence.

The ſtatute 13 Geo. II. c. 19. for preventing the multiplicity of horſe-races, another fund of gaming, directs, that no plates or matches under 50*l.* value ſhall be run, upon penalty of 200*l.* to be paid by the owner of each horſe running, and 100*l.* by ſuch as advertiſe the plate.

Gaming-houſes are public nuiſances, and may upon indictment be ſuppreſſed and fined. (1 Hawk. P. C. c. 8. 225.) Theſe are prohibited under ſevere penalties by ſeveral ſtatutes. No perſon ſhall for his gain or living, keep any common houſe or place of bowling, coyting, cloyſh, cayls, half-bowl, tennis, dicing-table, carding, or any unlawful game, on pain of 40*s.* a day; and every perſon frequenting ſuch houſes and play, and there playing, ſhall forfeit 6*s.* 8*d.* And juſtices of the peace, and the head officers of corporations, have power to enter places ſuſpected of unlawful gaming, and to arreſt and impriſon the keepers and players, till they give ſecurity to keep and reſort to ſuch houſes no longer; and ſuch officers are bound to make ſearch for ſuſpected houſes, weekly or monthly, under a forfeiture of 40*s.* a month. Farther, artificers, labourers, ſervants, &c. are prohibited to play at tables, dice, tennis, cards, bowls, &c. out of Chriſtmas, on pain of 20*s.* and in Chriſtmas only in the houſes or preſence of their maſters. 33 Hen. VIII. cap. 9. By 18 Geo. II. c. 34. no perſon ſhall keep any houſe or place for playing, or permit any perſon within ſuch houſe to play at any prohibited game, with cards or dice, under the penalties of 12 Geo. II. c. 28, above cited. Moreover, gaming in public-houſes is prohibited under a penalty to the keeper of the houſe, who knowingly ſuffers it, of 40*s.* for the firſt offence, and for every other offence 10*l.* by diſtreſs, three-fourths of which ſhall be to the poor, and one-fourth to the informer. And any journeyman, labourer, apprentice, or ſervant, who ſhall game in ſuch a houſe, ſhall forfeit, on conviction by confeſſion, or the oath of one witneſs, not more than 20*s.* nor leſs than 5*s.* at the pleaſure of the juſtice, or be committed to hard labour for a term not exceeding a month. (30 Geo. II. cap. 24.) And by 25 Geo. II. cap. 36. any houſe, or place kept for public dancing, muſic, or other entertainment, in London, or within twenty miles, (except places authorized by letters patent, or licence of the crown, or lord chamberlain,) without licence, granted at the preceding Michaelmas ſeſſions, and ſigned and ſealed by four juſtices in open court, and of which notice is given over the door or entrance of ſuch licenſed place in the following words, *viz.* "Licenſed purſuant to act of parliament of the 25th of king George the Second;" ſhall be deemed a diſorderly houſe or place, and the keeper thereof ſhall forfeit 100*l.* with full coſts. A conſtable, on notice given him in writing by any two inhabitants of the pariſh paying ſcot and lot, of any perſon keeping ſuch diſorderly houſe, and on their making oath to ſuch notice, and entering into a recognizance of 20*l.* each to produce evidence of the offence, ſhall enter into a recognizance of 30*l.* before a juſtice of the peace to proſecute ſuch perſon; and the juſtice ſhall iſſue his warrant for bringing the accuſed perſon before him,

him, and bind him over to appear at the next ſeſſions or aſſizes: if the conſtable neglect or refuſe to comply with ſuch notice, &c. he ſhall forfeit 20*l.* to each of the ſaid inhabitants; and the conſtable ſhall be allowed the reaſonable expences of the proſecution, to be paid by the overſeers of the poor; and on conviction of the offender, the overſeers ſhall pay 10*l.* to each of ſuch inhabitants, on pain of forfeiting double to the ſaid perſons.

Every ſpecies of gaming or gambling is ſtrictly forbidden in the Britiſh army; and occaſionally puniſhed with ſeverity.

The buſineſs of chance or hazard, on which the laws of gaming depend, is of mathematical conſideration; inaſmuch as it admits of more, and leſs. It is, or is ſuppoſed to be, an equality of chance, upon which the gameſters ſet out: this equality is to be broken in upon in the courſe of the game by the greater good fortune or addreſs of one of the parties, upon which he comes to have a better chance; ſo that his ſhare in the depoſit, or ſtakes, is now proportionably more or better than at firſt: this more or leſs is continually varying, and runs through all the ratios between equality and infinite difference; or from an infinitely little difference till it arrives at an infinitely great one, upon which the game is ended. The whole game, therefore, with reſpect to the event or iſſue thereof, is only a change of the quantity of each perſon's ſhare, or chance, or of the proportions their two ſhares bear to each other; which mathematics alone can meaſure.

Hence ſeveral authors have computed the variety of chance in ſeveral caſes and circumſtances that occur in gaming; for a detail of which, and the principles on which the calculations are founded, we refer to the article *Doctrine of* CHANCES. See alſo EXPECTATION and PROBABILITY.

GAMITES LAPIS, the *marriage ſtone*, a ſtone of a very ſingular kind deſcribed by Pliny, and ſome other of the ancients; he ſays it was of a white colour, and that it had in it the figure of two hands mutually infolding one another, which made it a ſymbol of that ſtate. We know nothing of any ſuch ſtone at preſent in the world; and it is eaſy to conjecture, that in Pliny's time either the ſtone muſt have been factitious, or elſe fancy muſt have been very far ſtretched to make the reſemblance.

GAMLING, in *Geography*, a river of Sileſia, which runs into the Oder, nine miles S. of Oderberg.

GAMLITZ, a town of the duchy of Stiria; 11 miles N.N.W. of Marburg.

GAMMA, or GAMMATA *Ferramenta*, an old inſtrument, uſed in *Surgery* for cauteriſing the hydrocele. It was ſhaped like the Greek letter Γ, and is mentioned by Paulus Ægineta.

GAMMACANOR, or GAMMADOUR, in *Geography*, a town of the iſland of Bachian, one of the Moluccas.

GAMMADIUM, a triangular veſtment uſed in the primitive church.

GAMMALAMENA, in *Geography*, a town of the iſland of Ternate, the uſual reſidence of the king.

GAMMARUS, in *Natural Hiſtory*, an extenſive genus of the cancri or crab tribe in the Fabrician ſyſtem, the antennæ of which are pedunculate and very ſimple. See article CANCER.

GAMME, *Fr. Gammut*, *Engl.* or *Gamma-ut*, is a title given to the muſical alphabet, or ſeries of ſounds uſed in practical melody and harmony, aſcending or deſcending in what the Greeks call the Diatonic genus, and the moderns the ſcale of Guido; that is, by tones and ſemitones.

Rouſſeau, who never ſaw the Micrologus of Guido, or any of that ingenious and celebrated monk's original writings, has given the cleareſt and beſt definition of this technical term (gammut) according to the generally received opinion.

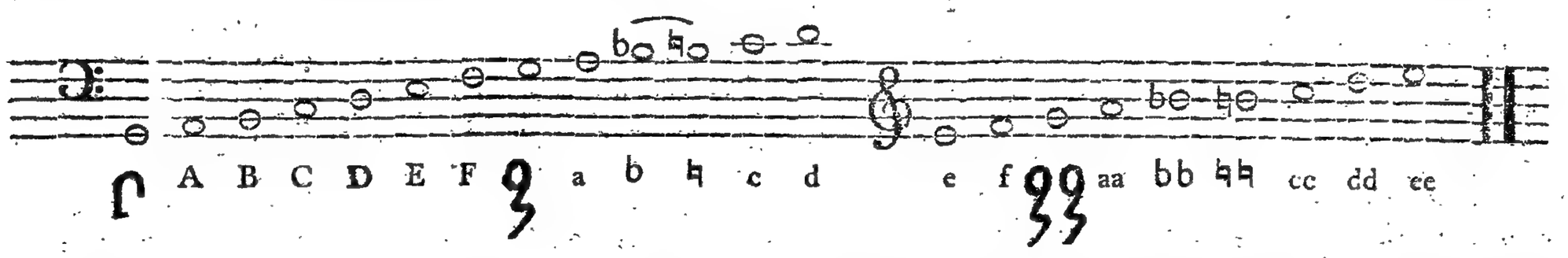
He ſays "the gammut is a table or ſcale invented by Guido d'Arezzo, by which muſical ſtudents learn to name and ſound correctly the intervals of the octave by the ſix ſyllables *ut*, *re*, *mi*, *fa*, *ſol*, *la*, according to all the arrangements that can be given them; which is called ſolmiſation," and which, like the changes on ſix bells, admit of 720 varieties.

The gammut has alſo been called *la mano armonica*, or the harmonic hand, from Guido having drawn the figure of a hand, upon the fingers of which he has arranged the notes, to ſhew the relation which the hexachords bear to the five tetrachords of the Greeks.

This hand appears in almoſt all the old muſical treatiſes in Latin and Italian, till the invention of *ſi* in France, for the ſeventh of the key of C, which has aboliſhed, in that kingdom, the mutations, and, conſequently, the harmonic hand, which taught them. See HARMONIC *Hand*.

Guido, according to the common opinion, having added a tetrachord in the acute to the diagram of the Greeks, and a ſound at the bottom, or rather, according to Meibomius, having by theſe additions reſtored the ancient diagram to its former extent, called this grave ſound (which anſwers to G on the firſt line in the baſe) *hypoproſlambanomenos*, and marked it by Γ, or gamma, the third letter of the Greek alphabet; and this letter being found at the beginning of the ſcale, for what reaſon does not clearly appear, gave birth to the barbarous name of gammut.

In the primitive ſtate of the gammut of Guido he expreſſed the ſounds by letters of the alphabet, without lines and ſpaces, or muſical characters for time; beginning with capitals for the firſt octave, minuſcules for the ſecond, and double letters for the third: as St. Gregory had done in naming the notes called Gregorian. In modern notation, the ſcale of Guido would have the following appearance, with the aſſiſtance of two different clefs, the baſe and the treble.



This gammut, in its whole compaſs, was compoſed of 20 ſounds or notes, that is, of two octaves and a major-ſixth.

As to the ſyllables for naming the notes in ſinging, invented by Guido (ſee SOLMISATION and HEXACHORDS), as he has provided only for ſix of the ſounds, it was neceſſary to make the ſame notes ſerve for different purpoſes, according to the progreſs of the melody; and theſe changes were called *mutations*; which ſee.

But as to the ſyllables *ut*, *re*, *mi*, *fa*, *ſol*, *la*, taken from a hymn

hymn to St. John the Baptiſt (ſee HYMN), they are only uſed in ſinging. See HEXACHORDS.

In conſulting the beſt elementary writers on muſic for a model of ſuch a gammut as could be underſtood without a maſter, or, at leaſt, be ſooneſt learned with his aſſiſtance, we were unable to find one that would not diſcourage an incipient ſtudent by its form and inſertion of the tenor clef.

The gammut which Graſſineau calls Guido's, and Rouſſeau the Italian gammut, is ſpread upon 10 lines and ſpaces, in ſuch a manner as a muſical ſtudent, far advanced, will never find in a muſic-book, and will perplex him as much as a firſt leſſon, or as it would a young arithmetician by giving him a ſum in the rule of three before he had learned addition.

We ſhall give the following elements on a plate in the order which long experience has found to be the moſt uſeful and eaſily comprehended in the firſt ſtages of practical muſic.

1. The regular ſeries of natural ſounds, from the bottom of the piano-forte to the top, that are compriſed within the ſtaff from gammut, or G on the firſt line in the baſe, to *g*, fifth ſpace in the treble, in the two moſt common and neceſſary clefs, the baſe and treble. See CLEFS.

2. The notes below and above the ſtaff, or regular lines.

3. Flats, ſharps, and naturals.

4. The time-table.

5. Characters of expreſſion; as the ſlur, different kinds of bowing.

6. Graces; as the ſhake, beat, and trill.

7. Tenor clefs, with the baritono clef, or baſe clef on the third line, and the French clef, or G clef on the firſt line.

In the biographical article aſſigned to Guido, we ſhall enter more at large into the hiſtory of the gammut, and inquire into the validity of the ingenious monk of Arezzo's claims to many other muſical inventions of which tradition has gratuitouſly made him a preſent. See GUIDO and MICROLOGUS.

GAMMER-LAMB. See GIMMER-*lamb*.

GAMMING, in *Geography*, a town of Auſtria; 10 miles E.S.E. of Bavarian Waidhofen.

GAMMING, *Markt*, a town of Auſtria; 10 miles E. of Bavarian Waidhofen.

GAMMO, a town of Africa, on the Ivory coaſt.

GAMMON, POINT, called formerly *Point Gilbert*, forms the eaſtern ſide of the harbour of Hyenis or Hyennes, in Barnſtable county, Maſſachuſetts.

GAMMONING, on *Ship-board*, are ſeveral turns of rope taken round the bowſprit, and reeved through holes in the knees of the head, for the greater ſecurity of the bowſprit.

GAMMUT. See GAMME.

GAMRY HEAD, on *Geography*, a cape of Scotland, on the N. coaſt of Bamffſhire, 6 miles E. of Bamff. N. lat. 57° 36'. W. long. 2° 20'.

GAN, a city of China, of the firſt rank, and metropolis of Se-tchuen. N. lat. 31° 16'. E. long. 103° 30'. Alſo, a city of China, of the ſecond rank, in the province of Pe-tcheli; 70 miles S.S.W. of Pekin. N. lat. 38° 54'. E. long. 115° 29'.

GANACHES, in the *Manege*, are the two bones, one on each ſide of the hinder part of the head, oppoſite to the neck, or onſet of the head, which form the lower jaw, and give it motion. It is in this place that the glands or kernels of the ſtrangles, and the glanders, are placed.

GANADO, in *Geography*, a town of Africa, in Bondou; 60 wiles W.S.W. of Fatteconda.

GANANOQUE, called alſo *Ganeno-coui*, a river of Upper Canada, which diſcharges itſelf into the river St. Laurence, in the townſhip of Leeds. In the mouth of the river there is an excellent harbour, the water in the channel being from 12 to 15 feet deep, and the current ſlow. This river was called the Thames before the diviſion of the province of Quebec.

GANARA, a country of Africa, in which is a town of the ſame name; ſituated on the banks of the Niger. The country is fertile and populous; the articles of its commerce are gold, ſenna, and ſlaves. N. lat. 12° 20'. E. long. 16°.

GANARASKA, a river of Upper Canada, by ſome called *Petueteſcoutiang*, which runs into lake Ontario on the N. ſide, eaſtward of Petit Eſcors, and W. of Pointe aux Chevaux. A carrying place of about 11 miles lies from the mouth of this river to the Rice lake, through a country well adapted for making a road.

GANAT, a town of Africa, in the country of Sahara, inhabited by the Tuerick; 200 miles S. of Mourzouk. N. lat. 24° 40'. E. long. 13° 56'.

GANAT-*ſur-Loire*, or *Gannat*, a town of France, and principal place of a diſtrict, in the department of the Allier, on the Loire; 15 miles N.E. of Moulins. The town contains 5043, and the canton 12,521 inhabitants, on a territory of 192½ kiliometres, in 12 communes.

GANCHE, *Fr.* derived from the Italian *ganus*, *hook*, a kind of gallows or gibbet uſed for the puniſhment of criminals in Turkey. The executioner raiſes the condemned by means of a pulley, and, ſuddenly ſlackening the rope, lets them fall on hooks of iron, which entangle and rend their bodies: in this condition they are left to die, and ſome have been known to languiſh for two or three days.

GAND, in *Geography*. See GHENT.

GANDAMUS, in *Ancient Geography*, a town of Arabia Felix, upon the Red ſea. Pomp. Mela.

GANDARA, a town of India, in the country called Gandarica by Steph. Byz.; different from the Gandarides of Pliny and Ptolemy, near the mouth of the Ganges.

GANDARUSSA, or GANDEROSA, in *Botany*, the Malay name of a ſpecies of *Juſticia*, *J. Gandaruſſa*, Linn. Suppl. 85, under which that plant is much celebrated in the popular ſongs of Java.

GANDASULL, GANDASULIUM, Rumph. Amb. v. 5. 175. t. 69. f. 3. See HEDYCHIUM *Coronarium*.

GANDE, in *Geography*, a river of Germany, which runs into the Lune; four miles W.S.W. of Ganderſheim.

GANDELI, a town of Italy; 20 miles N.E. of Bergamo.

GANDERSHEIM, a town of Germany, in the principality of Wolfenbuttel, ſituated on the river Gande, and having a celebrated abbey of Proteſtants, under the direction of an abbeſs, who is a princeſs, and four ladies of noble families; 33 miles S.W. of Brunſwick. N. lat. 51° 51'. E. long. 10° 1'.

GANDEUSEN, a town of Algiers; 40 miles W.S.W. of Tubnah.

GANDGOURLY, a town of Hindooſtan, in Golconda, at the union of the Manzorah and Godavery; 40 miles N.W. of Indelovoy.

GANDHAR, a town of Hindooſtan, in the circar of Rantampour; 30 miles S.S.W. of Rantampour.

GANDJA, or GANGEA, a town of the principality of Georgia 5;

Georgia; 100 miles S.E. of Tefflis. N. lat. 41° 32'. E. long. 45 10'.

GANDIA, a walled ſea-port town of Spain, in the province of Valencia, half a league from the coaſt, between the mouth of the Xucar and Cape Martin, on the rivulet Alevi, 40 miles S.S.E. of the capital, in a fertile, delightful, and populous territory, almoſt ſurrounded by a ridge of low hills, and wholly cultivated, except a low marſhy tract towards the coaſt, which is often inundated. The ducal palace is a magnificent edifice. N. lat. 39°. W. long. 0° 19.

GANDICOTTA, a town and fortreſs of Hindooſtan, ſituated on the top of a lofty mountain, on the ſouth bank of the river Pennar, in the circar of Cuddapa. The road to it is narrow, and formed in the rock, by the ſide of a frightful precipice. Below is a ſmall plain, watered by a number of ſprings, in which the inhabitants cultivate rice and millet. Near it is a diamond mine, 33 miles N. W. of Cuddapa. N. lat. 44° 55'. E. long. 78 29'.

GANDINA, a town of Italy, in the department of the Adda and Oglio; 10 miles N. E. of Bergamo.

GANDOLA, a town of Italy, in the department of the Serio; eight miles N.W. of Bergamo.

GANDOVA, a river of Abyſſinia, which runs into the Tacazé, 60 miles S. of Dekin.

GANE, a town of Arabia Felix; 150 miles N. of Mocha.—Alſo, a city of Africa, and capital of a country, governed by a ſultan, ſubject to Houſſan, on the N. ſide of the Niger, near a lake. Hornemann call's it *Cano*; 600 miles E. of Tombuctoo. N. lat. 16° 10'. E. long. 12° 40'.

GANEGAM, a town of the iſland of Ceylon; 60 miles S. S. E. of Columbo.

GANET ISLANDS, a cluſter of ſmall iſlands, near the eaſt coaſt of Labrador. N. lat 54°. W. long. 56° 10'.

GANEYGON, a town of Hindooſtan, in Dowlatabad; 33 miles S. W. of Amednagur.

GANG, in the *Sea Language*, ſignifies a crew.

To man a boat is called, to *put a gang of men* (which is a company) into her; they are commonly called the *cockſwain's* gang, who have the charge of her.

GANG-*fiſh*, in *Ichthyology*, a name given by ſome authors to a ſmall fiſh caught in the German lakes, and ſent in pickle into many parts of the world. The more uſual name of this fiſh among writers is lavaretus. See SALMO *Lavaretus*.

GANG-*ladder*, in *Canals*, a frame anſwering the ſame purpoſe as a *Horſing-block*, which ſee.

GANGS-*men*, in *Canal-making*, is a term for ſmall companies of men who undertake the labour of digging, embanking, or puddling a canal, reſervoir, &c.

GANG-*ox*. See OX.

GANG-*waggons*, or trams, &c. are names for the carriages, whether conſtructed of iron or wood, which are uſed for the conveyance of goods on rail-ways or tram-roads. See CANAL, and RAIL-WAYS.

GANG-*water*. See WATER-*gang*.

GANG-*way*, in *Mining*, ſignifies a paſſage, audit, or gate through which the miners paſs underground; ſometimes theſe are laid with iron or with wooden rails, for the trams or gang-waggon wheels to move on, or are laid with round logs of wood acroſs, if the floor is ſoft and ſubject to ſwell, on which the corves ſlide, as they are dragged along to the ſhaft bottom by the miners, or by the mine aſſes or horſes.

GANG-*way* is applied to all the ſeveral entrances, ways, or paſſages, from one part of the ſhip to the other.

Whatſoever is put in any of theſe paſſages, is ſaid to be laid or put in the gang-way.

GANG-*way* alſo denotes that part of a ſhip's ſide, both within and without, by which the paſſengers enter and depart: it is for this purpoſe provided with a ſufficient number of ſteps, or *cleats*, nailed upon the ſhip's ſide, nearly as low as the ſurface of the water; and ſometimes furniſhed with a ladder, whoſe lower end projects from the ſhip's ſide, being ſecured in this poſition by iron braces.

GANGA, in *Ornithology*, a name given by Buffon to the TETRAO *Alchata*, which ſee.

GANGACOTTY, in *Geography*, a town of Thibet; 68 miles S. of Gangotri.

GANGALAGUTTA, a town of Hindooſtan, in the circar of Cuddapa; 34 miles N. of Combam.

GANGAMAR, a town of Thibet; 18 miles S. of Jhanſu-Jeung.

GANGAPATNAM, a town of Hindooſtan, in the Carnatic, at the mouth of the Pennar; 80 miles N. of Madras. N. lat. 14° 25'. E. long. 80° 12'.

GANGARIDÆ, in *Ancient Geography*, a people of India, near the mouth of the Ganges, to whom Ptolemy aſſigns a capital called Gangia Regia, on the other ſide of the river, placed by M. D'Anville in lat. 24° 50'. See GOUR.

GANGARONO, a ſmall iſland in the gulf of Venice. N. lat. 44° 12'. E. long. 15° 35'.

GANGART, in *Mining*, ſignifies the ſides or walls of the vein or working; for which alſo the terms ſkirts, vein-ſkirts, woughs, &c. are uſed, in different mineral diſtricts. See VEIN.

GANGELT, in *Geography*, a town of France, in the department of the Roer, 12 miles S. S. E. of Ruremond. N. lat. 50° 58'. E. long. 5 59'.

GANGES, a town of France, in the department of the Herault, and chief place of a canton, in the diſtrict of Montpellier, and 21 miles N. of it. The place contains 3622, and the canton 7339 inhabitants, on a territory of 157½ kilometres, in 10 communes.

GANGES, a river of Aſia, which in the language of Hindooſtan is called *Pudda*, or *Padda*; and it is alſo named *Burra Gonga*, or the Great river, and *Gonga*, the river, by way of eminence; and hence the European names of the river are derived. It has, not unaptly, been denominated the twin-ſiſter, or rival of the *Burrampooter* (which ſee), from the contiguity of their ſprings, and from their reſemblance to each other in length of courſe, in bulk till they approach the ſea, in the ſmoothneſs and colour of their waters, in the appearance of their borders and iſlands, and finally, in the height to which their floods riſe, with the periodical rains. The Ganges, as well as the Burrampooter, has its ſource in the vaſt mountains of Thibet; and theſe two rivers proceed in oppoſite directions. The former ſeeks the plains of Hindooſtan by the weſt, and purſues the early part of its courſe through rugged vallies and defiles, and ſeldom viſits the habitations of men. After wandering about 800 miles through theſe mountainous regions, it iſſues forth a deity to the ſuperſtitious, yet gladdened, inhabitant of Hindooſtan. From the fabulous account of its origin we learn, that it flows out of the foot of Beſchan (the ſame with Viſtnou, or the preſerving deity), whence, according to the Bramins, it has its name "Pudda;" ſignifying in the Shanſcrit language foot; and that in its courſe to the plains of Hindooſtan it paſſes through an immenſe rock, ſhaped like a cow's head. This river was unknown to Herodotus, as he does not mention it, though it became famous in a century afterwards. Major Rennell, in ſumming up the whole information, collected from the different accounts of the upper part of the courſe of the Ganges, obſerves, that the two branches of it, which ſpring from the weſtern ſide of mount Kentaiſſe, take their courſe weſtward, inclining conſiderably to the north for a courſe of about

300 miles, in direct diſtance; when meeting the great chain or ridge of mount Himmaleh, which extends from Cabul along the north of Hindooſtan, and through Thibet, the rivers are compelled to turn to the ſouth; in which courſe they unite their waters, and form what is properly termed the river Ganges. This great body of water now forces a paſſage *through* the ridge of mount Himmaleh, at the diſtance, poſſibly, of 100 miles below the place of its firſt approach to it, and, ſapping its very foundation, ruſhes through a cavern, and precipitates itſelf into a vaſt baſon, which it has worn in the rock, at the hither foot of the mountains. The Ganges thus appears, to incurious ſpectators, to derive its original ſprings from this chain of mountains; and the mind of ſuperſtition has given to the mouth of the cavern the form of the head of a cow; an animal held by the Hindoos in a degree of veneration, almoſt equal to that in which the ancient Egyptians held their god Apis. From this ſecond ſource, as it may be termed, of the Ganges, its courſe becomes more eaſtwardly than before, through the rugged country of Sirinagur, until at Hurdwar it finally eſcapes from the mountainous tract, in which it has wandered for about 800 Britiſh miles.

The true origin of the Ganges was explored, ſo lately as the year 1717, by perſons deputed by the emperor Camhi for this purpoſe; and after a journey of about 2.500 Britiſh miles from the head of the Ganges, they brought ſome of its water back with them to Pekin. Until the reſult of this expedition was known in Europe, it was believed, on the teſtimony of the Hindoos, that the ſprings of the Ganges were at the foot of mount Himmaleh, or Imaus.

At Hurdwar, or Hurdoar, in latitude 30°, it opens itſelf a paſſage through mount Suvalick, or Suva-luik, or the chain of mountains that borders on the level country, on the north of the province of Delhi; and after guſhing through this opening, it flows with a ſmooth navigable ſtream through delightful plains during the remainder of its courſe to the ſea, which is about 1350 miles, diffuſing plenty immediately by means of its living productions, and ſecondarily, by enriching the adjacent lands, and affording an eaſy means of tranſport for the productions of its borders. In a military view, it opens a communication between the different poſts, and ſerves as a military way through the country, renders unneceſſary the forming of magazines, and infinitely ſurpaſſes the celebrated inland navigation of North America, where the *carrying places* not only obſtruct the progreſs of an army, but enable the adverſary to determine his place and mode of attack with certainty.

The Ganges, in its courſe through the plains, receives 11 rivers, ſome of which are equal to the Rhine, and none ſmaller than the Thames, beſides as many others of leſſer note. To this vaſt influx of ſtreams it is owing, that the Ganges exceeds the Nile ſo much in point of magnitude, while the latter exceeds it by one-third in length of courſe. Indeed, the Ganges is, in this laſt reſpect, inferior to many of the northern rivers of Aſia; though Mr. Rennell thinks that it diſcharges as much or more water than any of them, becauſe thoſe rivers do not lie within the limits of the periodical rains.

The bed of the Ganges is very unequal with reſpect to width. From its firſt arrival in the plains at Hurdwar, to the conflux of the Jumnah, the firſt river of note that joins it, its bed is generally from a mile to a mile and a quarter wide, and, compared with the latter part of its courſe, tolerably ſtraight. Hence, downward, its courſe becomes more winding, and its bed wider, till, having ſucceſſively received the waters of the Gogra, Soane, and Gunduck, beſides many ſmaller ſtreams, its bed has attained its full width; although, during the remaining 600 miles of its courſe, it receives many other principal ſtreams. Within this ſpace it is, in the narroweſt parts of its bed, half a mile wide, and in the wideſt, three miles, even where no iſlands intervene. The ſtream within this bed is always either increaſing, or decreaſing, according to the ſeaſon. When at its loweſt, which happens in April, the principal channel varies from 400 yards to $1\frac{1}{4}$ mile; but is commonly about $\frac{3}{4}$ of a mile in width. This river is fordable in ſome places above the conflux of the Jumnah, but the navigation is never interrupted. Below that, the channel is of conſiderable depth; for the additional ſtreams bring a greater acceſſion of depth than width. At 500 miles from the ſea, the channel is 30 feet deep when the river is at its loweſt; and it continues, at leaſt, at this depth to the ſea, where the ſudden expanſion of the ſtream deprives it of the force neceſſary to ſweep away the bars of ſand and mud thrown acroſs it by the ſtrong ſoutherly winds; ſo that the principal branch of the Ganges cannot be entered by large veſſels. See DELTA *of the Ganges*, and HOOGLY *River*.

The general deſcent of the Ganges does not exceed four inches *per* mile; and the mean rate of its motion is leſs than three miles an hour, in the dry months. In the wet ſeaſon, and whilſt the waters are running off from the inundated lands, the current runs from five to ſix miles an hour, and in certain circumſtances and ſituations it runs ſeven or eight miles. Mr. Rennell mentions an inſtance, in which a boat was carried, againſt a ſtrong wind, 56 miles in eight hours. Conſidering that the velocity of the ſtream is three miles in one ſeaſon, and five or more in the other, on the ſame deſcent of four inches *per* mile; and that the motion of the inundation is only half a mile *per* hour, on a much greater deſcent, no farther proof is required, how ſmall the proportion of velocity is that is communicated by the deſcent. It is then, ſays Mr. Rennell, to the *impetus* originating at the ſpring-head, or at the place where adventitious waters are poured in, and ſucceſſively communicated to every part of the ſtream, that we are principally to attribute the velocity; which is greater or leſs according to the quantity of water poured in. The windings of the Ganges in the plains are, without doubt, owing to the looſeneſs of the ſoil; and major Rennell alleges as a proof of this, that they are perpetually changing; which thoſe, originally induced by an inequality of ſurface, can ſeldom or never do. Appearances, ſays this ingenious writer, favour very ſtrongly the opinion, that the Ganges had its former bed in the tract now occupied by the lakes and moraſſes, between Nattore and Jaffiergunge; ſtriking out of its preſent courſe at Bauleah, and paſſing by Pootyah. With an equal degree of probability (favoured by tradition), we may trace its ſuppoſed courſe by Dacca, to a junction with the Burrampooter, or Megna, near Fringybazar: where the accumulation of two ſuch mighty ſtreams probably ſcooped out the amazing bed of the Megna. For an account of the openings that form the mouths of the Ganges; ſee DELTA *of the Ganges*. The ſand and mud-banks at this time extend 20 miles off ſome of the iſlands, in the mouths of the Ganges and Burrampooter; and in many places riſe within a few feet of the ſurface. Some future generation will probably ſee theſe banks riſe above water, and ſucceeding ones poſſeſs and cultivate them. Of the iſlands formed in the channel of the Ganges, ſome are four or five miles in extent, which are formed at the angular turnings of the river, and were originally ſand-banks thrown up round the points, and afterwards inſulated by breaches of the river; and others are formed in the ſtraight parts of the river, and in the middle of the ſtream, owing their origin to ſome obſtruction lurking at the bottom, and rapidly accumulating. The river borrows on each ſide to ſupply

ſupply the deficiency in its bed; and in ſuch parts of the river ſteep banks occur on both ſides. Theſe are increaſed by many periodical floods, and at length acquire mould ſufficient for the purpoſes of cultivation. Whilſt the river is forming new iſlands in one part, it is ſweeping away old ones in other parts.

Mr. Rennell, in accounting for the annual ſwelling and overflowing of the Ganges, obſerves, that it owes its increaſe as much to the rain-water that falls in the mountains contiguous to its ſource, and to the ſources of the great northern rivers that fall into it, as to that which falls in the plains of Hindooſtan; the quantity of ſnow melted in the mountains contributing only in a ſmall proportion to its increaſe; for it riſes 15½ feet out of 32 (the ſum total of its riſing) by the latter end of June; and it is well known, that the rainy ſeaſon does not begin in moſt of the flat countries till about that time. In the mountains it begins early in April; and by the latter end of that month, when the rain-water has reached Bengal, the river begins to riſe but by very ſlow degrees; for the increaſe is only about an inch *per* day for the firſt fortnight. It then gradually augments to two or three inches before any quantity of rain falls in the flat countries; and when the rain becomes general, the increaſe, on a medium, is five inches *per* day. See BENGAL.

The following table ſhews the gradual increaſe of the Ganges and its branches, according to obſervations made at Jellinghy and Dacca.

	At Jellinghy.		At Dacca.	
	Ft.	Inch.	Ft.	Inch.
In May it roſe - -	6	0	2	4
June - - -	9	6	4	6
July - - -	12	6	5	6
In the firſt half of Auguſt	4	0	1	11
	32	0	14	3

The quantity of the daily decreaſe of the river is nearly in the following proportion: during the latter half of Auguſt, and the whole of September, from three to four inches; from September to the end of November, it gradually leſſens from three inches to 1½ inch; and from November to the latter end of April, it is only half an inch *per* day at a medium. Theſe proportions relate to ſuch parts of the river as are not affected by the tides. The following circumſtance is remarked by Mr. Rennell as attending the increaſe of the Ganges; *viz.* that there is a difference in the quantity of the increaſe in places more or leſs remote from the ſea, as exhibited in the preceding table. It is a fact, he ſays, confirmed by repeated experiments, that from about the place where the tide commences to the ſea, the height of the periodical increaſe diminiſhes gradually, until it totally diſappears at the point of confluence; and this is perfectly conformable to the known laws of fluids. The ocean preſerves the ſame level at all ſeaſons (under ſimilar circumſtances of tide), and neceſſarily influences the level of all the waters that communicate with it, unleſs precipitated in the form of a cataract. Could we ſuppoſe, for a moment, that the increaſed column of water, of 31 feet perpendicular, was continued all the way to the ſea by ſome preternatural agency; whenever that agency was removed, the head of the column would diffuſe itſelf over the ocean, and the remaining parts would follow, from as far back as the influence of the ocean extended; forming a ſlope, whoſe perpendicular height would be 31 feet. This preciſely correſponds to the fact. At the point of junction with the ſea, the height is the ſame in both ſeaſons at equal times of the tide. At Luckipour, there is a difference of about ſix feet between the heights in the different ſeaſons; at Dacca, and places adjacent, 14; and near Cuſtee, 31 feet. Here is a regular ſlope; for the diſtances between the places bear a proportion to the reſpective heights. This ſlope muſt add to the rapidity of the ſtream; for, ſuppoſing the deſcent to have been originally four inches *per* mile, this will increaſe it to about 5½. Cuſtee is about 240 miles from the ſea, by the courſe of the river; and the ſurface of the river there, during the dry ſeaſon, is about 80 feet above the level of the ſea at high-water. The tides in the river Amazons are perceptible at 600 miles above its mouth; but at an elevation of only 90 feet, according to M. De Condamine. Thus far does the ocean manifeſt its dominion in both ſeaſons; in the one by the ebbing and flowing of its tides; and in the other by depreſſing the periodical flood, till the ſurface of it coincides as nearly with its own, as the deſcent of the channel of the river will admit. Similar circumſtances take place in the Jellinghy, Hoogly, and Burrampooter rivers, and, as Mr. Rennell ſuppoſes, in all others that are ſubject to periodical or occaſional ſwellings. Not only is the flood diminiſhed near the ſea, but the river banks are diminiſhed in the ſame proportion; ſo that in the dry ſeaſon the height of the periodical flood may be known by that of the bank.

The quantity of water diſcharged by the Ganges, in one ſecond of time, during the dry ſeaſon, is 80,000 cubic feet; but in the place where the experiment was made, the river, when full, has thrice the volume of water in it; and its motion is alſo accelerated in the proportion of five to three; ſo that the quantity diſcharged in a ſecond at that ſeaſon is 405,000 cubic feet. If we take the medium the whole year through, it will be nearly 180,000 cubic feet in a ſecond. Rennell's Memoir. Phil. Tranſ. vol. lxxi.

GANGES, in *Ancient Geography*, *Mowil-Ganga*, a very large river in the iſland of Taprobana, according to Ptolemy. It deſcended from high mountains in the centre of the iſland, and diſcharged itſelf into a large bay ſituated about the middle of the eaſtern coaſt.

GANGES *Iſlands*, or *North Natunas*, in *Geography*, two ſmall iſlands between the iſland of Borneo and the gulf of Siam. N. lat. 4° 55′. E. long. 106° 45′.

GANGI, a town of Sicily, in the valley of Demona; 14 miles S. W. of Miſtretta.

GAN-GIN, a town of China, of the third rank, in Houquang; 36 miles E S.E. of Heng-tche.

GANGLION, (a primitive Greek word) denotes, in *Anatomy*, the ſmall ſwellings found in certain parts of the nervous ſyſtem. See the account *of the ſtructure of the nerves* in the article BRAIN. The particular ganglions are deſcribed in the article NERVE.

GANGLION, in *Surgery*, is a term applied to a kind of tumour which generally forms upon the tendinous, or ligamentous parts of the limbs. The ſwelling is very prominent, and circumſcribed, and is always connected with ſome tendon, or aponeuroſis underneath. The diſeaſe is generally unattended with pain, the only inconveniences being, more or leſs, deformity, and ſometimes ſenſation of weakneſs in the performance of ſome particular motion. However, it behoves every ſurgeon and patient to be aware that, though ganglions are for the moſt part not ſeriouſly troubleſome while free from ulceration, yet it ſometimes happens, that in conſequence of their being imprudently punctured, or otherwiſe irritated, they are converted into very dangerous fungous, and cancerous diſeaſes. (See Medical Journal, vol. v.) A ganglion is ſo much like an encyſted tumour of the meliceris kind, that many ſurgical writers have treated of ſuch diſeaſes under the ſame head.

The

The ganglion, indeed, is compoſed of a tendinous cyſt, which is filled with a fluid reſembling white-of-egg. The chief circumſtance in which it differs from a common encyſted tumour, is in having a cloſe attachment to ſome tendon or ligamentous expanſion underneath.

The parts moſt frequently attacked with ganglions are the hands and feet; but there are inſtances of theſe tumours making their appearance upon many other ſituations in the body. Mr. Warner met with an extraordinary example of this kind, where the tumour poſſeſſed the whole back part of the neck.

Ganglions ſometimes take their riſe from a ſtrain or bruiſe; and, at other times, they happen without any previous accident. It is not common for them to grow to a very large ſize; but on certain occaſions they have done ſo, and proved very inconvenient, by depriving the part of its ſtrength and motion.

Ganglions are unattended with any diſcolouration of the ſkin, and, on being compreſſed, appear to poſſeſs a great deal of elaſticity.

Theſe tumours admit of being cured in various ways, ſome of which are more certainly efficacious, and freer from objections than others. The chief means are friction, with ſtimulating diſcutient applications, ſetons, preſſure, ſtriking the tumour with ſome hard body, and exciſion.

With reſpect to ſtimulating diſcutient applications, they are uſed with a view of producing an abſorption of the ſwelling, an attempt which more frequently ſucceeds in this ſort of caſe than in any other kind of tumour, putting out of conſideration a few particular excreſcences of a warty nature. The moſt common diſcutient application for ganglions is the oleum origani, with which theſe ſwellings are to be rubbed two or three times a day. Mr. Warner found that ſaponaceous liniments, mixed with opium, and plaſters, compoſed of ſoap and mercury, had the greateſt power in diſperſing this deſcription of tumours, and that, in many inſtances, they fully anſwered his purpoſe. In other caſes, he obſerves, that camphorated mercurial ointment will be found ſucceſsful. Bliſtering the ſkin which covers a ganglion, and keeping up a diſcharge from the excoriated ſurface, by means of the ſavine ointment, is another plan of cure to be mentioned with topical diſcutients.

When an endeavour is to be made to effect the abſorption of a ganglion, we are of opinion that the moſt eligible method, generally ſpeaking, is to rub the tumour with the oleum origani, or one of the applications recommended above by Mr. Warner. We ſhould not be inclined to have recourſe to the bliſtering plan, except, perhaps, in a few obſtinate caſes.

Sometimes, by the foregoing meaſures, particularly when theſe are aſſiſted by conſtant preſſure on the tumour, a ganglion may be effectually removed. Very frequently, however, the ſwelling only undergoes a temporary diminution, and returns to its former magnitude ſhortly after the applications are diſcontinued.

Setons are a dangerous and painful means of cure, and we earneſtly recommend them never to be tried with a view of removing ganglions. We have already ſtated, that while a ganglion is free from irritation and ulceration, the complaint is by no means ſevere; but that when it has burſt, or been punctured, it ſometimes changes into a terrible and fatal diſeaſe. In the fifth volume of the London Medical Journal, we may find an impreſſive caſe, in which the fungus hæmatodes was produced by an attempt to cure a ganglion with a ſeton. Were we to ſuppoſe the plan ſucceſsful, ſtill it would be objectionable, on account of its neceſſarily ſubjecting the patient, for a certain time, to ſome conſiderable pain, as well as troubleſome ſores, while milder and more infallible methods might be choſen.

Keeping up a conſtant preſſure on a ganglion, by binding a piece of ſheet-lead upon the tumour, is a very eligible plan to be tried in the firſt inſtance, eſpecially when aided by occaſional frictions with ſome of the above-mentioned diſcutient remedies. Sometimes a complete cure is thus accompliſhed; ſometimes only a temporary diminution of the ſwelling; as the fluid ſoon accumulates again, in conſequence of the cavity of the cyſt not being obliterated by an adheſion of its oppoſite ſides to each other.

The next practice which we have to notice, is that of ſtriking a ganglion with the fiſt, a hammer, or the back of a book. We have heard of ſeveral inſtances in which the ſwelling has thus been very expeditiouſly and permanently cured. It ſeems probable that the blow ruptures the ſac, drives out the fluid into the ſurrounding cellular ſubſtance, and occaſions an inflammatory affection of the cyſt, ending in the obliteration of the cavity for the fluid. We have never adopted this method ourſelves, from an averſion to running any riſk of making the tumour inflame and ulcerate, and becauſe we have generally found ſucceſs attend frictions with liniments, oleum origani, or camphorated mercurial ointment, when aided by the preſſure of a piece of lead.

Inſtances, however, are not uncommon, in which all attempts to diſperſe a ganglion prove ineffectual. When this is the caſe, and the parts become diſabled from the ſize and ſituation of the ſwelling, the ſurgeon is warranted in extirpating the diſeaſe with a knife. The manner of doing this operation is very ſimilar to that of removing encyſted tumours. (See EXTIRPATION.) Some practitioners have been fearful of cutting away ganglions, from an idea, that unpleaſant ſymptoms would ariſe from wounding the ſubjacent tendon, or ligamentous expanſion. Such apprehenſion, however, ſeems to be ill-founded, as many caſes are related in ſurgical books of ganglions being removed with a knife with the utmoſt ſucceſs. It is not always neceſſary to injure, in any material degree, the ſubjacent tendon, the chief objects of the operator only being to cut the ſwelling from the ſurface underneath, to take out the cyſt entire, that is to ſay, without wounding it, or leaving any particle of it behind, and then to bring the edges of the wound together with ſticking plaſter. Some preſſure ſhould alſo be made on the part with a compreſs of lint and a bandage.

In order to ſhew that a ganglion may, in caſe of its reſiſting other plans, and becoming troubleſome, be ſafely cured by exciſion, we ſhall quote the following caſe. "A young woman, 19 years of age, ſtrained her wriſt by a fall. The accident was immediately followed by great pain, and a weakneſs and ſwelling of the whole hand. Notwithſtanding proper methods were tried for her relief, the injured part continued much in the ſame ſtate for four years. A ſmall diſtinct tumour was now diſcovered, ariſing from the inner and lower part of her wriſt, and, in a few days, the ſwelling became ſo large as to hinder the patient from ſhutting her hand, or moving her fingers. When the part was ſhewn to Mr. Warner, he felt in the tumour a fluid, which extended about an inch above the tranſverſe ligament of the wriſt, and about half an inch below it; and which upon preſſure ſeemed to paſs under the ligament. Mr. Warner undertook the cure by extirpation. He began an inciſion a little above the upper part of the ſwelling, and continued the cut through the integuments to a little beyond the lower part. He then diſſected up the ſkin on each ſide, and was thus enabled to ſee the exact ſituation of the tumour, which lay under the tendons of the flexor carpi ulnaris, and palmaris longus muſcles, both of which were conſiderably

ſiderably lifted up, and removed from their natural ſituation, by the ſubjacent tumour. The ganglion alſo extended under the tranſverſe ligament of the wriſt, which part it was neceſſary to divide, before the baſe of the tumour could be diſſected off. The lower part of the cyſt adhered to the tendons of the extenſor muſcles, from which the whole was ſeparated by means of the knife. In ſix weeks the patient got well, without any conſiderable inflammation or abſceſs, and regained the uſe of her hand." (See Warner's Caſes, p. 165.) Two other caſes are recorded by the ſame author of ganglions being ſucceſsfully cured by extirpation. Mr. Warner is candid enough to allow, that, in ſome inſtances, he had ſeen inflammations and abſceſſes follow the operation; but, he adds, that he never knew one caſe that did not terminate well.

Mr. Gooch, in the ſecond volume of his chirurgical works, relates a caſe which he alſo cured with the knife. P. 376.

Heiſter likewiſe ſtates, that he has ſeveral times cut away ganglions with ſucceſs.

Whenever a ganglion is unuſually large and troubleſome, and does not yield to preſſure and diſcutients, we ſhould generally recommend its removal with a knife.

If the caſe be in a ſtate of ulceration, the ſooner the operation is done the better, by reaſon of the danger of the diſeaſe now putting on a malignant character. While no ulcer exiſts, a ſimple longitudinal cut through the integuments ſuffices; but when the ſkin is ulcerated, and the tumour has burſt, the ſurgeon muſt begin his operation by making an oval or circular inciſion, which will take away all the diſeaſed part of the integuments.

Mr. Warner does not mention that he brought the lips of the wound together with ſticking-plaſter, or applied a compreſs; but when theſe things are attended to, we have no doubt that the generality of patients will be well in a much ſhorter ſpace of time than ſix weeks after the operation.

We have not noticed the propoſal of curing ganglions with cauſtic; we deem it highly objectionable, and hope that, in future, no reſpectable ſurgeon will ever put it in practice. Irritating a ganglion with cauſtic is a moſt likely method of converting the ſwelling into a very dangerous diſeaſe.

GANGOUTRA, ſignifying the *fall* or *caſcade* of the Ganga or Ganges, in *Geography*, a cavern, ſtyled by the Hindoos the "Cow's mouth," through which the Ganges paſſes. The *Upper* Gangoutra is about 280 or 300 road miles above Hurdwar, where the Ganges enters the plains of Hindooſtan, placed by Tienſentaller in the parallel of 33° N. The *Middle* Gangoutra is at Deuprag, where the Baghyretty, ſuppoſed by Major Rennell to be the true head of the Ganges, and the Alacknundra rivers, the former from the N. and the latter from the N. E. join at a few miles diſtance below Sirinagur, there forming the *Proper* Ganges of Hindooſtan. The *Lower* Gangoutra is the opening in mount Sewalick, at Hurdwar, through which it iſſues. See GANGES.

GANGPOUR, a circar of Hindooſtan, in the country of Oriſſa, bounded on the north by Juſhpour and Bahar, on the eaſt by Konjoor, on the ſouth by Sumbalpour, and on the weſt by Ruttunpour. The chief towns are Gangpour and Pada.

GANGPOUR is the capital of the circar, and is diſtant 244 miles W. from Calcutta. N. lat. 21° 2'. E. long. 84° 10'.

GANGRA, in *Ancient Geography*, a town of Paphlagonia, the reſidence of Mopſus, king of the country, which ſent ſuccours to the Galatians againſt the Romans in the time of Antiochus the Great.—Alſo, a town of Arabia Felix. Steph. Byz.

GANGRÆNA ORIS. This denotes, in *Surgery*, a deep, irregular, ill-conditioned ulcer, ſituated on the inſide of the lips and cheek. The preceding name is that which was adopted by Van Swieten; but the diſeaſe has had ſeveral other appellations beſtowed upon it. Sennertus denominates it *aphthæ ſerpentes*; while the generality of the French writers call it *gangréne ſcorbutique des gencives*. It has alſo been named *labroſulcium*, and *cheilocace cancrum oris*, &c.

The malady is generally attended with a copious ſecretion of the ſaliva; and it commonly affects children under ſeven years of age, and ſeldom grown up perſons. The edges of the ulcer are remarkably jagged, and, when the complaint attacks the inſide of the lip, the ulceration ſpreads with celerity to the inſide of the cheek, which ſwells and feels hard. The gums are ſometimes involved in the diſeaſe, while the teeth are looſe and carious. Abſceſſes may alſo occur, and burſt in various adjoining ſituations. It is ſaid, that exfoliations ſometimes take place from the alveolar proceſſes, and other parts of the lower jaw-bone.

The gangræna oris, for the moſt part, is found to affect the children of the poor, or ſuch as reſide in damp places, are not kept duly clean, live on bad food, and are much crowded together. The exact cauſe of the malady, however, is unknown. When the affection is neglected, it may produce moſt dreadful degrees of ſloughing.

Although the gangræna oris is uncommon in adults, they are ſometimes afflicted with it.

The internal treatment, recommended by authors, conſiſts principally of milk and vegetable diet, bark, vitriolic acid, porter, &c.

The applications to the diſeaſe itſelf may be diluted vitriolic acid, burnt alum, the tincture of myrrh, the decoction of bark with the ſulphate of zinc, or a mixture of lime-water and ſpirit of wine, as may be found to agree beſt. Sometimes theſe applications may be uſed as gargles; ſometimes by wetting in them ſoft pieces of lint, which are to be put and kept upon the ſore.

GANGRÆNA *Oſſis*, ſometimes denotes a caries; ſometimes the diſeaſe known by the name of ſpina ventoſa.

GANGRENE, derived from the Greek γαινω, *to feed upon*, becauſe the fleſh is eaten away or deſtroyed by it. The expreſſion is very commonly uſed in the ſame ſenſe as the word *mortification*, which, we know, denotes the death of ſome part of the body. However, it is to be obſerved, that when the whole, or a conſiderable portion of a bone dies, without any of the fleſh being involved in ſimilar miſchief, the caſe is not denominated a *gangrene*, but a *necroſis*, as we ſhall have occaſion to explain more fully in a future volume of this Cyclopædia.

Although gangrene and mortification are not unfrequently employed ſynonymouſly by many reſpectable writers and practitioners, yet a diſtinction is ſometimes drawn, of which we ſhall preſently make mention.

Mortification is a diſorder which ariſes from an immenſe number of different cauſes, and, of courſe, it varies very conſiderably in the manner of its attack, its progreſs, and degree of danger. The caſes of the diſeaſe are frequent, and, as they often put the life of the patient into a ſtate of imminent peril, always ſtand in need of judicious ſurgical aſſiſtance, and have been indiſcriminately treated of by many writers, we feel that the ſubject before us admits of much uſeful diſcuſſion. We ſhall find that a good deal of error has prevailed in the general treatment of mortifications, principally, in conſequence of that blind enthuſiaſm which exaggerated

the Peruvian bark into a ſpecific for every kind of gangrene. It is far from our intention to ſay, that this medicine has not often done good in theſe caſes; we acknowledge that it has been highly ſerviceable in numerous inſtances; but we have no heſitation in aſſerting, that much harm has alſo ariſen from exhibiting bark in ſome examples in which it was not indicated, and from overloading the ſtomach with it on other occaſions, where the medicine might have been productive of real good, had it only been preſcribed with moderation.

Nor has the topical treatment of gangrene always been ſuch as ſhould entitle it to approbation. Of late years, indeed, the proper kind of local applications, and the circumſtances in which making inciſions into the part affected can prove uſeful, have been explained. Yet what man, that has ſeen any thing of ſurgery, can conſcientiouſly declare, that modern practice is altogether delivered from ſome abſurd prejudices about the virtues of a certain claſs of remedies, denominated antiſeptics?

We truſt, that the correctneſs of the preceding criticiſms will become the more ſtriking, the further the reader advances in the peruſal of the account which we have to offer of the ſubject, and the more he compares our ſtatement with the facts demonſtrated to him by experience.

We ſhall firſt detail the common ſymptoms and appearances attendant on ſuch mortifications as are preceded by inflammation.

When the mortification is beginning, the pulſe immediately becomes much weaker, and ſometimes irregular; the patient experiences a conſiderable proſtration of all the vital powers; and, after a violent increaſe of ſuffering, the pain in the part affected undergoes a ſudden diminution. A diſagreeable hiccough, repeated ſickneſs, and different degrees of delirium, are alſo the frequent concomitants of this ſort of local miſchief.

In the ſeat of the inflammation the integuments are affected with a livid diſcolouration, and change ſucceſſively from a red to a yelloviſh, and, laſtly, a greeniſh hue. The cuticle, in various places, riſes in the form of veſicles, which are generally filled with a turbid fluid. The ſwelling, tenſion, and hardneſs ſubſide, and, on touching the part, a crackling ſenſation is communicated to the fingers, owing to the generation of air in the cellular ſubſtance. Still, however, the part is not completely dead, as it retains ſome of its natural warmth and ſenſibility. It is particularly to this firſt ſtage of mortification that the term *gangrene* is applied.

When the organization of the parts is totally deſtroyed, together with all veſtiges of their natural ſtructure, and the gangrenous place is converted into a cold, black, fibrous, inſenſible maſs, a *ſphacelus*, or *complete mortification*, is ſaid to have happened.

A portion of the ſoft parts, in this dead, black condition, is technically named a *ſlough*, except when the piece of fleſh has been killed with cauſtic or fire, in which caſe the part which is deſtroyed is more frequently called an *eſchar*.

When any conſiderable portion of the body is affected with mortification, the conſtitution always ſeems to ſuffer a ſudden and an alarming ſhock. The eyes immediately exhibit that peculiar appearance, which Mr. Pott, in his book on ruptures, has diſtinguiſhed by the name of lack-luſtre. The whole ſyſtem is terribly dejected; the countenance all at once puts on a wild, wretched, cadaverous look; the pulſe generally becomes ſmall, rapid, and, as we have already ſtated, in ſome inſtances irregular; the ſkin is moiſtened with cold, clammy perſpirations; an inceſſant purging is apt to occur, and, frequently, the unhappy patient, after being more or leſs delirious, falls a victim to the diſorder.

We think, that the beſt general diviſion of mortification is that adopted by Mr. John Hunter, who remarks, that all theſe caſes are of two kinds; the one, without inflammation; the other, preceded by it.

This celebrated ſurgeon regarded inflammation as an increaſed action of that power which a part naturally poſſeſſes. It was his opinion that ſuch an affection (when of the healthy ſort) was probably attended with an increaſe of power; but, ſays he, in inflammations which terminate in mortification, there is no increaſe of power, but, on the contrary, a diminution of it. He thought that this loſs of power becomes, when joined to an increaſed action, a cauſe of mortification, by deſtroying the balance which ought to ſubſiſt between the power and the action of every part.

Mr. Hunter makes mention, alſo, of certain caſes of mortification, which, though they are preceded by inflammation, do not depend wholly upon it as a cauſe, but ſeem to have ſome peculiarity in their nature. Of this kind are the carbuncle, and the ſlough formed by the ſmall-pox puſtule. (See Hunter on the Blood, Inflammation, &c. p. 8.)

Let us now take a view of the various remote cauſes of gangrene and ſphacelus. Inflammation is the firſt, which deſerves particular attention. Parts which are violently and extenſively inflamed are frequently obſerved to mortify. However, it is not uſual for common phlegmonous inflammation to end in ſuch miſchief, unleſs the ſtate of the conſtitution is very bad, or the parts affected happen not to be endued with ſtrong vital powers, or are in a dropſical or paralytic condition. Eryſipelas often brings on mortification; and ſo does an exceedingly vehement ſpecies of inflammation, ſometimes known by the name of irritative. Phlegmon generally ends in reſolution; ſometimes, in ſuppuration; ſeldom in gangrene. At the ſame time, every man, at all converſant with ſurgery, knows, that any ordinary inflammation is apt to induce a mortification when the patient's habit is particularly weak, irritable, or unhealthy, or when the ſyſtem is conſiderably reduced by the effects of old age. It is alſo a well-known fact, evinced by daily experience, that very ſlight inflammations of anaſarcous and paralytic parts will bring on gangrene. It is on this account that making ſcarifications in the ſcrotum, or any of the limbs affected with anaſarca, is not altogether free from dangerous conſequences. There are likewiſe particular parts of the body, which cannot bear much inflammation, without inevitably falling into a ſtate of mortification. Of this nature are all tendons and faſciæ, which often ſlough, while the ſkin, which covers them, is not affected with the ſame kind of diſorder. The reaſon of this circumſtance ſeems imputable to the inferior vaſcularity of all tendinous ſtructures. The ſkin, which is at the ſame time inflamed, appears to be ſaved by being highly organized, exceedingly vaſcular, and endued with great vitality. When parts of new formation are affected with common inflammation, they are always very prone to mortify, and this circumſtance is probably owing to the ſame principle, which makes inflamed tendons and faſciæ ſo readily ſlough; for, all ſarcomatous and encyſted tumours, as well as all excreſcences, warts, &c. are, in the opinion of modern pathologiſts, furniſhed with leſs vitality than the generality of ſuch parts as enter into the natural and original formation of the body.

Of the ſeveral remote cauſes of gangrene, eryſipelas is thought to be the moſt frequent; for, whenever this ſpecies of inflammation falls into the ſuppurative ſtate, a great deal of ſloughing is always produced wherever the matter happens to be ſituated; and ſince, in eryſipelatous abſceſſes, the pus is not confined by any ſurrounding cloſure of the interſtices of the cellular ſubſtance with coagulating lymph, we find that the matter generally finds its way very extenſively

ſively in different directions, occaſioning gangrenous diſorder whereſoever it happens to ſpread. In many of theſe inſtances all the ſloughing is beneath the ſkin, chiefly affecting the faſciæ, tendons, and cellular ſubſtance. In ſome caſes, the high vaſcularity of the ſkin does not altogether ſave it, a portion of it dying, and turning black. On ſome occaſions, the quantity of integuments deſtroyed is large; in other examples it is ſmall, while the ſubjacent gangrenous miſchief is conſiderable. Sometimes, alſo, when ſloughing is the conſequence of eryſipelas, the ravages are not confined to the cellular ſubſtance, tendons, aponeuroſes, and ſkin; but the muſcles, large veſſels, and bones are alſo deſtroyed, ſo that the whole thickneſs of the limb is left in a complete ſtate of ſphacelus.

Any thing which entirely cuts off the requiſite ſupply of blood to a part may be the occaſion of a mortification. The knowledge of this circumſtance ſometimes leads to a rational method of curing polypi, and other morbid excreſcences. The ſurgeon knows, that, if he can ſucceed in putting a tight ligature round the necks of ſuch tumours, the circulation of blood in the ſwellings will be ſtopped, and they of courſe will ſlough and fall off. The effects of ſtopping the flow of blood into parts are often ſeen in caſes of ſtrangulated herniæ and wounded arteries, and when a bandage is applied with unwarrantable tightneſs. Surgical writers mention the occurrence of mortification from aneuriſmal tumours, and other large ſwellings, the preſſure of which is repreſented as hindering the influx of blood into the part. The oſſified ſtate of the arteries, in old perſons, is alſo ſet down as becoming a cauſe of mortification, by impeding the due ſupply of blood.

Mortification will alſo be occaſioned by any circumſtance which entirely prevents the return of blood from a part. In this caſe, the blood-veſſels become turgid, and the part is quickly affected with pain, ſwelling, and lividity. Veſicles ſoon ariſe, and, at length, the ſeat of the diſorder becomes ſoft, œdematous, emphyſematous, cold, black, inſenſible, and fetid. Here the ſymptoms are ſomewhat different from ſuch as attend a mortification from ſome impediment to the entrance of arterial blood into the part. In the latter inſtance, the part is ſaid to be at firſt affected with ſoftneſs and coldneſs, and a diminution of its ſize; then it becomes inſenſible, ſhrivelled, black, and lifeleſs.

Mortification frequently attacks patients whoſe complaints compel to remain a long while in bed in the ſame poſture. In this example, the ſloughing is chiefly attributable to the unremitted preſſure which parts ſuſtain, and which obſtructs the circulation. Surgeons have frequent opportunities of beholding melancholy inſtances of this kind of mortification, particularly in caſes of fractures, paralyſis from diſeaſed vertebræ, &c. The miſchief moſt readily occurs where the bones have the leaſt fleſh upon them, and, conſequently, where all external preſſure muſt operate with the greateſt effect; as, for inſtance, about the os ſacrum, os ilium, trochanter major, the ſpine of the ſcapula, &c. The diſordered part, in this caſe, always becomes at firſt ſoftiſh, livid, red at the circumference, and œdematous, afterwards entirely loſing its ſenſibility, and acquiring a black appearance. When the ſlough is detached, a foul ſpreading ulcer is always left. The preſſure on parts, from long confinement in one poſture, more readily occaſions mortification, when the conſtitution is particularly circumſtanced. Previous fever, dropſy, paralyſis, the languid circulation of old age, &c. all render the diſorder more eaſy of production.

Some of the remote cauſes of mortification operate by actually ſubverting the organization of the part. Bad comminuted compound fractures, attended with extenſive injury of the ſoft parts, and a wound of the main arteries of the limb; very large contuſed lacerated wounds, &c. thus induce gangrene and ſphacelus. The action of fire and cauſtic ſubſtances may be ſaid to bring on ſloughing on the ſame principle; for a total deſtruction of all natural organization muſt be the conſequence of the chemical decompoſition of any part of the animal body. We ſhould obſerve, however, that the heat applied muſt be very great to kill and decompoſe the fleſh at once; and that, when mortification ariſes from burns, under any other circumſtances, the affection muſt be preceded by inflammation.

Long expoſure to certain degrees of cold will often give riſe to gangrene and ſphacelus, particularly when the benumbed frozen parts are imprudently expoſed, all at once, to the fire. In this circumſtance, a violent ungovernable inflammation is ſuddenly excited, which rapidly ends in a mortification. Bad chilblains afford a mild example of ſuch a caſe; while a ſevere one may be ſeen in the ſphacelus of a whole extremity. Cold will more readily make parts ſlough, when the ſyſtem is debilitated by poor living, or any previous diſeaſe. We have ſeen, in the hoſpitals of the metropolis, many Laſcars, whoſe feet had mortified in conſequence of the cold of this climate, and want of proper nouriſhment. In former times, alſo, numerous Africans out of ſlave ſhips uſed to be ſeen in the London hoſpitals, whoſe limbs were ſometimes in a ſtate of ſphacelus, from the combined effect of cold, poor living, and ill-treatment, and ſometimes, as we are ſorry to remark, from the cruel preſſure of their irons. The treatment of frozen and froſt-bitten parts we ſhall preſently conſider.

The furunculus and carbuncle are diſeaſes which are always attended with a greater or a leſs degree of gangrenous diſorder, as the reader may learn more particularly by a reference to thoſe articles.

Mortification is ſtated to originate ſometimes from unknown epidemic cauſes; and inſtances are mentioned, in which all the ſores and wounds in a large hoſpital have become, about the ſame time, affected with gangrene. Gangrene and ſphacelus ſometimes proceed from inexplicable cauſes. The occaſion of that ſpecies of mortification, which begins in one of the toes, and extends thence up the leg, is not exactly underſtood. We ſhall preſently introduce Mr. Pott's intereſting obſervations on this particular caſe.

Having noticed the general ſymptoms of mortification, the principal remote cauſes, and the diviſion of the diſorder into two kinds, one preceded by inflammation, the other not, we now proceed to the conſideration of ſome other circumſtances which require explanation, before we begin to ſpeak of the treatment.

Beſides the diviſion of mortifications into ſuch as are preceded by inflammation, and into others which are not, ſurgical authors have made ſome other diſtinctions; for inſtance, the *dry* and *humid* gangrenes; the *white* gangrene, &c. The two firſt kinds are characteriſed by the little or great quantity of moiſture about the ſphacelated part. Hildanus, Tulpius, Queſnay, Bertrandi, and others have treated of the dry gangrene in their reſpective writings.

In the *white* gangrene, the mortified parts are ſaid not to turn black, but to retain nearly their natural colour. Queſnay has taken particular notice of this curious variety of the diſtemper.

A mortified part may be conſidered, in relation to the reſt of the body, as an extraneous ſubſtance, the ſeparation of which will be equally conducive to the comfort and recovery of the patient. However, it ſhould be known, that a ſlough does not admit of removal as ſoon as it is formed; for although there is no vital connection between the dead and living

living matter, yet a mechanical union exiſts until the abſorbent veſſels have had time to take away ſuch particles as connect the ſound fleſh with the dead maſs. Were a ſurgeon imprudently to uſe force for the purpoſe of tearing away an extenſive mortified part, he would ſubject the patient to the danger of a renewal of the ſloughing, put him to unwarrantable pain, and bring on a hæmorrhage, which, in a debilitated ſtate of the ſyſtem, might lead to fatal conſequences. The detachment of a ſlough is altogether the work of nature, and the ſurgeon can only uſefully interfere in removing ſuch portions of the mortified maſs as are completely looſe. When a mortification ceaſes to ſpread, the adjoining edge of the living part ſoon exhibits the appearance of a red line, or border, which is a ſign much taken notice of by all experienced ſurgeons; becauſe it ſhews that the ſpreading of the mortification has ſtopped, and that the limb, which could not prudently be amputated before, may now be removed, if circumſtances make the proceeding neceſſary. Soon after the red line of ſeparation appears, ſuppuration commences. At firſt, a ſmall quantity of matter iſſues from the ſpace between the ſlough and the living ſurface, and the diſcharge of purulent matter gradually becomes more and more copious. The pus is of courſe ſecreted from the veſſels of the living part; but it muſt be manifeſt, that before the matter can be poured out, a ſpace muſt be formed for it between the ſlough and the living parts. The preſent received opinion is, that ſuch an interſpace is produced by the action of the abſorbent veſſels, which are on the living ſurface, and which, in fact, effect the detachment of the dead maſs, by removing ſuch particles of matter as connect it with the living fleſh. The inflammation which ariſes on the living edge, as ſoon as the mortification ceaſes to ſpread, and which precedes the detachment of the ſlough, ſeeming eſſential to the completion of that proceſs, is ſaid to depend chiefly upon the preſence of the ſlough, which operates as an extraneous ſubſtance on the living matter with which it is in contact. Thus, the living ſurface is made to inflame, redden, and ſuppurate.

Some philoſophizing writers affect to ridicule the opinion, that the ſeparation of a dead from a living part is chiefly accompliſhed by the action of the abſorbent veſſels, or, by what a formal modern author is pleaſed to term the "mordicant powers of abſorbent orifices." (See Pearſon's Principles.) Theſe ſages, however, do very wrong to torture their intellectual powers with ſubjects which, of all others, are the leaſt calculated to receive elucidation from ſuch dim rays as emanate from ordinary genius. To any man free from the vanity of ſetting up ſome new weak hypotheſis, and of endeavouring to ſubvert the better eſtabliſhed opinions of others, merely to make way for the inſignificant offspring of his own fancy, there will be no more difficulty in conceiving how any of the particles of the body can be taken away by one ſet of veſſels, called abſorbents, than in conceiving how ſuch particles can be depoſited by another order of veſſels, named arteries.

It is a curious circumſtance, in the hiſtory of mortification, that the blood coagulates for ſome way up the large arteries which lead into the mortified portion of a limb. Were it not for this event, the ſeparation of the dead part would generally be productive of a fatal hæmorrhage.

There is a ſpecies of ſphacelus which ſpreads with immenſe rapidity, and is exceedingly dangerous, hardly leaving any time for the trial of remedies. Sometimes, however, a mortification ſpreads ſo ſlowly, that it does not occupy much extent at the end of ſeveral months; yet the caſe is frequently not the leſs fatal on this account. The danger is never altogether paſt until the dead part is ſeparated. It is ſaid, that long after a mortification has ceaſed to ſpread, the patient may die in conſequence of the abſorption of ſome of the putrid matter into the circulation. With regard to the prognoſis, we can only offer a few general remarks. The degree of danger will always be, in a great meaſure, proportioned to the ſize of the part affected, and its importance in relation to the neceſſary operations of the animal economy. The event of every caſe will alſo be conſiderably influenced by the age and conſtitution of the patient.

In forming a judgment concerning the hope of a recovery, we ſhould not be entirely actuated by ſuperficial appearances. Often, when a part looks quite black and completely ſphacelated, its total deſtruction does not enſue; for in many caſes the diſorder only affects the ſkin and cellular ſubſtance. The integuments frequently ſlough away, and we have the happineſs to find that the tendons, muſcles, and other organs underneath, are perfectly ſound, ſo that ſtrong hopes of a recovery may be juſtly entertained.

No favourable prognoſis can ever be delivered while a mortification is in a ſpreading ſtate. Nor ſhould any flattering proſpects be held out in any inſtance in which the quantity of ſloughs and putrid matter is large, and the patient old and vaſtly debilitated. After the deſtructive proceſs has ſtopped in the part, the ravages may be too great for the ſyſtem to repair, and the diſcharge too copious and weakening; or the patient may ſuddenly periſh, as authors aſſert, in conſequence of the effects of putrid matter abſorbed into the circulation.

Treatment of Gangrene and Sphacelus.—The treatment of every kind of mortification is divided into *conſtitutional* and *local*; the firſt compriſing ſuch internal remedies as are indicated by the ſtate of the general ſyſtem; the ſecond comprehending whatever is neceſſary to be applied or done to the mortified part itſelf.

When a mortification is in a ſpreading ſtate, is the conſequence of violent inflammation, and is attended with a ſtrong, full, frequent pulſe, and other ſymptoms of inflammatory fever, the antiphlogiſtic treatment is obviouſly indicated. As for the part which is already ſphacelated, no kind of ſurgery can reſtore it to its original ſtate; with reſpect to the living circumference, which is in danger of being next deſtroyed, and which may be materially affected by the conduct of the practitioner, in what other ſtate can it be regarded, except that of ſuch vehement inflammation as is the forerunner of gangrene? Hence, the ſame kind of conſtitutional treatment is required as in other inflammatory caſes, namely, bleeding, purging, antimonials, low diet, &c. However, there is this difference, that as the ſyſtem always ſoon ſuffers a conſiderable dejection, and the ſtrength ſuddenly ſinks, when a large portion of the body mortifies, the ſurgeon is obliged to be very cautious in not carrying the plan of evacuations too far. Were he to employ the lancet, and exhibit purgatives as freely as in any common inſtance of phlegmonous inflammation, the patient would often be reduced, partly by the diſeaſe, and partly by the treatment, into a ſtate of debility, from which no ſucceeding ſkill could extricate him.

As the change from the violence of inflammation into gangrene and ſphacelus is always attended with a ſevere degree of pain, it is indiſpenſably proper to adminiſter opium, with a view both of alleviating the ſufferings, and procuring ſleep.

Numerous practitioners, and, we may ſay, the majority of writers, recommend the exhibition of bark in the preceding inſtance, though as far as our obſervations extend, without either being influenced by any rational principles, or at all encouraged by unqueſtionable ſucceſs. For, admitting

mitting that bark has the wonderful virtue of directly imparting ſtrength to the human conſtitution, how inconſiſtent it ſeems at once to adopt meaſures which lower the ſyſtem, and put in practice other things which tend to ſtrengthen! We wiſh, however, our cenſures on this uſe of bark only to extend to the period while the mortification is accompanied with conſiderable inflammation, and the ſtrong actions of the common inflammatory fever; for when this ſtage is over, we agree that all evacuations ſhould be omitted, and a tonic treatment be immediately followed.

The partiſans of the Peruvian bark have, indeed, the authority of Mr. Hunter on their ſide, who thought it a ſingularly efficacious medicine in all caſes of mortification preceded by inflammation, inaſmuch as he believed it had the peculiar virtue of increaſing the powers, and leſſening the action in the part. What man of experience, however, who is not a bigot to theory, can ſuppoſe that bark will actually diminiſh the action in a part affected with the higheſt degree of inflammation? If it poſſeſſes this miraculous quality, why is it not regularly preſcribed in all caſes of inflammation? Why not put at the head of the liſt of antiphlogiſtic remedies? In practice, we could never find a fact in proof of the alleged property of bark in leſſening action. We believe that the reaſon of this medicine being indiſcriminately given in every ſtage and ſpecies of mortification, is referable to cauſes which were ably pointed out by that excellent practical ſurgeon Mr. Samuel Sharp, whoſe obſervations we ſhall preſently quote.

We are happy in finding ſome practitioners yet unblinded by prejudices in favour of bark. Among theſe we have to notice the reſpectable German ſurgeon, Richter. This experienced writer remarks, that there are three different kinds of fever, which are obſerved to be attendant on the various ſpecies of mortification, namely, the ſympathetic inflammatory fever, one accompanied by extreme debility, being in all probability of a typhoid nature; and another fever, which ſeems to be intimately connected with a diſordered ſtate of the abdominal viſcera.

The inflammatory fever takes place when the mortification is the conſequence of acute inflammation, which has been produced by ſome external injury in a healthy conſtitution. Here, ſays Richter, bark is in general hurtful.

The ſecond fever, which we have juſt mentioned, certainly demands the exhibition of bark.

The third, however, or that which is dependent on diſorder of the chylopoietic organs, is not likely to be benefited by bark, becauſe one of the principal indications is to procure free evacuations from the ſtomach and bowels. See Richter's Anfangsgründe der Wundarzneykunſt, Baud I. Kap. 3.

Our chief wiſh, in the foregoing remarks, is to convince the reader, that while a gangrene is ſpreading, attended with a ſtrong frequent pulſe and other ſymptoms of inflammatory fever, and while the local miſchief is ſurrounded by acute inflammation, the treatment ſhould be of the antiphlogiſtic kind, and bark need not be adminiſtered, a moderate employment of evacuations being the moſt likely means of averting the deſtruction which impends over the highly inflamed parts, which are immediately around ſuch as are already dead.

Inconſiſtent, however, as the practice of giving barks in this inflammatory ſtage of mortification appears to us, we are far from ſaying any thing againſt the exhibition of the medicine the moment the ſtrong actions of the inflammatory fever ceaſe, and ſigns of approaching debility commence. All evacuations muſt now be diſcontinued, and the patient's ſtrength ſupported by every means in our power. The moſt rational mode of effecting this object undoubtedly conſiſts in giving ſuch food as is at once the moſt nouriſhing and moſt eaſy of digeſtion, ſuch as jellies and good ſoups. Bark may now be advantageouſly employed, if only given in moderation, ſo as to improve the tone, inſtead of oppreſſing the functions of the digeſtive organs. With bark, the practitioner may join the vitriolic acid, laudanum, aromatic confection, or æther, as his diſcretion may direct. The patient ſhould alſo be allowed a moderate quantity of Madeira, or port wine, and either ale, porter, or cyder, as may agree with his conſtitution beſt. In ſome caſes brandy may be given with great benefit, and the uſe of opium ſhould ever be remembered.

Whenever bark is indicated in caſes of mortification, we conceive that the moſt eligible way of deriving benefit from it is to preſcribe moderate quantities of the medicine, perhaps about two ounces of the decoction, with a little of the tincture, about three times a day. We decidedly reprobate the plan of cramming the ſtomach with the decoction, tincture, and powder, all made into a thick mixture. We have ſeen ſome hoſpital ſurgeons in this city eagerly ſeize every opportunity in theſe caſes of preſcribing the foregoing farrago, ſometimes denominated the *bark in full*, as if the degree of benefit would certainly be in a ratio to the quantity of the medicine crammed down the patient's throat. Such practitioners muſt ſurely entertain ſtrange notions, both of the virtues of bark, and of the nature of the human alimentary canal. They muſt ſuppoſe that a certain portion of ſtrength will be extracted from every grain of ſolid bark, which can juſt be got down the revolting œſophagus into the ſtomach. When the medicine is in the latter place, they ſeem to fancy that a degree of vigour, proportioned to the weight and quantity of the remedy ſwallowed, will ſurely be extricated from the miraculous mixture by the digeſtive organs, and infuſed into the ſyſtem. They alſo appear to think that the ſtomach and bowels muſt be as inſenſible as leathern bags, or dead bladders, into which any quantity of a thing may be ſtowed without the leaſt harm, ſo that they do not actually burſt.

Our ſentiments are far different. We believe that bark has no direct power of imparting ſtrength to the human conſtitution, and that it has a ſtrengthening effect only in as much as it improves the tone of the ſtomach, with which it comes into contact. If this be correct, how unlikely is it that any good will be produced by loading the ſtomach and bowels with as much of the medicine as the patient can be made to ſwallow. Will not ſuch a method be more oppreſſive than beneficial to the digeſtive organs? Is not the abſurdity of the practice diſplayed every day? Do we not ſee the patients themſelves remonſtrating? Do they not frequently make complaint that the bark ſickens, purges, and ſo diſorders them, that they can keep no nouriſhment within them, and that inſtead of being ſerved by the remedy, they are almoſt killed by it? Let bark only be given in the way which we have adviſed, and whatever good it is capable of doing will be obtained.

Sometimes bark will produce purging, though adminiſtered with moderation, in which circumſtance a few drops of the tinctura opii ſhould be added to each doſe. Frequently the ſtomach will not bear the decoction of this medicine. In ſuch caſes bark ſhould be tried in the form of a very ſubtile powder, or the infuſion, or the tincture, may be exhibited.

Thus we ſee, that in caſes of gangrene bark is ſometimes proper, ſometimes inefficacious, and ſometimes abſolutely pernicious, and that it can only be conſidered as a uſeful medicine when preſcribed by practitioners of diſcrimination,

mination. We ſee, alſo, that in certain inſtances of mortification, although bark is at firſt improper, it is afterwards ſtrongly indicated by the change of circumſtances.

We have ſtated, that bark ſhould be adminiſtered whenever any ſpecies of gangrenous diſorder is attended with a ſtate of the ſyſtem, reſembling that which occurs in typhus fever, and, generally, whenever great debility is decidedly preſent. The anthrax, or carbuncle, we know, is a diſeaſe always attended with more or leſs ſloughing, as well as with a depraved conſtitution, and a remarkable proſtration of ſtrength. Bark is found, in this inſtance, to be followed by the moſt beneficial effects.

It is alſo a highly valuable medicine in almoſt all mortifications which are the conſequence of eryſipelatous inflammation. Let it ever be recollected, however, that, in no caſe, ought bark to be given in immoderate doſes, nor when it diſagrees with the ſtomach and bowels.

One principal cauſe, which has induced ſurgeons to order bark in all caſes of mortification, without the leaſt diſtinction, is the manner in which this medicine has been puffed off as a *ſpecific* for gangrenous diſorders, which it has been alleged to ſtop by ſome peculiar virtues, which no other article of the materia medica poſſeſſes. The dark days of prejudice, however, have ſeldom been altogether deſtitute of ſome few diſcerning men, whoſe abilities and ſtrength of underſtanding have not ſuffered them to be deceived and led aſtray by the vague opinions of the multitude. Among ſuch exalted characters, Mr. Samuel Sharp, ſurgeon of Guy's Hoſpital, merits a conſpicuous place. Notwithſtanding he lived in times when bark was praiſed up to the ſkies, and repreſented, in almoſt every publication of the day, as curing ſome melancholy ſpecimen of mortification, he never allowed himſelf to be blinded by any paper aſſertions, nor his eyes to be turned away from the facts which preſented themſelves in his own extenſive practice. The following obſervations of this experienced ſurgeon are as pertinent and intereſting now, as they were at the period when they were originally publiſhed. "There has lately ſtarted up in Great Britain a new practice of treating this complaint (meaning a mortification), which, at preſent, makes ſome noiſe in other parts of Europe, and is therefore worth our attention. Every body will immediately conclude, that I mean the cortex peruvianus, which, within theſe few years, has been ſo exalted for its virtues in ſtopping a gangrene, that the cautery itſelf was not more eſteemed amongſt the ancients, than is this medicine by ſome of the moderns. I know it will be looked upon by many as a kind of ſcepticiſm to doubt the efficacy of a remedy ſo well atteſted by ſuch an infinity of caſes; and yet I ſhall frankly own, I have never clearly, to my ſatisfaction, met with any evident proofs of its preference to the cordial medicines uſually preſcribed; though I have a long time made experiment of it, with a view to ſearch into the truth.

"Perhaps it may ſeem ſtrange thus to diſpute a doctrine eſtabliſhed on, what is called, matter of fact; but I ſhall here obſerve, that, in the practice of phyſic and ſurgery it is often exceedingly difficult to aſcertain a fact. Prejudice, or want of abilities, ſometimes miſleads us in our judgment, where there is evidently a right and a wrong; but, in certain caſes, to diſtinguiſh how far the remedy, and how far nature operate, is probably above our diſcernment. In gangrenes, particularly, there is frequently ſuch a complication of unknown circumſtances, as cannot but tend to deceive an unwary obſerver. Mortifications, ariſing from mere cold, compreſſion, or ſtricture, generally ceaſe upon removing the cauſe, and are, therefore, ſeldom proper caſes for proving the power of bark. However, there are two kinds of gangrene where internals have a fairer trial; theſe are a ſpreading gangrene from an internal cauſe, and a ſpreading gangrene from violent external accidents, ſuch as gun-ſhot wounds, compound fractures, &c. Yet, even here, we cannot judge of their effect with abſolute certainty; for ſometimes a mortification from internal cauſes is a kind of critical diſorder. There ſeems to be a certain portion of the body deſtined to periſh, and no more. Of this we have an infinity of examples brought into our hoſpitals, where gangrene ſtops at a particular point, without the leaſt aſſiſtance from art. The ſame thing happens in the other ſpecies of gangrene from violent accidents, where the injury appears to be communicated to a certain diſtance, and no farther; though, by the way, I ſhall remark in this place, contrary to the received opinion, that gangrenes from theſe accidents (where there has been no previous ſtraightneſs of bandage) are as often fatal, as thoſe from internal cauſes.

"As I have here ſtated the fact, we ſee how difficult it is to aſcertain the real efficacy of this medicine; but had bark, in any degree, thoſe wonderful effects in gangrenes which it has in periodical complaints, its pre-eminence would no more be doubted in the one caſe than in the other. What, in my judgment, ſeems to have raiſed its character ſo high, are the great number of ſingle obſervations publiſhed on this ſubject, the authors of which not having frequent opportunities of ſeeing the iſſue of this diſorder, under the uſe of cordials, &c. and ſome of them, perhaps, prejudiced with the common ſuppoſition, that every gangrene is of itſelf mortal, have therefore aſcribed a marvellous influence to the bark, when the event has proved ſucceſsful." (See Critical Enquiry, &c. chap. on Amputations.)

We ſhall now conclude the ſubject of bark in caſes of mortification. We have not allowed this medicine any direct power of imparting ſtrength, neither have we admitted, that it at all deſerves the name of a ſpecific in checking the progreſs of gangrene and ſphacelus. We have ſtated our belief, that it can only be the means of ſupporting the ſtrength inaſmuch as it may improve the tone of the digeſtive organs. With theſe principles, we have condemned the practice of making the patient take immoderate quantities of the remedy; ſo as to diſorder, inſtead of meliorating, the ſtate of the ſtomach and bowels. We have maintained, that bark is never indicated when the mortification is ſpreading, in conſequence of acute inflammation, in a patient not deficient in ſtrength; and when the affection is either attended with inflammatory fever, or with another fever depending on diſorder of the chylopoietic organs. In this laſt inſtance, the firſt indication is to empty the primæ viæ, and, afterwards, bark may be given, if circumſtances require it. We have allowed, that moderate doſes of bark may be exhibited with advantage in almoſt every ſpecies of mortification, immediately when evident ſigns of debility make their approach, ſo that the medicine will often be proper after a certain time, though it may not be indicated in the commencement of the caſe.

When a mortification is ſpreading in a very old, enfeebled patient, bark may be preſcribed with opium, cordials, and aromatic medicines; but we again repeat our own ſentiment, that, whenever the indication is to ſupport the ſtrength, it is much more rational to endeavour to effect this object by eligible kinds of nouriſhment, than by overloading the ſtomach with any kind of medicine whatſoever.

There is a particular ſpecies of mortification, beginning in the toes, and extending gradually to the foot and leg, and deſerving particular notice, as being an inſtance in

which bark is univerſally allowed to fail. This caſe is remarkable, alſo, on account of its not being benefited by that grand remedy, notwithſtanding the frequent concomitant evils of debility and old age. The late able Mr. Pott, whoſe writings ſhew, that he had as much faith in bark as moſt ſurgeons, could not acknowledge its efficacy in the inſtance to which we are alluding. The diſtemper begins at the extremity of one or more of the ſmall toes, and ſooner or later paſſes on to the foot and ankle, and ſometimes to a part of the leg, in former times, moſt commonly deſtroying the patient, in ſpite of all the aid of phyſic and ſurgery.

The annexed deſcription of the diſeaſe and its treatment is from the pen of Mr. Pott, whoſe ſurgical works are equally recommended by the practical knowledge which they contain, and by the fine animated ſtyle in which they are written.

He remarks, that this caſe "is very unlike to the mortification from inflammation, to that from external cold, from ligature, or bandage, or to that which proceeds from any known and viſible cauſe, and this as well in its attack as in its proceſs. In ſome few inſtances, it makes its appearance with little or no pain; but, in by much the majority of theſe caſes, the patients feel great uneaſineſs through the whole foot and joint of the ankle, particularly in the night, even before theſe parts ſhew any mark of diſtemper, or before there is any other, than a ſmall diſcoloured ſpot on the end of one of the little toes.

"It generally makes its firſt appearance on the inſide, or at the extremity, of one of the ſmaller toes, by a ſmall, black, or blueiſh ſpot: from this ſpot the cuticle is always found to be detached, and the ſkin under it to be of a dark red colour.

"If the patient has lately cut his nails, or corn, it is moſt frequently, though very unjuſtly, ſet to the account of ſuch operation.

"Its progreſs in different ſubjects, and under different circumſtances, is different; in ſome it is ſlow and long in paſſing from toe to toe, and from thence to the foot and ankle; in others its progreſs is rapid, and horridly painful: it generally begins on the inſide of each ſmall toe, before it is viſible either on its under or upper part; and when it makes its attack on the foot, the upper part of it firſt ſhews its diſtempered ſtate, by tumefaction, change of colour, and ſometimes by veſication; but wherever it is, one of the firſt marks of it is a ſeparation or detachment of the cuticle.

"Each ſex is liable to it; but for one female in whom I have met with it, I think I may ſay, that I have ſeen it in at leaſt twenty males. I think, alſo, that I have much more often found it in the rich and voluptuous, than in the labouring poor; more often in great eaters, than free drinkers. It frequently happens to perſons advanced in life, but is by no means peculiar to old age. It is not, in general, preceded or accompanied by apparent diſtemperature either of the part, or of the habit. I do not know any particular kind of conſtitution which is more liable to it than another; but as far as my obſervation goes, I think that I have moſt frequently obſerved it to attack thoſe, who have been ſubject to flying uncertain pains in their feet, which they have called gouty, and but ſeldom in thoſe who have been accuſtomed to have the gout regularly and fairly. It has, by ſome, been ſuppoſed to ariſe from an oſſification of veſſels; but for this opinion I never could find any foundation but mere conjecture.

"The common method of treating this diſtemper is, by ſpirituous fomentations, cataplaſms actually and potentially warm, by dreſſings of the digeſtive kind, as they are called, animated with warm, pungent oils and balſams, &c. and, internally, by the Peruvian bark.

"I wiſh I could ſay that this, which, with little alteration, has been the general practice, had been moſt frequently, or even often ſucceſsful; but I am, from long and repeated experience, obliged to ſay, that it has not.

"I am ſenſible, that many of my readers will be ſurpriſed at my affirming, that the Peruvian bark will not ſtop a mortification, a diſtemper in which, for ſome years, it has been regarded as ſpecific; but I muſt beg not to be miſunderſtood: I mean to confine my obſervation and my objection to this particular ſpecies of mortification, which I regard as being ſui generis: and under this reſtriction I muſt repeat, that I have ſeldom, if ever, ſeen the bark ſucceſsful: in all other caſes, wherein it is uſed or recommended, no man has a higher opinion of it; but, in this I cannot give it a praiſe, which it does not deſerve.

"I believe I may venture to ſay, that I have tried it as fairly, as fully, and as variouſly as any man has or can: I have given it in the largeſt quantity, at the ſhorteſt intervals, and for the longeſt poſſible ſpace; that is, as long as the patient's life would permit: I have given it by itſelf in decoction, extract, and ſubſtance; I have combined all theſe together; I have joined it with nitre, ſal. abſynth. with ſnake-root, with confect. cardiac. with volatile ſalts, and with muſk, as different circumſtances ſeemed to require, or admit: I have uſed it as fomentation, as poultice, as dreſſing; I have aſſiſted it with every thing which has been uſually thought capable of procuring, or aſſiſting digeſtion; ſtill the diſtemper has continued its courſe, perhaps a little more ſlowly, but ſtill it has ended in death.

"I am ſorry to rob one of our great medicines of any part of its ſuppoſed merit, but as on the one hand, its claim, in this inſtance, is unjuſt, and as on the other, I hope to add as much to the character of another, the res medica will be no ſufferer.

"Some time ago, I had a patient labouring under this complaint, who, from antipathy, obſtinacy, or ſome other cauſe, could not be prevailed on to take bark in any form whatever. I made uſe of every argument, but to no purpoſe: fomentation, poultice, and the uſual dreſſings were applied in the uſual manner; the diſeaſe advanced ſome days more, ſome days leſs, and at the end of a fortnight the ſmall toes were all completely mortified, the great one become blackiſh, the foot much ſwollen, altered in colour, and the diſeaſe ſeeming to advance with ſuch haſty ſtrides, that I ſuppoſed a very few days would determine the event. The pain in the foot and ankle was ſo great, and ſo continual, as totally to deprive the patient of ſleep. On this account, and merely to procure ſome remiſſion, I gave two grains of opium at night, which not having the deſired effect, I repeated it in the morning. Finding, during the following day, ſome advantage, I repeated the ſame doſe night and morning, for three days; at the end of which time the patient became quite eaſy, and the appearances on the foot and ankle were viſibly more favourable. Encouraged by this, I increaſed the quantity of the medicine, giving one grain every three or four hours, taking care to watch its narcotic effect, and to keep the belly empty by glyſters. In nine days from the firſt adminiſtration of the opium, all the tumefaction of the foot and ankle totally ſubſided, the ſkin recovered its natural colour, and all the mortified parts plainly began to ſeparate; in another week they were all looſe, and caſting off, the matter was good, and the incarnation florid. During the whole of this time, I continued the uſe of the opium, varying its quantity as

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circumſtances required, but never gave leſs than three or four grains in twenty-four hours.

" When the ſloughs were all caſt off, the bones ſeparated, and I had only a clean ſore to dreſs and heal, I gradually left off the medicine.

" I am very willing to acknowledge, that however well-pleaſed I might be with the event of this caſe, yet I really regarded it as accidental; ſo much ſo, that having very ſoon after another opportunity, I did not care to truſt to opium alone, but joined the bark with it. The event was equally fortunate. But although I had joined the cortex with the extractum thebaicum, and did therefore attribute the ſucceſs to their united powers, yet the effect was ſo very unlike to what I had ever ſeen from the bark without opium, that I could not avoid ſeriouſly, and often reflecting on it, and determining to uſe it by itſelf, whenever another opportunity ſhould offer. I did ſo, and ſucceeded in the ſame happy manner, though under the very diſagreeable circumſtances of ſeventy years of age, a broken, diſtempered conſtitution, and the diſeaſe making a haſty progreſs.

" To relate caſes which are nearly, or at leaſt materially ſimilar, is of no uſe: I ſhall therefore only ſay, that every opportunity, which I have had ſince of making the experiment, has ſtill more and more convinced me of the great value and utility of this medicine, and of its power of reſcuing from deſtruction perſons under this affliction.

" I cannot ſay that it has never failed me: it certainly has; but then it has been under ſuch circumſtances, as I think would fairly account for the failure.

" I ſhould be exceedingly ſorry to be miſunderſtood; I ſhould be ſtill more ſo to miſlead any body; and therefore I beg it may be noticed, that I do not propoſe the extractum thebaicum, in this caſe, as an univerſal, infallible ſpecific; I know, from experience, that it is not; but as I alſo know, from repeated experience, that it will, under proper management and direction, do more than any, or than all other medicines; and that I have, by means of it, ſaved ſome lives, which, I am very ſure, would, under the common, and moſt approved method of treatment, without it, have been loſt, I could not anſwer to myſelf the not communicating what I had obſerved.

" If this was an experiment, in which the life or limb, or health of the patient, was in any degree endangered, or by which the perſon, on whom it may be tried, could, in any degree, be injured, I ſhould have withheld what I now publiſh, until a greater length of time, and more experience had rendered it ſtill more abſolutely certain; and I ſhould have thought myſelf ſtrictly vindicable in ſo doing: but as this is a medicine, whoſe general effects are well known, and which is, at the ſame time, ſo capable of direction and management, that it is almoſt impoſſible for any perſon who deſerves to be truſted with medicine at all to do any material harm with it, I thought it would be wrong and unjuſt to conceal what had occurred to me, leſt I might thereby deprive the afflicted of an aſſiſtance which, I verily believe, is not to be obtained from any other quarter.

" In ſhort, from what I have ſeen and done, I am perfectly convinced that, by its means, and by its means ſolely, I have ſaved lives which, without it, muſt have been loſt.

" If it preſerves a few of thoſe, who are ſo unfortunate as to labour under this naſty, painful, lingering, and deſtructive diſorder, to which we are all liable, and which has hitherto, moſt frequently, foiled all attempts of art, I ſhall be ſincerely glad to have contributed to ſo good an end: if it ſhould prove in other hands as ſucceſsful as it has with me, I ſhall be ſtill more ſo; but, on the other hand, if, after ſeveral times giving me reaſon to believe and hope that it would prove an inſtrument for the preſervation of many, it ſhould, upon more repeated trial, be found to fail, I ſhall be ſorry for the event, but ſhall ſtill think, that I did right in communicating what I had ſeen, and thereby endeavouring to be uſeful to mankind.

" Hoc opus, hoc ſtudium, parvi properemus et ampli,
Si patriæ volumus, ſi nobis vivere cari."

" If I am right in my conjecture concerning this hazardous and deſtructive malady; and if the method which I have propoſed and practiſed ſhould prove as ſucceſsful in the hands of others as it has in mine, I cannot help thinking, that the external or chirurgic treatment of the diſorder might be amended; that is, might be made to coincide more than it does at preſent with ſuch ſoothing kind of plan.

" Since I have had reaſon to embrace this opinion, and to act in conformity to it, I have found more advantage from frequently ſoaking the foot and ankle in warm milk, than from any ſpirituous, or aromatic fomentations whatever; that is, I have found the one more capable of alleviating the pain, which ſuch patients almoſt always feel, than the other; which circumſtance I regard as a very material one. Pain is always an evil, but, in this particular caſe, I look upon it as being ſingularly ſo. Whatever heats, irritates, ſtimulates, or gives uneaſineſs, appears to me always to increaſe the diſorder, and to add to the rapidity of its progreſs; and, on the contrary, I have always found, that whatever tended merely to calm, to appeaſe, and to relax, at leaſt retarded the miſchief, if it did do no more.

" The whole plan of the chirurgic treatment of this diſeaſe is founded on a general idea of warming, invigorating, ſtimulating, and reſiſting putrefaction; and the means generally made uſe of are very proper for ſuch purpoſe: but I muſt own that I think the purpoſe, or intention, to be improper.

" Upon this principle, the whole theriaca Londinenſis, and the preſent cataplaſma è Cymino, have been, and ſtill are, ſo freely uſed on this occaſion. A compoſition of this kind, if it does any thing, muſt heat and ſtimulate, and it is by heating and ſtimulating the ſkin, to which it is applied, that it ſo frequently does that miſchief which I am confident it often does, though ſuch miſchief is ſet to the account of the nature of the diſorder. Caſes exactly ſimilar, in all circumſtances, are not to be met with every day, but I am from experience convinced, that of two, as nearly ſimilar as may be, in point of pain, if the one be treated in the uſual manner, with a warm, ſtimulating cataplaſm, and the other only with a poultice made of the fine farina ſeminis lini, in boiling milk or water, mixed with ung. ſambuc. or freſh butter, that the pain, and the progreſs of the diſtemper, will be much greater and quicker in the former than in the latter.

" When the black or mortified ſpot has fairly made its appearance on one or more of the toes, it is the general practice to ſcarify or cut into ſuch altered part with the point of a knife or lancet. If this inciſion be made merely to learn whether the part be mortified or not, it is altogether unneceſſary, the detachment of the cuticle, and the colour of the ſkin, render that a decided point: if it be not made quite through the eſchar, it can ſerve no purpoſe at all; if it be made quite through, as there is no confined fluid to give diſcharge to, it can only ſerve to convey ſuch medicines as may be applied for the purpoſe of procuring digeſtion to parts capable of feeling their influence, and on this account they are ſuppoſed to be beneficial, and therefore right.

" When the upper part of the foot begins to part with

its cuticle and to change colour, it is a practice with many to ſcarify immediately; here, as in the preceding inſtance, if the ſcarifications be too ſuperficial, they muſt be uſeleſs; if they be ſo deep as to cauſe a ſlight hemorrhage, and to reach the parts which have not yet loſt their ſenſibility, they muſt do what indeed they are generally intended to do, that is, give the medicines, which ſhall be applied, an opportunity of acting on ſuch parts.

"The medicines moſt frequently made uſe of for this purpoſe are, like the theriaca, choſen for this ſuppoſed activity; and conſiſt of the warm, pungent oils and balſams, whoſe actions muſt neceſſarily be to ſtimulate and irritate: from theſe qualities they moſt frequently excite pain, which, according to my idea of the diſeaſe, is diametrically oppoſite to the proper curative intention; and this I am convinced of from repeated experience.

"The dreſſings cannot conſiſt of materials which are too ſoft and lenient, nor are any ſcarifications neceſſary for their application. But I would go farther and ſay, that ſcarifications are not only uſeleſs, but, in my opinion, prejudicial, by exciting pain, the great and chiefly to be dreaded evil in this complaint. The poultice ſhould be alſo ſoft, ſmooth, and unirritating; its intention ſhould be merely to ſoften and relax; it ſhould comprehend the whole foot, ankle, and part of the leg; and ſhould always be ſo moiſt or greaſy as not to be likely to become at all dry or hard between one dreſſing and another.

"I will trouble the reader with only one remark more.

"When the toes are, to all appearance, perfectly mortified, and ſeem ſo looſe as to be capable of being eaſily taken away, it is in general thought right to remove them. However rotten and looſe they may ſeem to be, or really are, yet while they hold on they hold by ſomething which is ſtill endued with ſenſation, as may always be known, if they be bent back or twiſted with any degree of violence.

"I will not enter into a diſpute about the ſenſibility or inſenſibility of ligaments, nor undertake to determine whether they be ligaments or any other kind of parts, which ſtill maintain the connection of the toes with their own reſpective joints, or with the metatarſal bones; it is ſufficient for me to know, and to inform the young practitioner, that however looſe they may ſeem, yet if they be violently twiſted off, or the parts, by which they hang, be divided, a very conſiderable degree of pain will moſt commonly attend ſuch operation, which therefore had much better be avoided; and that I have ſeen this very pain, thus produced, bring on freſh miſchief, and that of the gangrenous kind.

"If the patient does well, theſe parts will certainly drop off; if he does not, no good can ariſe from removing them." Pott's Chirurgical Works.

Opium has been acknowledged by many other authors beſides Mr. Pott to be an exceedingly efficacious medicine in all caſes of gangrene accompanied with much irritation. Indeed, while bark is only proper in a limited number of inſtances, opium is indicated in all, either with a view of appeaſing pain, allaying irritation, procuring ſleep, or preventing diarrhœa.

Mr. Kirkland thought, that when opium is preſcribed, the medicine ſhould not be puſhed at firſt, as he believes more harm than good ariſes when the doſes are ſuch as to impair the appetite, occaſion affections of the heart, or delirium.

Camphor is a medicine not to be forgotten in caſes accompanied with irritation and debility. The celebrated Pouteau had a high opinion of its virtues in ſuch inſtances, and he uſed to order five grains to be taken with ten of nitre, every four hours.

Carbonic acid gas has alſo gained conſiderable repute for its beneficial effects in caſes of gangrene and ſphacelus. It has ſometimes done good when bark has failed. Water, impregnated with the gas, is a very eligible beverage for patients labouring under theſe complaints.

We have only to add, on the ſubject of the internal treatment of mortifications, that, in all theſe caſes, a good ſupply of freſh air and the ſtricteſt obſervance of cleanlineſs are of the higheſt importance to the health and recovery of the patient. A few particulars neceſſary to be ſtated concerning the treatment of mortifications from cold and preſſure, may very well be noticed in ſpeaking of the topical means.

Local treatment of Gangrene and Sphacelus.—There can be no doubt that the extent of the deſtruction about to take place in the parts during the gangrenous ſtage may always be conſiderably influenced by the kind of treatment purſued at this period of the diſorder. Hence, it behoves the practitioner, above all things, to find out, if poſſible, the cauſe of the miſchief, and, if he can, remove it as ſpeedily as poſſible. So, when the mortification appears to originate from violent inflammation, he muſt uſe every means in his power to remove this latter affection of the ſurrounding parts, which are ſtill alive, and on the point of being deſtroyed. The local treatment, like the conſtitutional, ought in theſe circumſtances to be of the antiphlogiſtic deſcription. It matters not what is applied to ſuch parts as are already dead; but it is of material conſequence that nothing irritating be put on thoſe which are living and in a high ſtate of inflammation. We ſhould be inclined on principle to make uſe of cold applications in preference to warm ones, and perhaps the lotio aquæ lithargyri acetati is as good as any other.

Mr. Hunter was of opinion that all the local applications ſhould be cold; but we know that there are practitioners who are averſe to this method, and provided they employ nothing ſtimulating, and only uſe moderately warm fomentations and emollient poultices, we cannot find much fault with them. It is a fact which cannot always be reconciled to theories, that in ſome caſes of inflammation the patient derives moſt relief from warm emollient applications; in others from cold ones.

When the ſurrounding inflammation is at an end, and the limits of the mortification are fixed, a ſoft linſeed poultice, containing ſome powdered charcoal, is an excellent application.

We have adviſed the ſurgeon to endeavour to diſcover the remote cauſe, and remove it if poſſible. When the diſorder is owing to preſſure of any kind, nothing avails without removing the occaſion of the ſloughing, and even ſuch removal may be too late to be of much ſervice. In this inſtance the chief means of preventing an increaſe of miſchief are to change the patient's poſture, and put cuſhions under him wherever they are likely to take the preſſure off the parts which are affected. In this ſort of caſe we have generally uſed a ſoft linſeed poultice or a ſimple pledget, as a topical application, though ſome ſurgeons prefer bits of lint dipped in ſpirit of wine.

Tight bandages ſometimes occaſion gangrene, and we need hardly ſay, that their removal is the very firſt indication.

Violent inflammation and gangrenous ſymptoms are ſometimes the conſequence of the expoſure of the parts affected to certain degrees of cold. Theſe evils are particularly apt to follow when the parts have been ſuddenly warmed. Experience has repeatedly evinced, that caloric ſhould always be communicated to frozen parts very gradually. Even when a part, which is not actually frozen, but exceſſively

cold, is all on a ſudden placed in a very warm ſituation, it is found that conſiderable inflammation and ſloughing will frequently follow. The part becomes affected with ſwelling, a livid diſcolouration, and intolerable darting pain.

In order to reſtore warmth to a part which is either in a frozen, or exceſſively cold ſtate, the ſafeſt plan is to rub it with ſnow or very cold water, until ſigns of ſenſe and motion return, when the frictions may be made with brandy, or camphorated ſpirit of wine. The next object is to throw the patient into a perſpiration, which is to be fulfilled by adminiſtering ſome mulled wine, putting the patient to bed in a chamber where there is a fire, and covering him well with blankets. When the inflammatory and gangrenous ſymptoms have already begun, in conſequence of the part having been ſuddenly warmed, the miſchief often admits of being ſtopped by immerſing the part in water of a temperature nearly as low as the freezing point. This method ſhould be perſiſted in for a conſiderable time.

When the effects of cold terminate in a ſphacelus, the local treatment, as well as the general, is not attended with any particularity. An emollient poultice is commonly the beſt application, until the ſloughs have been detached, when the ſores ſhould be dreſſed, according to the principles to be explained in the articles ULCER and WOUNDS.

When a gangrene has proceeded to the ſtate of ſphacelus, ſome practitioners are in the habit of applying the cataplaſma cereviſiæ, or the cataplaſma effervescens. The firſt is prepared by ſtirring into the grounds of ſtrong beer as much oatmeal as will make the maſs of a proper conſiſtence. The ſecond is made by ſtirring into an infuſion of malt as much oatmeal as will render the maſs ſufficiently thick, and then adding about a ſpoonful of yeaſt. The charcoal poultice we have already mentioned as a favourite application. Bark has alſo been topically uſed, from a ſuppoſition of its being a powerful antiſeptic.

We may remark, however, that the linſeed poultice is made uſe of in moſt inſtances, and perhaps anſwers as well as any other in every caſe.

The ancients uſed to endeavour to ſtop the ſpreading of mortifications, by applying the actual cautery to the parts affected. This barbarous method was adopted in all ages, from the time of Hippocrates down to the beginning of the eighteenth century, when ſcarifications and other plans had failed. "Illi affectus qui medicamentis non ſanantur, ferro ſanantur; qui ferro non ſanantur, igne ſanantur; qui igne non curantur, hos exiſtimare oportet inſanabiles." This memorable aphoriſm, which Hippocrates left behind him, relating to the efficacy of fire, brought the cautery into uſe upon almoſt every occaſion. It was believed, as Mr. Sharp obſerves, that in mortifications the putrefying principle, or venom, was extracted with the juices, which were dried up by the hot iron. It was alſo fancied, that the ſeparation of the ſloughs was exceedingly aſſiſted by this proceſs; and, what was more important, it was imagined, that the life of the part was quickened by drawing the ſpirits to it, and freeing it of all humidities. Such was the language of the old ſurgeons.

It is well remarked by Mr. Sharp, that we have hardly in ſurgery a more extraordinary inſtance of human fallibility than this; for, after an uninterrupted practice of above two thouſand years, this celebrated remedy, whoſe virtues were ſuppoſed to be evident both from reaſon and experience, is at length fallen into diſrepute, and never employed for ſtopping a gangrene. See Critical Enquiry, &c.

We have expreſſed a general preference to emollient applications in caſes of mortification, and have alſo taken notice of the charcoal, fermenting, and oat-meal poultices, as ſometimes being proper. We may likewiſe enumerate the carrot and cicuta poultices as having been occaſionally thought ſerviceable in caſes of gangrenous ulcers. Of the practice, however, of employing very ſtimulating applications, we cannot refrain from declaring our decided diſapprobation. It was with ſome diſguſt that we read the directions of a modern writer and lecturer, when he ſays, that "the ſurrounding parts may be invigorated by the application of alcohol, oil of turpentine—cataplaſms containing theriaca Londinenſis, &c." This precept reminds us of the habit of a certain practitioner, who, whenever he had a patient with the facies Hippocratica, uſed to pour down the dying fellow's throat a glaſs of brandy, by way of a final effort to ſave him. However, to diſmiſs all anecdote from this ſerious ſubject, the practice of employing hot ſtimulating applications in theſe caſes is one of thoſe pernicious abſurdities into which our forefathers fell, and which, it ſeems, ſtill continue to prejudice ſome of our cotemporaries. It is only neceſſary to add, with regard to topical ſtimulants, in caſes of mortification, that to all ſurgeons who have imbibed the principles of their profeſſion, under the able lecturers at the great hoſpitals of this metropolis, our admonition not to imitate ſuch practice will be needleſs.

The ancients knew, as well as the moderns, that it was of no conſequence what they put on the ſloughs and mortified parts. Hence, when the mortification extended to any depth, they were always very anxious, that their invigorating, ſtimulating, warm applications ſhould extend their action to the ſubjacent and ſurrounding living fleſh. It was principally with this view that they uſed to make deep inciſions and ſcarifications in the ſphacelated part. They alſo believed, that the practice was of uſe both in giving exit to collections of ſanies under the ſloughs, and putting the living parts into a leſs ſtrangulated condition. The old writers likewiſe adviſe us to cut to the quick, as the only means of making the blood and ſpirits return to the place which they have abandoned.

We will not ſay, that a ſurgeon can never have an opportunity of cutting through a ſlough, and letting out ſome ſanies, to the relief of his patient; but we will venture to declare, that the making of inciſions and ſcarifications is generally wrong and hurtful. If only the dead parts are touched, we confeſs no harm can ariſe; but if the wound is carried down to the quick, pain, bleeding, and a renewal of the ſloughing, will be frequent conſequences of ſuch imprudent irritation. According to the principles which brought the practice into vogue, the inciſions will anſwer no end, unleſs they extend through the dead parts, for they will not enable the applications to get to the quick, nor will they ſerve to give exit to the ſanies underneath. Now, unleſs it ſo happens, that there is a large collection of matter under the ſlough, (which will not often happen,) the cutting inſtrument will wound the living parts, excite great irritation, and often bring on ſerious and fatal conſequences. Wiſeman, though an advocate for ſcarifications, is candid enough to own, that he has ſeen the gangrene increaſed, in conſequence of the tendons being wounded. (See vol. ii. of his works.)

Since we place no confidence in the invigorating power of topical ſtimulants, we have no occaſion to take any meaſures for extending their action to the living parts, and, conſequently, do not ſee the utility of ſcarifications. We are not ſo prejudiced, however, that we would not make a cut through a ſlough, if we were to ſee that, by ſo doing, we might uſefully diſcharge any material quantity of confined ſanious matter. At the ſame time, we would uſe our utmoſt caution not to injure the ſubjacent living parts. As the principles which led to the common practice of ſcarifications

are now exploded, it becomes unneceſſary to take up more of the reader's time in endeavouring to prove the bad effects of this proceeding.

When a ſphacelus has ceaſed to extend its limits, it will be ſome time before the ſurgeon can remove the ſlough, owing to the coheſion which ſtill ſubſiſts between the dead and living parts. The ſeparation, as we have already explained, is the work of nature, the proceſs being chiefly effected by the abſorbent veſſels, which take away the particles of matter, that form the bond of connection between the dead maſs and the living fleſh. It often happens, however, when a ſlough is large, that a portion of it will be looſe and fit for removal much ſooner than the reſt. In this circumſtance, it is proper to cut the looſe portion off, and take it away, for the ſake of cleanlineſs, and in order to diminiſh as much as poſſible the fetid effluvia in the room, which are highly detrimental to the patient's health. The ſame reaſons ſhould always make us vigilant to remove all the dead putrid matter as ſoon as it can be done without irritation or pain.

When the whole thickneſs of a limb is mortified, the patient might ſometimes get quite well by a natural proceſs; the ſloughs being thrown off, and the end of the remaining part of the limb healing up. Experience has proved, however, that when a ſphacelus has proceeded thus far, it is generally beſt to perform amputation "as ſoon as the mortification has evidently ſtopped, and a line of ſeparation can be diſcerned between the dead and living parts." The reaſons for the operation are, to give the patient a ſtump, with which he can uſe a wooden leg, and have the enjoyment of locomotion; to expedite his recovery; and to leſſen his ſufferings. Were amputation not executed, it would be a long while before all the ſloughs and exfoliations could come away; many inciſions would be neceſſary to extract all the pieces of dead bone, and open abſceſſes; and, after all the pain and confinement, the patient would not have a ſtump which could bear the leaſt preſſure, without becoming diſeaſed.

It will be noticed, that a particular ſtreſs is laid on the direction not to amputate before the mortification has ceaſed to ſpread. This rule is of the higheſt importance; for were the operation done ſooner, the ſtump would often become affected with gangrene, and the patient's death be accelerated.

When the old ſurgeons failed in their endeavours to ſtop a mortification, the famous maxim of "enſe recidendum," &c. was invariably followed, and, as Mr. Sharp remarks, the immediate proſpect of inevitable death, without this remedy, always prevented the leaſt doubt of its propriety; but (ſays this valuable writer) time has at length produced in this caſe a moſt remarkable revolution. The ſpreading of a gangrene, which was formerly eſteemed the ſtrongeſt motive for amputation, has now become an argument againſt it; and the moſt eminent ſurgeons always defer amputation till the gangrene has ſtopped, and ſometimes till the dead parts have advanced in their ſeparation.

The reaſon of this extraordinary change in practice is the amazingly ill ſucceſs which has attended the operation under the circumſtance of a ſpreading gangrene. Mr. Pott aſſures us, in his remarks on amputation, that he has often ſeen the experiment made of cutting off a limb in which gangrene had begun to ſhew itſelf, but never ſaw it ſucceed, and it invariably haſtened the patient's death. The cauſe of ſuch bad conſequences is imputed by authors to the impoſſibility of knowing how far the tendency to mortification reaches up the limb, and it is certain that ſuch diſpoſition frequently extends where there is no viſible alteration to excite the leaſt ſuſpicion. In many inſtances, a certain portion of the body ſeems deſtined to periſh, in ſpite of every proceeding on the part of the ſurgeon; and, ſhould he chance to amputate juſt below the unknown line, where the gangrene would ſpontaneouſly terminate, the ſtump itſelf muſt mortify. As there is never in any caſe any criterion by which we can judge where the gangrene will ſtop, it follows that we can never prudently determine where to amputate.

Generally ſpeaking, the operation ſhould be done when the mortification has ceaſed to ſpread, and a red line can be ſeen on the living edge, denoting the commencement of the ſeparation. However, there are inſtances in which the operation ſhould be poſtponed longer. We have ſeen in hoſpitals ſome patients with the ſubſtantial part of the lower portion of their leg in a ſphacelated ſtate, and the detachment complete, except with regard to the bones. Some of theſe patients were ſo reduced, that amputation, immediately performed, might have made them ſink under the hands of the operator. Neither was there now any urgency for the operation; the living ſurface was covered with healthy granulations, the diſcharge was moderate, and the dead maſs, being dry and covered with ſpirit of wine, which was not allowed to come into contact with the living fleſh, the fetid exhalation was not exceſſive. This grievance alſo can always be diminiſhed by taking care to let plenty of freſh air into the patient's chamber. We have ſeen ſome of theſe patients, after a ſhort time, and under a liberal allowance of wine, porter, and nouriſhing food, with bark, cordials, &c. regain a degree of ſtrength that was really ſurpriſing. The operation then admitted of being done under more advantageous circumſtances than at an earlier period. We entertain no doubt, that, in many of theſe inſtances, the patients would get quite well without amputation. The bones would exfoliate, and the extremity of the limb heal. But, we have before ſtated, that the cure in this way would be very tedious, and the ſtump unfit for bearing the leaſt preſſure, ſo that the motives for the operation are ſtill ſtrong and weighty.

Although we have explained that amputation cannot prudently be undertaken after a gangrene has begun, and while it is ſpreading, yet every practitioner ſhould know that the operation ought frequently to be performed before the mortification has had time to begin at all. There are many external injuries, ſuch as bad gun-ſhot wounds, lacerated wounds, ſhattered compound fractures, &c. which will inevitably bring on mortification, or which at leaſt will do ſo in nine caſes out of ten. In ſuch examples amputation ſhould be performed in the firſt inſtance, the wound of the operation being infinitely leſs dangerous than an extenſive ſphacelus.

GANGU, in *Geography*, a town of Africa, in Bambarra. N. lat. 13° 51'. W. long. 4°.

GANGUD, a town of Hindooſtan, in Guzerat; 35 miles S.S.W. of Amedabad.

GANGUE, in *Mining*, ſignifies the matrix of ores, or the matter ſurrounding the ore in a mineral vein: it is uſually ſpar of ſome kind, and is often called vein-ſtuff, or deads. See VEIN.

GANHEIM, in *Geography*, a town of Germany, in the principality of Wartzburg; ſix miles N.W. of Volckach.

GANI, *Diamond Mine of*. See DIAMOND.

GANJAM, a town of Hindooſtan, in the circar of Cicacole, near the bay of Bengal. It is ſituated on an eminence, near a river that is not navigable, about a mile within the bar. It has a pagoda, dedicated to an obſcene deity. N. lat. 19° 22. E. long. 85° 20'.

GANIL, in *Mineralogy*. This word, which in the Iriſh

language purports lime-ſtone in the form of ſand, is applied by Mr. Kirwan to the third family of his firſt claſs of the calcareous genus. Its colour is deſcribed as yellowiſh white. Luſtre reflected only from a few ſhining particles. Tranſlucent on the edges. In the lump it cannot be broken but by a hammer; but ſmall pieces of it fritter between the fingers. Specific gravity 2.742. Phoſphoreſces when ſcraped with a knife in the dark. Contains 47 per cent. of carbonic gas, and is almoſt entirely ſoluble in nitrous acid.

It is found on the ſhores of Rhaghery, a ſmall iſland of the coaſt of Antrim. Mr. Kirwan mentions the neighbourhood of Veſuvius and mount Gothard as localities of the ſame foſſil; whence it is probably the ſame with that variety of granular lime-ſtone which has obtained the name of *Dolomite*. See DOLOMITE.

GANISTER, otherwiſe crowſtone or galliard, of which we have given an account under the article CROWSTONE, is a ſtone which, although it has the appearance of a fine-grained and very hard grit-ſtone, and is admirably adapted to the repairing of roads when broken ſufficiently ſmall, nevertheleſs contains ſo large a portion of alumine as to aſſimilate with the valuable fire-clay from whence it is dug, at Birkin-line in Aſhover, Crook's-moor in Sheffield, and other places in and near Derbyſhire; and it has recently been applied, when pounded very fine and kneaded with water, to make (without the addition of clay or other ſubſtances) the beſt crucibles for the Sheffield ſteel-makers' uſe of any which they have been able hitherto to procure. This fact is not merely intereſting to the metallurgiſt, and thoſe who want veſſels to ſtand very intenſe degrees of heat, but has alſo ſome geological importance, in further generalizing the fact, diſcovered by Mr. Farey in his recent examination of about 500 collieries in and around Derbyſhire (ſee Philoſophical Magazine, vol. xxxv. p. 421), mentioned under our article FLOOR *of Coals*: crowſtone or ganiſter being the only durable ſtone or rock on which a ſeam of coals immediately reſts, in all this extenſive diſtrict, or in any other collieries which have fallen under that gentleman's obſervation, or been the ſubject of his inquiries; ſince it now appears, that even this hard and durable ſtone, when mechanically reduced to a plaſtic ſtate, ſuch as all the clunches and other hard floors or hills of coal ſoon acquire by expoſure to the air and rain, has the ſame properties of an infuſible fire-clay which diſtinguiſh the floors of coal-ſeams, perhaps in this and every other part of the world.

GANKA, in *Geography*, a town of Arabia, in the province of Oman; 124 miles S. of Maſcate.

GANKU, a town of China, of the third rank, in the province of Se-tchuen; 12 miles W. of Ho.

GAN-NAN, a town of China, of the third rank, in Koei-tcheou; 35 miles E. of Pou-ngan.

GANNAT, a town of France, and principal place of a diſtrict, in the department of the Allier; 27 miles S. of Moulins. The place contains 5043, and the canton 12,521 inhabitants, on a territory of 192½ kiliometres, in 12 communes. N. lat. 46 6'. E. long. 3° 16'.

GANNELOR, a ſmall iſland in the gulf of St. Laurence, in N. lat. 48°, near Bird iſland.

GANNEMIE, a town of Arabia, 28 miles N.W. of Dsjebi.

GANNET, in *Ornithology*. See PELECANUS *Baſſanus*.

GANNET *Iſland*, in *Geography*, a ſmall iſland near the north coaſt of New Zealand, in the ſouth Pacific ocean, ſo called from the number of gannets that were ſeen to fly about it. S. lat. 37° 57'. W. long. 184° 46'.

GANNING, a town of China, of the ſecond rank, in Yun-nan. N. lat. 25°. E. long. 102° 16'.

GANOR, a town of Hindooſtan; 40 miles N.N.W. of Delhi.

GANOS, a town of European Turkey, in Romania, on the ſea of Marmora; 32 miles N. E. of Gallipoli. N. lat. 40° 48'. E. long. 27° 13'.

GAN-PIN, a town of China, of the third rank, in Koei-tcheou; 20 miles N.E. of Ngan-chun.

GAN-PING, a town of China, of the third rank, in Petche-li; 12 miles N. of Ching.

GANSIGNI, a town of Hindooſtan, in the circar of Aurungabad; 32 miles E S.E. of Aurungabad.

GANT, a town of Germany, in the Tyroleſe; ſeven miles W.N.W. of Landeck.

GANTINGA, a town on the eaſt coaſt of the iſland of Celebes. N. lat. 0° 14'. E. long. 122° 6'.

GANTLET, or GAUNTLET, a large, ſtrong glove, made to cover the arm, or hand, of a cavalier, armed at all points.

The word is derived of the French *gantelet*; and that from *gand*, *gant*, *glove*.

The ganntlet was of iron, and the fingers plated. The caſk and gauntlets were always borne in the ancient marches in ceremony. Gauntlets were not introduced till about the thirteenth century.

The gantlet was frequently thrown, like the glove, by way of challenge.

GANTLET, in *Surgery*, is a kind of bandage for the hand, being a ſwathe, four or five yards long, wherewith they wrap up the hand, and all the fingers, one after another.

GANTLOPE, a military puniſhment. See *Military* EXECUTION.

GANTLOPE, or *Gauntlope*, vulgarly pronounced *gauntlet*, is a puniſhment for felony, or ſome other heinous offence, in a ſhip of war. For this purpoſe, the whole ſhip's crew is diſpoſed in two rows, ſtanding face to face on both ſides of the deck, ſo as to form a lane, whereby to go forward on one ſide, and return aft on the other; each perſon being furniſhed with a ſmall twiſted cord, called a knittle, having two or three knots upon it. The delinquent is then ſtripped naked above the waiſt, and ordered to paſs forward between the two rows of men, and aft on the other ſide, a certain number of times, rarely exceeding three; during which every perſon gives him a ſtripe as he runs along. This puniſhment, which is called "running the gauntlet," is ſeldom inflicted, except for ſuch crimes as will naturally excite a general antipathy among the ſeamen.

GANUARA, in *Geography*, a town of Hindooſtan, in Golconda; 10 miles N. of Hydrabad.

GAN-YE, a town of China, of the third rank, in Se-tchuen; 10 miles W. of Ho.

GANYMEDE, Γανυμηδης, a term lately come in uſe to expreſs a catamite, or bardacio. See SODOMY.

The expreſſion takes its riſe from a young beautiful Trojan ſhepherd, thus called, whom Jupiter raviſhed, or carried off, by his eagle, or rather by himſelf, under the figure of an eagle, as he was hunting upon mount Ida; and made him his cup-bearer, in the place of Hebe; who, having made a falſe ſtep, and ſpilt her liquor, was turned out of that office.

Some ſay, that the Jupiter who raviſhed Ganymede was Tantalus, king of Phrygia; the eagle expreſſed the ſwiftneſs wherewith he was carried off.

The ſtatue of Ganymede was tranſported from Greece to Rome, and ſet up in the temple of Peace; and to this Juvenal refers, when he ſays,

"Nuper enim repeto fanum Iſidis, et Ganymedem hic facis."

GAOGA, in *Geography*, a country of Africa, W. of Nubia, with a town of the ſame name, ſituated on a large lake. The inhabitants are ſaid to be barbarous and uncivilized. N. lat. 16°. E. long. 26°.

GAOL, a priſon, or place of legal confinement.

The word is formed of the French *geole*; and that of the barbarous Latin *geola*, *gaola*, *gayola*, a *cage*; whence the Picards ſtill call a bird-cage *gayolle*. The gaoler, geolier, was called *gaularius* and *cajularius*. Scaliger derives the word *gaoler* from *janicularius*. And ſome Latin authors call him *commentarienſis*, becauſe he keeps a regiſter, or liſt, of all thoſe under his cuſtody.

Every county hath two gaols; one for debtors, which may be any houſe where the ſheriff pleaſes; the other for the peace and matters of the crown, which is the county gaol.

By 22 and 23 C. II. c. 20. the gaoler ſhall keep debtors and felons ſeparate, on pain of forfeiting his office, and treble damages to the party grieved; and by 31 G. III. c. 46. tranſports are to be kept ſeparate from other priſoners. As the gaol is intended, in moſt caſes, for cuſtody, and not for puniſhment, it is enacted by 14 Geo. III. c. 59. that the juſtices, in their ſeveral quarter ſeſſions, ſhall order the walls and ceilings of the ſeveral cells and wards, both of the debtors and felons, and of any other rooms uſed by the priſoners in their reſpective gaols, where felons are uſually confined, to be ſcraped and whitewaſhed once in the year at leaſt, and to be regularly waſhed and kept clean, and conſtantly ſupplied with freſh air by hand ventilators or otherwiſe; and ſhall order two rooms in each gaol, one for the men and another for the women, to be ſet apart for ſick priſoners; and order a warm and cold bath, or commodious bathing-tub, to be provided in each gaol, and direct the priſoners to be waſhed in ſuch warm or cold baths, or bathing-tubs, &c.; and they ſhall appoint an experienced ſurgeon or apothecary, at a ſtated ſalary, to attend the gaol, and to report, at each quarter ſeſſions, the ſtate of the health of the priſoners; order clothes for the priſoners when they ſee occaſion, prevent their being kept under ground when it can be done conveniently, and from time to time make orders for reſtoring or preſerving the health of the priſoners; the expences to be paid out of the county rates, or out of the public ſtock of any city, franchiſe, or place to which the gaols belong. The gaoler is ſubject to fine for neglect or diſobedience of the orders of juſtices, by complaint to the judges of aſſize, or to the juſtices in their quarter ſeſſions. By 31 G. III. c. 46. viſiting juſtices are appointed for inſpecting gaols at leaſt three times in each quarter of a year, in order to prevent abuſes, &c., and they are to report to the quarter ſeſſions. The juſtices in ſeſſions may alſo appoint clergymen to officiate in gaols according to the rites of the church of England, and allow to each a ſalary not exceeding 50*l.* a year, to be paid by the treaſurer of the county-rate. 13 G. III. c. 58.

If a gaol be out of repair, inſufficient, &c. the juſtices of the peace in the quarter-ſeſſions may agree with workmen for rebuilding or repairing it; and by warrant under their hands and ſeals, order the ſum agreed upon to be levied upon the ſeveral hundreds and diviſions in the county, by a proportionate rate; and the juſtices in ſeſſions may borrow, on mortgage of the ſaid rates, any ſum not leſs than 50*l.* nor more than 100*l.* and diſcharge the whole by yearly payments. 11 and 12 W. III. cap. 19. 24 Geo. III. c. 54. See PRISON-*breaking*.

GAOL *Delivery*. See JUSTICES, and OYER and *Terminer*.

GAOL *Fever*. See FEVER, and TYPHUS.

GAOLER, is the maſter of a priſon; one that hath the cuſtody of the place where priſoners are kept. Sheriffs muſt make ſuch perſons gaolers for whom they will anſwer: but if there is a default in the gaoler, action lies againſt him for an eſcape, &c. (2 Inſt. 592. 14 Ed. III. ſt. 1. c. 10. 19 H. VII. c. 10.) In common caſes the ſheriff or gaoler is chargeable, at the diſcretion of the party; though the ſheriff is moſt uſually charged. (Wood's Inſt. 76.) When a ſheriff quits his office, the cuſtody of the county gaol can belong only to his ſucceſſor. 1 L. Raym. 136.

By 8 and 9 W. III. cap. 27. marſhal and warden taking any reward to connive at priſoners' eſcape, forfeits 500*l.* and his ſaid office, and is for ever after incapable of holding ſuch office. The office of marſhal of the king's bench, and warden of the Fleet, ſhall be executed by thoſe who have the inheritance of the ſaid priſons, or their deputies, &c. By 3 Geo. I. cap. 15. no one ſhall purchaſe the office of gaoler, or any other office pertaining to the high ſheriff, under pain of 500*l.*

Where a gaol is broken by thieves, the gaoler is anſwerable; not if it be broken by enemies. (3 Inſt. 52.) If a criminal, endeavouring to break the gaol, aſſaults his gaoler, he may be lawfully killed by him in the affray. (1 Hawk. 71. 1 H. H. 496.) But if the gaoler or his officers, or any perſon aiding him, ſhould fall in the conflict, this will amount to wilful murder in all perſons joining in ſuch reſiſtance. (Foſt. 321.) By 24 G. II. cap. 40. no licence ſhall be granted for ſelling ſpirituous liquors within any gaol or priſon; and if the gaoler ſhall ſell, lend, uſe, or give away, or ſuffer the ſame, except by way of medicine, he ſhall forfeit 100*l.* half to the king, and half, with full coſts, to him who ſhall ſue. Any perſon bringing any ſpirituous liquors into ſuch gaol, may be apprehended by the gaoler or his ſervants, and carried before a juſtice; and upon conviction by the oath of one witneſs or otherwiſe, ſhall be committed to priſon or the houſe of correction for a term not exceeding three months, unleſs he ſhall immediately pay a fine not exceeding 20*l.* nor leſs than 10*l.* at the pleaſure of the juſtice, half to the informer, and half to the poor of ſuch gaol. A copy of theſe clauſes ſhall be hung up in each gaol, on pain of the gaoler forfeiting 40*l.* A gaoler ſhall not ſuffer tippling or gaming in ſuch priſon, nor be licenſed to ſell any wine, ale, or other liquors; nor have any beneficial intereſt or concern in the ſale of any liquors, or in any tap-houſe, tap-room, or tap, on pain of forfeiting 10*l.* for every ſuch offence. The juſtices in their ſeſſions may appoint ſalaries to gaolers in lieu of the profits derived from the ſale of liquors; to be paid out of the county rate. By 14 Eliz. c. 5. and 12 C. II. c. 29. priſoners are to be provided for by a ſum to be paid out of the county rate. (See alſo 31 G. III. c. 46.) By this ſtatute it is enacted, that the juſtices in ſeſſions, or ſpecial adjournment thereof, ſhall regulate and ſettle a table of fees and rates to be taken by gaolers; and ſhall order a copy of the ſame to be hung up in the court of aſſize and quarter ſeſſions, and another copy to be ſent to the gaoler, who ſhall cauſe the ſame to be hung up in ſome conſpicuous place within the gaol; and all orders and directions contained in the act of 32 G. II. c. 28. reſpecting the table of fees to be taken by gaolers, ſhall be conformed to as if the ſame were in this act particularly enacted and repeated. By the ſame ſtatute, the keeper of every gaol ſhall on the firſt day of every aſſize make a return in writing to the clerk of aſſize or other proper officer, and ſhall ſpecify therein the number and ſize of the cells, the names of the priſoners, the offences of which they have been guilty, the court before which every perſon was convicted, the ſentence of the court, if tried and convicted before any court of record, or if committed by a juſtice of the peace, the name of ſuch juſtice, and the offence of

which

which he was convicted, the age, bodily ſtate, and behaviour of every ſuch convict; ſuch return, before it is delivered into court, to be examined and ſigned by one of the viſiting juſtices. A gaoler voluntarily ſuffering priſoners to eſcape ſhall be puniſhed in the ſame manner as the priſoner ought to have been who eſcaped; and if he negligently permit him to eſcape, he ſhall be puniſhed by fine and impriſonment; and the ſheriff ſhall anſwer for him. 2 Hawk. 134, 5, 6. 5 Mod. 415, 416.

The abuſes of gaolers and ſheriffs' officers towards the unfortunate perſons in their cuſtody, are well reſtrained and guarded againſt by ſtatute 32 Geo. II. cap. 28.

Gaolers are not juſtified by law in fettering a priſoner unleſs he is unruly, or has attempted an eſcape. (2 Inſt. 381. 3 Inſt. 34.) The humane language of our ancient lawgivers is; "Cuſtodes pœnam ſibi commiſſorum non augeant, nec eos torqueant; ſed omni ſævitia remota, pietateque adhibita judicia debite exequantur." Flet. lib. i. cap. 26. If the gaoler keep the priſoner more ſtrictly than he ought of right, whereof the priſoner dieth, this is felony in the gaoler by the common law; and hence it is, that if a priſoner die in a gaol, the coroner ought to ſit upon him; and if the death was owing to cruel and oppreſſive uſage on the part of the gaoler, or any officer of his, it will be deemed wilful murder in the perſon guilty of ſuch dureſs. 3 Inſt. 91. Foſt. 321, 2.

GAONS, a certain order of Jewiſh doctors, who appeared in the Eaſt after the cloſing of the Talmud. The word gaons ſignifies *excellent, ſublime*; as in the divinity ſchools we formerly had irrefragable, ſublime, reſolute, angelic, and ſubtile doctors. The Gaons ſucceeded the Seburæans, or Opiners, about the beginning of the ſixth century. Chanan Meiſchtia was the head, and the firſt of the excellents; he reſtored the academy of Pandebita, which had been ſhut up for the ſpace of thirty years.

GAP, in *Rural Economy*, a defect, breach, or opening in a hedge fence. Theſe ſorts of gaps are capable of being repaired in many different ways, according to their nature and circumſtances; but it is in general the beſt done by having recourſe to living plants of the ſame kind as the hedge, and ſuited in ſize to it. See FENCE.

GAP, in *Geography*, a town of France, principal place of a diſtrict, and capital of the department of the Higher Alps. The place contains 8050, and the canton 10,893 inhabitants, on a territory of 200 kiliometres in 7 communes. Before the revolution, it was the ſee of a biſhop, ſuffragan of Aix, and capital of a county called "Gapençois," about nine leagues long and ſix wide; 45 miles S. of Grenoble. N. lat. 44° 34'. E. long. 6° 10'.

GAPSAL, or HAPSAL, a town of Ruſſia, in the government of Revel, on a ſmall gulf of the Baltic; formerly the ſee of a biſhop, and ſubject to the Danes, but in the beginning of the 18th century annexed to Ruſſia, 36 miles W.S.W. of Revel. N. lat. 59° 5'. E. long. 42° 24'.

GARA, a lake of Ireland, in the county of Sligo, on the confines of Roſcommon. It is an extenſive and romantic ſheet of water, not far from the town of Boyle.

GARA, a lake of Egypt; 12 miles S. of Fayoum.

GARACHIO, a town on the weſt coaſt of the iſle of Teneriffe.

GARAFOA, CAPE, a cape on the weſt coaſt of Africa. N. lat. 2° 40'.

GARAGAY, in *Ornithology*, the name of a rapacious bird of Mexico, of the ſize of our kite; its head and the tips of its wings are white; it makes but ſhort flights; it is very fond of the eggs of tortoiſes and crocodiles, and hunts the places where they have buried them in the ſands.

GARAJAM, in *Geography*, a river of Africa, which runs into the Atlantic, N. lat. 3°.

GARAMA, in *Ancient Geography*, a town of Africa, the metropolis of the people called *Garamantes*.

GARAMANTES, the ancient inhabitants of an extenſive diſtrict of Africa, ſituated to the S. E. of Gætulia, and E. of the Nigritæ. Although the limits of their country cannot be preciſely aſcertained, there is reaſon to believe, that it extended to the borders of the Proper Ethiopia, and that it comprehended many large territories. According to Dr. Shaw, ſome of the ancient Garamantes ſpread themſelves over that tract that included the diſtricts of Gad-demz, Fezzan, and ſome of the more diſtant cities and villages of the kingdom of Tripoli. Their country, whatever might be its extent, abounded with wild beaſts; and the inhabitants were ſo ſavage, that they fled at the ſight of a perſon belonging to any other nation. Deſtitute of arms, they made no effort for ſelf-defence, when they were attacked, and they wholly ſecluded themſelves from intercourſe with other people. They ſeem, however, to have gradually advanced to a higher ſtate of ſociety, as they built towns, or rather daſhkras; the principal of which were Garama, near mount Girgiris, and the ſource of the Cinyphus, Debris, and Metelgæ. They alſo aſſociated with a neighbouring people, called the Marmaridæ, and carried on trade with the Carthaginians, Arabs, Perſians, and Ethiopians. Indeed, the caravans of the Carthaginians muſt, in all probability, have paſſed to Carthage from thoſe remote countries, through the ſandy deſerts of the Garamantes: and it has been ſaid that they, as well as the Perſians and Ethiopians, ſupplied the Carthaginians with a great number of valuable gems. Although it appears, by the teſtimony of Herodotus, that the ancient Garamantes were reproached with cowardice, their poſterity ſeem to have been of a different diſpoſition, if we may rely on the accounts given of them by Pliny, Tacitus, and Feſtus Avienus. Some of them roved about the deſerts of Libya like their ſucceſſors the modern Bedoweens; whilſt others inhabited the daſhkras which were diſperſed over thoſe parched and barren plains. The former lived frugally, and ſupported themſelves by hunting. The country of the Garamantes, as well as Nigritia, was probably firſt peopled from Egypt and Ethiopia; and they ſeem to have been the deſcendants of Miſraim and Cuſh, intermixed with ſome colonies of Arabs. The language, or rather languages, ſpoken in theſe regions, bore a great affinity at firſt to the Egyptian, Arabic, and Ethiopic, and at this time may poſſibly be corrupted dialects of theſe tongues. As to their religion, they, in common with the Arabs, Indians, and Ethiopians, worſhipped Jupiter Ammon, repreſenting him with a ram's head, or at leaſt with ram's horns, and had a temple dedicated to him. The women among the Garamantes were uſed promiſcuouſly, ſo that they ſeem to have had no notion of matrimony. In early times they were governed by phylarchs, or heads of tribes, like the Gætulians and Arabs; but in proceſs of time, as we learn from Tacitus, monarchy ſeems to have prevailed among them. Ptolemy indeed aſſerts, that they formed a large and powerful nation, extending themſelves from mount Uſargala to the lake or moraſs Nuba; and yet their affairs are ſcarcely at all recorded in hiſtory. Maſiniſſa, when expelled from his dominions by Syphax, took refuge among them. As the roads to their country from Mauritania were rendered impaſſable by robbers, the Romans had little knowledge of them till after the expiration of the republic. Lucius Cornelius Balba entirely ſubdued them, and for this ſervice Auguſtus granted to him a triumph. Afterwards they ſeized an opportunity of emancipating themſelves from the Roman yoke, as Florus informs us; and we learn from Tacitus, that the

king of the Garamantes joined Tacfarinas, in the reign of Tiberius, againſt the Romans. After the laſt defeat and death of Tacfarinas, they ſent ambaſſadors to Rome to appeaſe the reſentment of Tiberius; which was effected, moſt probably, by their entire ſubmiſſion; ſince it appears probable, that the Roman empire extended on that ſide almoſt, if not altogether, to the northern coaſt of the Niger.

GARAN, in *Geography*, a ſmall iſland in the North ſea, near the N. coaſt of Scotland; 3 miles E. S. E. of cape Wrath. N. lat. 58° 35'. W. long. 4° 45'.

Garan, a town of Candahar, 12 miles from Cabul.

GARAPHAS, in *Ancient Geography*, a maritime town of Africa Propria, according to Ptolemy.

GARAPHI Mons, a mountain of Mauritania Cæſarienſis, to the north of the river Chinalaph. It was S. of Julia Cæſarea, and S. W. of Tipaſa.

GARAPO, Cape, a cape of France, in the Mediterranean, about 6 miles S. of Antibes. N. lat. 43° 31'. E. long. 7° 4'.

GARATIVA, a river of Braſil, which runs into the Atlantic, S. lat. 13°.

GARATRONIUM, in *Natural Hiſtory*, the name of a foſſile body, commonly ſuppoſed the ſame with the bufonites, but very improperly; the only juſt account of it is that of Ferrante Imperato, who tells us that it is a purple ſtone with variegations of a gold yellow, diſpoſed in the manner of the veins of many ſorts of marble; and that the Perſians, and many of the eaſtern people, put it into the handles of their ſabres. It appears by this deſcription to be a kind of jaſper; and is very improperly confounded with the bufonites, a ſmall ſtone fit only to be worn in rings.

GARAY, in *Geography*, a town of Africa, in the kingdom of Cayor, 80 miles S. E. of Amboul.

GARAZA, a town of Braſil, in the province of Pernambuco, 25 miles N. of Olinda.

GARB, in *Britiſh Antiquity*, from the French *garbe, faſcia*, a bundle or ſheaf of corn. See Garbe.

Garb, or *El-Garb*, in *Geography*, a province of Morocco, which begins in the territory of Tetuan, and extends near a degree in length from eaſt to weſt, reaching quite to cape Spartel: its length from north to ſouth is about 36 leagues. It is bounded to the north by the ſtraits of Gibraltar, to the ſouth by the river Mamora, to the weſt by the ocean, and to the eaſt by the kingdom of Fez. The northern part is not very fruitful; as it is interſected with vallies, the lands are liable to be injured by the heavy rains, and the harveſt is very uncertain; the reſt of the province is extremely beautiful; it is watered by ſeveral rivers, and embelliſhed by ſome foreſts.

GARBAN, a town of Candahar, on the Behat; 30 miles N. of Cabul.

GARBE, in *Heraldry*, a repreſentation of a ſheaf of corn, or other grain; ſometimes borne in coat-armour, to ſignify ſummer, or the month of Auguſt; as the bunch of grapes denotes autumn.

Garbe *Dendour*, in *Geography*, a town of Nubia, on the weſt coaſt of the Nile, in which is an ancient temple. The Nile near this place is of moſt difficult navigation; the whole breadth being filled up with rocks under water, and between the rocks with eddies and whirlpools; 60 miles S. of Syene.

Garbe *Dirſche*, a town of Nubia, on the eaſt coaſt of the Nile, in which are ſome ancient ruins; three miles N. of Garbe Dendour.

GARBIA, a diſtrict in the north part of Egypt, between the eaſt and weſt branches of the Nile.

GARBLER *of Spices*, an officer of great antiquity in the city of London, who is empowered to enter any ſhop, warehouſe, &c. to view and ſearch drugs, &c. and to garble and cleanſe them. By ſtat. 6 Ann. c. 16. this officer is to be appointed by the court of lord mayor, aldermen, and common council, to garble ſpices at the requeſt of the owner, but not otherwiſe.

GARBLES, the duſt, ſoil, or filth, ſevered from good ſpice, drugs, &c.

GARBLING of ſpices, drugs, &c. is the cleanſing it from the droſs and duſt, mixed therewith, and ſevering the good from the bad.

The word comes from the Italian *garbellare, to ſhake*.

Garbling *of bow-ſtaves*, is the ſorting or culling out the good from the bad.

GARBO, Il, in *Geography*, a town of Etruria; ſix miles E. S. E. of Leghorn.

GARBOARD-Strake, in a *Ship*, is the firſt ſeam next to the keel.

Garboard-*plank*, the firſt plank faſtened on the keel.

GARCHANSKOI, in *Geography*, a town of Ruſſia, in the government of Tobolſk, on the river Tobol; 80 miles S. of Tobolſk.

GARCIA, a town of Spain, in the province of Catalonia; 18 miles N. of Tortoſa.

GARCIAS-LASSO, or Garcilaso, de la Vega, in *Biography*, an eminent Spaniſh poet, was born at Toledo in 1503. He was the younger ſon of a man of rank, who had been employed in ſome important negociations. Garcilaſo, as a man, was diſtinguiſhed for his wit and bravery, and as a poet, he adopted the ſtyle and manner of his friend Boſcan (ſee his article). His works conſiſt chiefly of paſtorals, ſome of which are very prolix, and in one of them, it is ſaid, he has introduced almoſt action enough for a drama. His principal excellence is tenderneſs, which is frequently diſplayed with great beauty in his ſonnets, of which the reader will be pleaſed with the following ſpecimen tranſlated by Mr. Southey.

"As when a mother, weak in tenderneſs,
Hears her ſick child with prayers and tears implore
Some ſeeming good, that makes his pain the leſs,
Yet, with ſhort eaſe! the future evil more:
Even as her fondneſs yields to his vain will
She haſtes to gratify her ſickly ſon—
Anticipating then the coming ill,
Sadly ſhe ſits, and weeps what ſhe has done.
Thus have I pampered my diſtemper'd mind,
And yielded thus to fancy's wayward mood,
Poor dupe of fancy! ſelf-condemned to find
The future anguiſh in the preſent good.
Thus do I waſte a wretched life away,
And nightly weep the errors of the day."

"Both Boſcan and Garcilaſo poſſeſſed more learning than taſte, and more taſte than genius. Their poems, particularly thoſe of the latter, are full of imitations from the ancients." The poems of Garcilaſo have paſſed through many editions, and commentaries have been written upon them by Sanchez de las Brozas, the moſt eminent of the Spaniſh grammarians. Garcilaſo followed the profeſſion of arms, and attended Charles V. in many of his expeditions. At length he loſt his life in battle, as he was ſignalizing his courage in the preſence of his ſovereign, in an attack on a fortreſs in Provence, in the year 1536. Monthly Mag. Gen. Biog. Moreri.

GARCINIA, in *Botany*, named by Linnæus in commemoration of Laurence Garçin, M. D. F. R. S. who lived in the early part of the laſt century, and viſited the

Eaſt,

Eaſt, where he made ſeveral botanical obſervations, ſome of which are printed in the Philoſophical Tranſactions n. 415, 431, 489, 491. In the place laſt mentioned he eſtabliſhes the genus *Salvadora*, and in n. 431 deſcribes the valuable tree now under conſideration, by its Malay name, *Mangoſtans*. Linn. Gen. 237. Schreb. 319, 831. Willd. Sp. Pl. v. 2. 848. Mart. Mill. Dict. v. 2. Juſſ. 256. Lamarck Illuſtr. t. 405. (Mangoſtana; Gærtn. v. 2. 105. t. 105. Cambogia; Linn. Gen. 263. Schreb. 351. Juſſ. 256.)—Claſs and order, *Dodecandria Monogynia*. Nat. Ord. *Guttiferæ*, Juſſ.

Gen. Ch *Cal.* Perianth inferior, of four roundiſh, concave, obtuſe, ſpreading, permanent leaves. *Cor.* Petals four, roundiſh, concave, ſpreading, rather larger than the calyx. *Stam.* Filaments about 16, erect, collected into a tubular form, ſimple, ſhorter than the calyx; anthers roundiſh. *Piſt.* Germen ſuperior, nearly oval; ſtyle ſcarcely any; ſtigma flat, peltate, ſpreading, in ſix or eight blunt lobes, permanent. *Peric.* Berry coriaceous, globoſe, large, crowned with the ſtigma, of ſix or eight pulpy cells, with membranous partitions. *Seeds* ſolitary, imbedded in the pulp, vertical, ſomewhat elliptical, compreſſed, rugged, with a ſimple embryo.

Eſſ. Ch. Calyx inferior, of four leaves. Petals four. Berry coriaceous, of ſeveral cells, crowned with the ſtigma. Seeds ſolitary.

Obſ. The number of the ſtamens, and of the ſegments of the ſtigma, the latter always agreeing with the number of cells in the fruit, differ in different ſpecies from four to eight, and vary in the ſame from five to eight, according to the obſervations of Gærtner and Juſſieu. The former firſt united *Cambogia* to *Garcinia*, but is highly reprehenſible for the troubleſome and improper change of the Linnæan name to a barbarous one that agrees with only one ſpecies.

1. G. *Mangoſtana*. Linn. Sp. Pl. 635. (Mangoſtana; Rumph. Amboin. v. 1. 132. t. 43. Mangoſtan Apple.)—Branches quadrangular. Leaves ovate; their veins ſomewhat diſtant. Flowers terminal, ſolitary.—Native of the more oriental parts of the Eaſt Indies, as Malacca, Sumatra, and Java. Cultivated with difficulty in ſome few places beſides. *Rumphius*. This is univerſally allowed to be the moſt delicious, as well as moſt wholeſome, of Indian fruits. It reſembles a ſmall orange, of a dark brown colour, full of ſoft ſweet pale-coloured pulp, from which the outer coat eaſily ſeparates, and each of whoſe cells contains a large oval ſeed. The external coat dried is aſtringent, and uſeful in dyſenteries. The pulp may be eaten with ſafety, and in almoſt any quantity, in health or in ſickneſs. Rumphius ſays, it is eſteemed a very bad ſymptom if a patient has no appetite even for the Mangoſtan. The *tree* is about the ſize of a common apple-tree, ſmooth in all its parts, with oppoſite quadrangular branches. *Leaves* oppoſite, five or ſix inches long, ovate, pointed, of a ſhining green, entire, furniſhed with a rather ſlender midrib, from which ſpring irregularly numerous rather diſtant veins. *Foot-ſtalks* three quarters of an inch long, thick. *Flower-ſtalks* terminal, ſimple and ſingle-flowered, an inch long, without bracteas. *Flowers* whitiſh, the ſize of a ſhilling, with yellow ſtamens. The *fruit* ripens uſually in November and December. Mr. Ellis, who was very deſirous of procuring this plant, publiſhed in 1775 a deſcription of it and the bread-fruit, with "directions to voyagers for bringing over theſe and other vegetable productions." There is however little hope of our ever ſeeing the Mangoſtan growing in Europe.

2. G. *celebica*. Linn. Sp. Pl. 635. (Mangoſtana celebica; Rumph. Amboin. v. 1. 134, t. 44.)—Branches roundiſh. Leaves elliptic-oblong; their veins numerous, cloſe, ſtraight and parallel.—Native of the iſland of Celebes, from whence, according to Rumphius, it was brought to Amboyna. We have ſpecimens from the latter place, under the name of Wild Mangoſtan, gathered by the late Mr. Chriſtopher Smith. It appears to differ from the firſt ſpecies in having rounder, or at leaſt not regularly quadrangular, *branches*; more elliptical *leaves*, tapering to each end, whoſe veins are peculiarly numerous, ſtraight and parallel. *Foot-ſtalks* half an inch long, keeled and very deeply channelled. *Flowers* dirty white, fragrant, terminal, about three together, on ſhort thick ſtalks. *Fruit* like the former, but yellower and more acid. Rumphius reports that ſmall pieces of the wood, buried for three years in marſhy rice-grounds, become petrified, and make a ſort of hone, called Kiras-ſtone, after the country name of the tree. The ſame author ſuſpects the Panitsjika, or Lymappel, Rheede Hort. Malab. v. 3. 45. t. 41, to be this ſame plant; but that is unqueſtionably Roxburgh's *Embryopteris glutinifera*. See EMBRYOPTERIS.

3. G. *Cambogia*. Willd. Sp. Pl. v. 2. 848. (Mangoſtana Cambogia; Gærtn. v. 2. 106. Cambogia Gutta; Linn. Sp. Pl. 728. Coddam-pulli; Rheed. Hort. Mal. v. 1. 41. t. 24. Carcapuli; Cluſ. Exot. 286.—Leaves elliptical, acute at each end; their veins rather diſtant. Fruit furrowed. Branches round.—Native of denſe woods, where the ſoil is ſandy, in Malabar. *Rheede*. This is deſcribed as a tall *tree*, with a trunk about four feet in diameter, and a thick widely ſpreading *root*, out of which, when wounded, flows a very viſcid but taſteleſs liquor. The *branches* are round and ſmooth. *Leaves* oppoſite, three or four inches long, elliptical, entire, tapering at each extremity, a little oblique, ſmooth, paler beneath; their lateral veins rather few and diſtant, forming very acute angles with the midrib, connected by reticulations. *Footſtalks* ſlightly channelled. Rheede deſcribes the *flowers* as terminating the young leafy ſhoots, on very ſhort ſtalks, and of a fleſh or roſe-colour, without ſmell. His minute account of their ſtructure well accords with our generic character. The *fruit* is pendulous, on ſtalks an inch long, ſolitary, the ſize of a ſmall orange, but furrowed like a melon, and crowned with tumid crenate remains of the ſtigma; its colour yellow or whitiſh; the flavour of its pulp ſweet with ſome acidity. The cells and ſeeds are ſaid to be 8, 9 or 10. The ſeaſon of flowering and fruiting is March. In a ſpecimen of this tree, ſent by the Rev. Dr. Rottler from the Eaſt Indies, the flower-ſtalks, which are clothed with ruſty down, and near an inch long, grow in pairs from buds juſt below the inſertion of each leaf, and are by no means terminal. Probably they might appear ſo in the early ſtate in which Rheede delineates them, and that appearance might be deſtroyed by the ſubſequent growth of the branches. His deſcription of the leaves is peculiarly exact. Nothing is ſaid in the Hortus Malabaricus to authorize the report of Gamboge being the produce of this tree. Dr. Roxburgh, in the deſcription of his *Xanthochymus pictorius*, Plants of Coromandel, v. 2 t. 196, ſays the full-grown but unripe fruit of that tree produces, when wounded, a copious yellow acrid gum, uſeful in painting, very like *Gummi Guttæ*, or Gamboge, but he gives us no information concerning the origin of the latter. Linnæus received for the *Cambogia* a widely different plant, his own *Aſclepias carnoſa*, Sm. Exot. Bot. t. 70.

4. G. *cornea*. Linn. Syſt. Veg. ed. 13. 368. (Lignum corneum; Rumph. Amb. v. 3. 55. t. 30: not v. 2, as copied by Murray and Willdenow.) – Leaves elliptical, ſomewhat ovate, ſhining; their veins unequal and irregular. Flowers terminal, ſolitary, drooping. Branches quadran-

gular.—Native of the mountains of Amboyna. *Rumphius.* A tall, but not very large *tree*, whoſe ultimate branches are ſhort, tufted, acutely quadrangular, with a ſmooth green bark. *Leaves* oppoſite, in pairs croſſing each other, from eleven to fifteen inches long, and four broad, but on old trees ſhorter; ſmooth, firm, and ſhining, with one thick rib, which is furrowed above and triangular at the back, ſending off many fine tranſverſe veins, not exactly parallel nor united. *Footſtalks* ſhort and thick, ſometimes ſo curved as to render the leaves reſupinate. *Flowers* ſolitary at the end of each branch, on curved ſtalks, of four firm thick yellow petals, ſlightly fragrant. *Fruit* the ſize of a plum, globoſe, brown, even, crowned with the ſtigma which reſembles the head of a nail, full of glutinous pulp, lodging ſemilunar ſeeds. A viſcid liquor iſſues from its coat, as well as from the branches, when wounded, which turns yellow in drying. The wood is extremely hard and horny, white when freſh, but ſoon turning reddiſh or yellowiſh.

We have a Java ſpecimen, marked with the Malay name *Moendoe*, which appears to be what Rumphius means p. 56, by *Munda* of the Malays, and which thoſe people eſteem the ſame with his *Lignum corneum*. Our ſpecimen agrees very exactly with his account as to the leaves, and the extreme hardneſs of the wood, but the flowers are ſmaller, and grow at the baſe of the younger branches. We dare not deſcribe it as a diſtinct ſpecies, becauſe there ſeems to be a myſtery about the inflorescence of this whole genus, which we cannot ſolve for want of an opportunity of tracing its progreſs in a growing ſtate.

5. G. *dioica*. (G. cornea; Roxb. MSS.)—Leaves elliptic-lanceolate, pointed at each end; their veins unequal. Flowers two or three together, drooping, dioecious. Branches round.—Native of the Eaſt Indies, communicated to us by lord viſcount Valentia from the Calcutta garden. The *branches* are ſlender, numerous, oppoſite, very ſlightly angular when young only. *Leaves* two or three inches long, elliptic-lanceolate, entire, pointed at each end, opaque, their veins rather numerous, but very unequal, irregular and ſubdivided. *Footſtalks* angular, channelled. *Flowers* either at the ends, or about the lower part, of the young branches, two or three together, on ſhort angular drooping ſtalks, each about the ſize of a hawthorn bloſſom; male on one tree, female on another. The latter ſeem to have the ſhorteſt ſtalks, and of three at the end of a branch in our ſpecimen, one only is fruitful, having the germen ſwelled to the ſize of a black currant, with a large, tumid, lobed and wrinkled ſtigma. We cannot find any figure or deſcription applicable to this ſpecies, unleſs it be the following. It does not at all agree with the preceding.

6. G. *Morella*. (Mangoſtana Morella; Gærtn. v. 2. 106. Kannawakoraka; Herm. Muſ. Zeyl. 26, not 76. Arbor indica, Gummi Guttam fundens, fructu dulci rotundo, ceraſi magnitudine; Burm. Zeyl. 27.)—Leaves roundiſh. Stigma four-lobed. Berry of four cells.—Native of Ceylon about Columbo. *Burmann.* A handſome *tree* of a moderate height. *Leaves* round, green, ſucculent. *Fruit* the ſize of a Morella Cherry, eatable, containing four ſeeds only, in a ſweet pulp, ſtreaked with yellow. From the bark of this tree when wounded flows a copious yellow juice, which gradually hardens into a ſmooth gum, proving emetic and purgative.—Such is Burmann's account, and Hermann expreſsly ſays that the beſt Gamboge (*Gummi Gambæ*) comes from this tree, which he eſteems the Carcapuli of Acoſta; the deſcription of which latter agrees rather with our G. *Cambogia*. Hermann ſays the Carcapuli of Acoſta and that of Linſchoten differ in flower and fruit, but agree in other reſpects, and both produce Gamboge, though that of the Kannawakoraka is the beſt. It ſeems therefore certain that our *Garcinia Morella* is the true Gamboge plant. We have never ſeen ſpecimens of this ſpecies in any ſtate. It is to be hoped that ſome light will be thrown on this obſcure ſubject by Mr. W. J. Hooker who has recently undertaken to inveſtigate the botany of Ceylon.—At the end of this genus in Willdenow, p. 849, is an obſervation copied implicitly from Linn. Mant. 2. 391, which is altogether a maſs of confuſion. *Mangium ſylveſtre* ought to be *Lignum corneum*; p. 77 ought to be 55; and the whole alluded to G. *cornea* as different from G. *Mangoſtana*, before the former was regularly adopted as a ſpecies. So precarious is blind tranſcription! S.

GARCON, or GARSOON, a French term, literally ſignifying a boy, or male child, any time before his marriage.

It is alſo applied to divers inferior officers among us called *grooms, garçiones*. Thus all the ſervants in the French king's chambers, wardrobe, &c. who performed the leſſer offices thereof under the proper officers, were called *garçons de la chambre, de la garderobe*, &c.

GARD. See GUARD.

GARD, *Raviſhment de*. See RAVISHMENT.

GARD. *Corps de* GARDE. See CORPS.

GARD, in *Geography*, a department of France, in the ſouth-eaſt region, bounded on the north by the departments of the Lozere and Ardeche, on the eaſt by the Rhône, on the ſouth by the Mediterranean and the department of the Herault, and on the weſt by the departments of the Herault and the Aveiron. Nîmes is its capital. This department, ſituated in 44° N. lat., is compoſed of the dioceſes of Nîmes, Alais, and Uzès, contains 292 ſquare leagues, and 309,052 inhabitants, in 38 cantons, and 365 communes, and is divided into four diſtricts, *viz.* Alais, whoſe inhabitants amount to 65,446, Uzès, 72,033, Nîmes, 113,785, and Le Vigan, 57,788. Its contributions amount to 2,866,398 francs, and the expences charged upon it for adminiſtration, juſtice, and public inſtruction, are 311,120 fr. 66 cent. Interſected by hills, the ſoil is, in general, abundantly fertile, producing grain, wine, delicious fruits, oil, and paſtures. It has mines of copper, iron, vitriol, and other minerals, quarries of marble, and mineral ſprings.

GARDA, a lake of Italy, between the Veroneſe and the Breſſan, about 30 miles long, and from two to ſeven wide.—Alſo, a town of Italy, in the Veroneſe, on the eaſt bank of the lake above-mentioned. In the time of the Guelphs and Gibellines it was a celebrated fortreſs with a citadel; but at preſent it is an open place; and on the ruins of the citadel has been built an hermitage, or convent, of the Carthuſian monks; 16 miles N.W. of Verona. N. lat. 45° 36′. E. long. 10° 43′.—Alſo, a town of Hindooſtan, in Oriſſa; 75 miles S.E. of Cattack.

GARDANE, JOSEPH JAMES, in *Biography*, was born at Ciotat, in Provence, and after he had been created doctor of the faculty of Montpellier, he repaired to Paris, where he again received the ſame degree. His talents procured him the honour of a place in the academies of Montpellier, of Nancy, of Marſeilles, and of Dijon; and by his zeal he obtained the appointment to the Bureau des Nourrices, and to two hoſpitals at Paris. In this city he was actively employed, during ſeveral years, in contributing to the prevention and cure of the moſt deſtructive and loathſome diſeaſes which afflict mankind, eſpecially the ſmall-pox and the lues venerea. He publiſhed a conſiderable number of treatiſes, at Paris, between the years 1767 and 1776, chiefly relating to the two diſeaſes juſt mentioned. Eloy. Dict. Hiſt.

GARDANNE, in *Geography*, a town of France, in the department of the mouths of the Rhone, and chief place of a can-

a canton, in the diſtrict of Aix; 4 miles S.S.E. of Aix. The place contains 2279, and the canton 7529 inhabitants, on a territory of 167½ kiliometres, in 6 communes.

GARDANT, in *Heraldry*. See GUARDANT.

GARDE, in *Geography*, a town of Hinder Pomerania, on a freſh-water lake, abounding with fiſh, near the ſea; 18 miles N.E. of Stolpe.

GARDECAUT, or GARD DU CORD, in a watch, that which ſtops the fuſee, when wound up, and for that end is driven up by the ſtring. Some call it *guard-cock*; others, *guard du gut*.

GARDEFAN, CAPE, or *Straits of Burial*, in *Geography*, as it is called by the Abyſſinians, or *Cape Gardefui*, as it was denominated by the Portugneſe, the *Promontorium Aromatum* of the Romans, denotes that point of the Abyſſinian coaſt of the gulf of Suez, which ſtretches out into the gulf before you arrive at *Babelmandeb*; which ſee. See alſo *Cape* DEFAN.

GARDEIAH, a town of Africa, the capital of Beni-Mezzab; 180 miles E. of Fighig. N. lat. 32° 15'. E. long. 2° 30'.

GARDELEBEN, or GARDELEGEN, a town of the Old Mark of Brandenburg, containing four churches, four hoſpitals, and a manufacture of cloth; celebrated for its beer; 72 miles W. of Berlin. N. lat. 52° 32'. E. long. 11° 36'.

GARDEN, ALEXANDER, in *Biography*, an eminent botaniſt and zoologiſt, was born in Scotland, in January, 1730, and educated at the univerſity of Edinburgh; where he ſtudied botany according to the Tournefortian ſyſtem under Dr. Alſton, and where, probably, he took the degree of doctor of phyſic. He ſettled as a phyſician at Charleſtown, South Carolina, in 1752, and ſoon after married. From his firſt arrival in America he had betaken himſelf to the inveſtigation of the vegetable productions about Charleſtown, with the aſſiſtance of the works of Tournefort and Ray; but he found the greateſt difficulty in aſcertaining his diſcoveries, and eſpecially in reducing ſuch plants as appeared nondeſcripts to their proper places in the ſyſtems of thoſe writers. New ſections were neceſſarily to be formed at every ſtep to admit what they had never ſeen, and the uncertainties attendant on generic or ſpecific diſcrimination were inſurmountable, on account of the great affinity and yet conſiderable difference between American botany and that of Europe, to which the ideas and ſyſtem of Tournefort in particular were accommodated. In the midſt of this perplexity, Dr. Garden met with the *Fundamenta Botanica* and *Claſſes Plantarum* of Linnæus, as well as the *Flora Virginica* of Gronovius. Theſe books, eſpecially the firſt, delighted him ſo much, that he introduced himſelf to the correſpondence of Linnæus in March, 1755, by an elegant and enthuſiaſtic Latin letter, in which he expreſſed his admiration at the clearneſs, didactic preciſion, and ingenuity of theſe writings, and his gratitude for the benefits which he had derived from their repeated peruſal. In the ſummer of 1754 he had been obliged, by indifferent health, to take a journey through ſome of the northern provinces, and viſited Mr. Colden, near New York; where, alſo, he became perſonally acquainted with the celebrated John Bartram, then juſt returned from an excurſion to the Blue mountains. Equally ſtruck with the knowledge and with the candour of theſe men, he became ardently attached to them. "Viri," ſays he, in the above letter, "quorum ut ſumma eſt in arte ſapientia et induſtria, ſic et intemerata fides.

——animæ, quales neque candidiores
Terra tulit."

He had ſcarcely diſpatched this firſt letter, when he received from Europe the *Critica* and *Philoſophia Botanica*, *Amœnitates Academicæ*, and *Syſtema Naturæ*, works well calculated to confirm and to increaſe the taſte he had with ſo much zeal adopted. From this time, therefore, during his ſubſequent reſidence in Carolina, he was a profeſſed and ardent botaniſt, the correſpondent, not only of Linnæus, but of Gronovius, Collinſon, Ellis, and occaſionally of moſt other diſtinguiſhed naturaliſts in various parts of the globe. In his firſt attempt at founding a genus, which he communicated to the great Swediſh naturaliſt by the name of *Elliſia*, he was unfortunate, the plant he deſcribed being *Swertia diſſormis*; ſee FRASERA. Nor was he more ſucceſsful in his next, which proved a *Styrax*, the *lævigatum* of Hort. Kew. v. 2. 75. Linnæus, however, was not at firſt aware of this, and deſtined the ſuppoſed new genus to commemorate Dr. Hales; nor is it certain that he ever diſcovered his miſtake after Ellis had eſtabliſhed a truly diſtinct *Haleſia*, like the *Styrax* in flower and habit, but very different in fruit. At leaſt the *H. tetraptera*, and the leaves, though not the fruit, of *H. diptera*, in the Linnæan herbarium, are both *Styrax grandifolium* of Hort. Kew. The *Stillingia* and *Fothergilla* of Dr. Garden, ſent in 1765, have finally been eſtabliſhed; his *Cyrilla* and *Hopea* have been reduced, the former to *Itea*, the latter to *Symplocos*, by L'Heritier and ſucceeding botaniſts. He was therefore leſs happy than Ellis in the diſcovery of new genera, but it does not follow that he had leſs botanical ſkill. Who can hope always to decide irrevocably on this ſubject?

Linnæus was anxious to obtain from Dr. Garden a knowledge of the inſects, and eſpecially the fiſhes, of South Carolina, and in this he was not diſappointed. The deſcriptions of Garden were altogether Linnæan, and were accompanied by ſpecimens of the ſkins of all the fiſhes, ſpread and dried on a board. He had a black ſervant who was peculiarly dextrous at this operation, ſo as to preſerve the outline of the fiſh, and every important character, with great accuracy. Well aware, nevertheleſs, that in many caſes an entire ſpecimen is abſolutely neceſſary, he ſent many fiſhes and reptiles in bottles of rum, among which were various ſpecies of tortoiſes, lizards, and ſerpents. Hence his name occurs more frequently than that of any other perſon in the Syſtema Naturæ under the claſſes of *Amphibia* and *Piſces*. His moſt celebrated diſcovery was that of the *Siren lacertina*, of which he ſent a deſcription with ſpecimens to Upſal in the ſpring of 1765, and which ſeemed to him a middle link between *Lacerta* and *Muræna*. In Auguſt, 1766, he wrote to Linnæus in Engliſh as follows. "It gives me much ſatisfaction that you had ſome pleaſure in viewing and examining the extraordinary two-legged animal which I ſent you laſt year. We have numbers of them in this province. They live in dams and ponds of freſh water, and in low marſhy grounds all over the province. I have ſeen them of all ſizes, from four inches to three feet or 3½ in length. They always appeared to me to be the ſame animal in every thing but magnitude, and we have none of the *Lacertæ* in this country, except the alligator, that ever grow to above ſix or ſeven inches in length at moſt; and all theſe are land animals, never uſing or living in water but when driven into it. I think you may depend on this being no *larva* of any animal, but a real diſtinct genus by itſelf. In one that I opened laſt ſpring, I think I ſaw the male ſperm, or what we call the ſperm of fiſhes. I ſend you an entire ſpecimen in ſpirits, with the ſkin, head, and vertebræ of the neck, of a pretty large one. Laſt year I deſired my ſervant to daſh the head of one againſt a ſtone to kill it; but he, miſapprehending me, daſhed the whole animal forcibly againſt the ground; when

when to my ſurpriſe it broke off ſhort into three or four pieces, juſt in the ſame manner as the glaſs ſnake does when ſtruck. From this I judged it was not of the eel kind, whoſe ſkin and muſcles are remarkably tough. Though I never yet have been able to know ocularly whether they propagate their ſpecies in this form, yet I have great reaſon to believe it, for we ſhould certainly meet with them in their perfect ſtate if theſe were only *larvæ*, but we poſitively have no animal that reſembles them."—Linnæus found, as he thought, ſo great a peculiarity in the organs of reſpiration in this animal, it having apparently both gills and lungs, that he was induced to eſtabliſh a new order of *Amphibia* to receive it, which he named *Meantes*; ſee the laſt leaf of the 1ſt vol. of Syſt. Nat. ed. 12. This new order was to follow the *Serpentes* at p. 393, not 395. A diſſertation on the *Siren lacertina* is alſo to be found in Amœn. Acad. v. 7. 311. t. 5: and Ellis wrote a paper on the ſubject, which appears in the Philoſophical Tranſactions, v. 56. 189. t. 9. Among the moſt curious conſequences of this diſcovery was a letter written to Dr. Garden by the famous ſir John Hill, which he once ſhewed to the writer of this account. That ingenious but arrogant philoſopher aſſured him, that he himſelf "had diſtributed all the known productions of nature into a ſeries or chain, according to their reſpective affinities, marking each genus, or link of that chain with a number. That there were occaſional interruptions in this ſeries, where he had placed numbers for certain productions, which he knew *muſt exiſt*, but had not yet diſcovered, and that the *Siren* preciſely filled up one of theſe vacant numbers!" This preſumption, ſo different from his own patient and practical inveſtigation of nature, ſo diſguſted Dr. Garden, that he immediately declined all further intercourſe with ſir John, anſwering that "he was himſelf but a humble obſerver, and felt unworthy of correſponding with a man who ſeemed to be ſo intimately in the councils of the Almighty and Allwiſe Creator."—All naturaliſts, however, did not embrace the *Siren*, to their own confuſion, with the ardour of ſir John Hill. The learned Camper diſputed its pretenſions to form a new order, or even a genus, and reduced it to *Muræna*, where it now ſtands in Gmelin's edition of the Syſtema, v. 1. 1136, by the name of *Muræna Siren*.

In a letter dated May, 1770, Dr. Garden gave Linnæus an account of what is called in South Carolina the Potatoe Louſe, "a venomous inſect, of a bright red colour, extremely minute, inhabiting for the moſt part the rotten trunks of trees. Though this inſect is ſo very ſmall as to be ſcarcely diſcernible, it occaſions the moſt ſerious miſchief. In ſummer, the ſeaſon of its greateſt vigour and abundance, thoſe perſons who incautiouſly lie down upon the ground, ſit upon fallen trees, or even walk where it abounds, are attacked by great numbers of theſe vermin at once, which immediately overrun all parts of the body, not only wounding the ſkin and inſerting their poiſon, but introducing themſelves under the cuticle, and occaſioning itching that ſoon becomes intolerable, with ſubſequent inflammation and ſwelling, attended with a piercing burning pain. Very often a fever ſupervenes, and ſmall itching ulcers are formed. The inſect in queſtion is quite different from that kind of flea called by Cateſby the Chigo, or Chigger." In ſome of his letters Dr. Garden finds great fault with the writer laſt named, whoſe whole work, he ſays, "but eſpecially the 2d volume, is ſo incomplete, and abounds with ſuch groſs errors, that it would be no ſmall taſk to amend and complete it; and that he never conſulted it without indignation and diſguſt, at ſeeing the moſt beautiful works of the Creator ſo miſerably defaced and mutilated, and ſo ill repreſented."—The above Potatoe Louſe proved the *Acarus Batatas*, Syſt. Nat. v. 1. 1026.—In the ſummer of 1770 Dr. Garden ſent an intelligent negro ſervant to the iſland of Providence for the purpoſe of collecting natural curioſities, and eſpecially fiſh, this being, as we preſume, the man abovementioned who excelled in their preparation. His harveſt, however, on this occaſion, was much leſs abundant than might have been expected, in conſequence of a ſtorm in his voyage back, which ſo terrified him, that he forgot all neceſſary attention to his collection, in fears for his own life. What arrived in tolerable order were ſent to Linnæus, and among them were ſeveral new or curious fiſhes and inſects. The laſt letter of Dr. Garden to Linnæus in our poſſeſſion is dated May, 1773, and contains a critical account of the fructification of *Zamia pumila*. Soon after this period the political diſturbances in America interrupted his ſcientific correſpondence, and finally obliged him, as having joined the loyaliſts, to quit that country and take refuge in Europe. He left a ſon behind him, but was accompanied to England by his wife and two daughters. We are not informed of the preciſe time of his arrival in England, but it appears, from the records of the Royal Society, that, though elected a fellow of that ſociety June 10, 1773, he was not admitted till May 15, 1783, the latter being probably his firſt opportunity of attending in perſon after he came to London, where he reſided till his death, which happened April 15, 1791, in the 62d year of his age. He had, in conſequence of the recommendation of Linnæus, been elected a member of the Royal Academy of Upſal in 1761.

Dr. Garden had for the greater part of his life laboured under a delicate ſtate of health. He was afflicted with conſtant ſea-ſickneſs throughout his voyage to America, which deterred him from any excurſions by ſea during his abode there, though he ardently wiſhed to examine ſome of the Bahama iſlands in particular. His practice as a phyſician, though very extenſive, was frequently interrupted by the ſtate of his own health, and he was obliged to indulge in the relaxation afforded by a country-houſe and garden, where he delighted to cultivate in luxuriance the choiceſt plants of American growth. The ſcarlet honeyſuckle, entwined among the delicate *Chionanthus*, formed the favourite decorations of his bowers; for it was not ſo much rarity or ſingularity, as beautiful nature, that he loved. His returning voyage was attended with the ſame diſtreſſing inconvenience, and this cauſed a rupture of a veſſel in the lungs. This accident, in a frame ſtrongly prediſpoſed to pulmonary conſumption, with a fair, florid complexion, ſoon produced that diſorder, which finally proved fatal. In perſon, Dr. Garden was tall and thin, with regular features, peculiarly animated eyes, and a benevolent prepoſſeſſing countenance. We have elſewhere obſerved, that "few characters could be more juſtly beloved in private, nor were ſenſibility and cheerfulneſs ever more happily combined. He was an American loyaliſt, free from party bigotry. In ſcientific purſuits, he ſought only truth and nature, for their own ſakes, ever unaſſuming and unambitious, while his name gave authority throughout Europe wherever it appeared. The elegant and fragrant *Gardenia*, dedicated to him by his friend Ellis, is worthy to perpetuate his name." S.

GARDEN, a portion of ground laid out for the purpoſe of ornamental effect, or the raiſing and providing different ſorts of plants of the flowery, herbaceous, and eſculent kinds, as well as various other vegetable productions and fruits by proper cultivation and encloſure.

It is evident, from many different circumſtances, that the introduction of gardens almoſt immediately ſucceeded that of the art of building houſes, and, of courſe, became the natural

natural attendants of property and individual poſſeſſion at an early period. It was ſoon found convenient to have various ſorts of plants and herbs at hand, inſtead of ſeeking them at a diſtance when they were wanted. As the art of cultivation became more general, and its advantages more fully underſtood, the expediency of having diſtinct incloſures for the purpoſe was rendered obvious.

Orchards and vineyards were afterwards had recourſe to as luxury increaſed, and habitations became more general. The ancient gardens ſeem to have been chiefly of this kind, variouſly intermixed with works of art, as fountains, grottos, porticos, ſtatues, ſhady walks, baths, &c. &c.

Modern gardens are, however, moſtly diveſted of all theſe heavy and unnatural ornaments, being more ſimple imitations of nature, contrived for the purpoſe of produce and pleaſure.

Gardens are uſually diſtinguiſhed, by the nature of their products, into the ornamental, or flower, and kitchen kinds, the laſt being chiefly deſtined to the raiſing of uſeful culinary roots, plants, and vegetables. There are alſo nurſery gardens, which are principally employed in raiſing trees, ſhrubs, &c.

Where gardens of the firſt ſort are neceſſary, they ſhould be laid out ſo as to have open ſunny ſheltered expoſures, forming, if poſſible, the connections between the ornamented, or pleaſure-grounds, and the kitchen-gardens, according to the general nature and ſituation of ſuch grounds, ſo as to afford the moſt ſtriking effect and variety that are poſſible.

The nature of their forms may vary in proportion to the diſtribution of the lands, and the particular circumſtances of their ſituations, being made ſquare, circular, oblong, or in any other manner, according to the taſte of the proprietor; the parts approaching the ornamented grounds being moſtly ſeparated by walks, and the introduction of different ſorts of the moſt curious, hardy, flowering, ſhrubby plants. The interior parts ſhould have a neat ornamental diſtribution, ſo as to produce the moſt ſtriking variety when the flowers are in blow, and afford the greateſt convenience in their cultivation. It was formerly the practice to have them laid out with walks ſurrounding the outer boundaries, or borders being introduced all round within them and the inner compartments, divided into a variety of narrow ſtraight borders, or plain four-feet wide parallel beds, having two-feet wide alleys between; the whole of them being laid in a rounding form, and neatly edged with dwarf-box, or ſome other plant ſuited to the purpoſe; and the walks and alleys laid with the fineſt ſand; but at preſent they are moſtly arranged ſo as to ſuit the nature of the ſituation, produce the moſt ornamental effect, and afford the greateſt eaſe, convenience, and ſucceſs in the culture of flowers, &c.

Gardens of this nature ſhould contain all the different ſorts of hardy, curious, ornamental flower-plants, whether of the bulbous, tuberous, or fibrous rooted kinds, and be conſtantly kept in neat order.

The ſecond ſort, or kitchen garden, ſhould be laid out in different methods, according to the differences in the circumſtances of the ground. It is ſometimes ſo managed, as to conſtitute a part of, or communicate with the pleaſure-ground; but where there is ſufficient extent of land, it is better to be diſtinct, or detached from it, and in every caſe as much concealed from the houſe as poſſible. The moſt convenient diſtribution is at ſome diſtance behind it; but on the ſides may anſwer very well, eſpecially when not too contiguous, or ſo ſituated as to interrupt any particular proſpect or view of the adjacent country.

Expoſure.—With regard to the nature of the ſituation moſt proper for this purpoſe, it ſhould, when convenient, be where there is a gentle declination towards the ſouth, or ſouth-eaſt, in order that it may have the full advantage of the morning ſun.

The nature of the expoſure of a garden is a matter of conſiderable importance, as not being capable of change like thoſe of ſhelter, ſoil, &c. It has been obſerved, by a late writer on "Country Reſidences," that the beſt expoſure for a garden is that of the ſouth-eaſt, but that in an extenſive and complete garden, it is deſirable that part of it ſhould have a northern aſpect, in order that late crops may be raiſed with advantage. And this, it is ſuppoſed, may often be attained, either by fixing upon both ſides of a gentle ſwell, or eminence, or on the two oppoſite ſides of a hollow or depreſſion. Should ſuch a hollow wind in any conſiderable degree, every ſort of expoſure would at once be had without difficulty, and moſtly in combination with ſhelter and proper ſoil.

Situation.—This ſhould be relative to the nature of the reſt of the place, and the convenience of water. It ſhould be ſomewhat contiguous to the neceſſary offices, ſtables, &c. and at no great diſtance from the farm, being concealed as much as poſſible from general view, and ſo contrived, as to interfere but little with pictureſque improvements. It ſhould be ſo near a ſupply of water as to have it in abundance for the common purpoſes of watering during the whole of the ſummer months. And it may be uſed in other ways with advantage, in particular ſituations and circumſtances. It is a common but dangerous error to form gardens in too low ſituations, in order that they may have the benefit of natural ſhelter, as they are very liable to the effects of hoar froſts, blights, and mildews. Mr. Forſyth remarks, in his "Treatiſe on the Culture and Management of Fruit Trees," that if a garden "be ſituated in a bottom, the wind will have the leſs effect upon it; but then the damps and fogs will be very prejudicial to the fruit and other crops;" and that when "ſituated too high, although it will, in a great meaſure, be free from damps and fogs, it will be expoſed to the fury of the winds, to the great hurt of the trees, by breaking their branches, and blowing down their bloſſoms and fruit."

Shelter.—A garden ſhould, in this writer's opinion, "be well ſheltered from the north and eaſt to prevent the blighting winds from affecting the trees, and alſo from the weſterly winds, which are very hurtful in the ſpring or ſummer months." Where it is not "naturally ſheltered with gentle riſing hills, which are the beſt ſhelter of any; plantations of foreſt-trees ſhould," he thinks, "be made at proper diſtances, ſo as not to ſhade it." Theſe, he ſuppoſes, will be found the beſt ſubſtitute, but at the ſame time the ſun and air ſhould be freely admitted. On this account it is ſuppoſed that "a place ſurrounded by woods is a very improper ſituation for a garden or orchard, as a foul ſtagnant air is very hurtful to vegetation." It is likewiſe added that "blights are much more frequent in ſuch ſituations than in thoſe that are more open and expoſed." In theſe ſheltering plantations, it is well adviſed that fruit-trees ſhould be intermixed with thoſe of the foreſt kind, which, beſides being advantageous in the way of affording ſhelter, ornament, and fruit, become nurſeries for raiſing foreſt-trees. But where the ſituations will not admit of this, he ſuggeſts the propriety of planting ſome croſs rows of fruit-trees in the garden, at the diſtances of about forty or ſeventy yards from each other, more or leſs, according to the extent: where the length is conſiderable, one row may be ſufficient on each ſide; but in ſhort croſs rows, two on each ſide the walks or paths. In this intention the trees ſhould be planted oppoſite one another, but in ſuch a manner that thoſe in one row may be oppoſite to the middle parts of the

open

open ſpaces in the others. In this method, beſides the ornamental effect that is produced, the force of violent winds is broken, and much damage to other trees prevented.

In this view, the beſt ſort of trees, according to the ſame writer, is that of dwarfs, with ſtems about two feet high, which may readily be provided by removing the lower branches.

The author of the Treatiſe on Country Reſidences adviſes "that the planting ſhould be performed on all ſides of the garden, the diſtance being proportioned according to the particular circumſtances of the caſe. But when the garden is upon the perfect flat, the neareſt foreſt trees ſhould not, in common, be within leſs than one hundred feet of the outer fruit wall, nor on the ſouth ſide within leſs than one hundred and twenty or thirty feet of it; where however it is upon a high riſing bank, they may ſometimes be admitted to come as near as fifty or ſixty feet. It is likewiſe in moſt caſes a good way to form a deep ſunk fence between ſuch trees and the garden ground, eſpecially when they are of the fir tribe, in order to prevent the roots from running too much in the ſurface mould of the garden."

Soil.—In fixing upon ground for a garden, it is likewiſe a point of much importance to have the natural ſoil of a good quality, being ſufficiently dry, mellow, and capable of being eaſily wrought in all ſeaſons, as well as of a good depth, as from a foot and a half to three feet. And if the ſurface be uneven, it will be the better, as there will be a greater variety in the quality, and of courſe it will be more fully adapted to the culture of different crops. The moſt proper ſort of ſoil for this purpoſe is that of the rich, friable, loamy kind, and the worſt thoſe of the very light, ſandy, and ſtiff clayey deſcriptions. But the properties of ſoils may be much improved in moſt caſes by a judicious application of different ſorts of materials in the way of manure.

Some think a medium loam the moſt proper, as being capable of being made of different degrees of lightneſs in different parts, by the addition of ſand and other ſimilar materials, ſo as to ſuit different ſorts of vegetables; and in others of various degrees of tenacity and heavineſs, by the uſe of clay or other coheſive ſubſtances.

Where the under ſoil is of the retentive kind, great care ſhould be taken to have it well drained, as unleſs this be effectually accompliſhed, healthy vegetables or trees can ſeldom be produced. See SOIL and MANURE.

In caſes where fruit-trees, eſpecially thoſe of the finer ſorts, as well as apple and pear kinds, are to be planted, a greater depth of good ſoil, as well as a greater degree of dryneſs, is neceſſary in general than that mentioned above.

Form.—There are very different opinions in reſpect to the moſt proper and advantageous forms for this ſort of culture; but though much muſt depend on the nature of the ſituation, where the ſpade is to be made uſe of in performing the work, the ſquare ſhape, or that which approaches neareſt to it, is probably the moſt convenient. In other caſes, where the principal part of the work is, from the difficulty of procuring labourers, and the increaſing expence of them, to be executed by the plough, the oblong and circular forms may be the moſt ſuitable, as they may be wrought with greater facility and convenience. The ſhape of the garden is uſually decided by the walls, but that which is moſt adapted to the general purpoſes of cultivation is, in the opinion of the above writer, that of a parallelogram; though were the chief object the production of wall-fruit, the oval form with its long diameter from eaſt to weſt would be better, as containing the ſmalleſt quantity of wall hid from the ſun, and a large portion of it conſtantly expoſed to the ſouth. But as all forms, except thoſe of the ſquare kind, derange the regulation of the quarters, and are conſequently troubleſome in digging and cropping, they are in general properly diſcarded, except in ſome flower-gardens, where fruits are raiſed on the walls.

Size.—The ſize of kitchen-gardens ſhould always be fully ſufficient for the extent of the family, varying from half an acre to four, five, or more, within the fence. The firſt quantity, where there are wall and eſpalier trees, will furniſh ſufficient employment for one man, and afford due ſupplies of vegetables and fruit for families, conſiſting of a dozen or more perſons. But much in theſe reſpects depends upon proper care and management. The nature of the ſoil ſhould alſo be taken into the account in determining this point.

Incloſing.—The methods of incloſing that are purſued in theſe caſes vary according to the facility of procuring materials on the particular ſpots. Some adviſe the boundary fence to be a ſunk one, with a hedge or low wall; but others think the beſt mode of incloſing garden-ground is by means of brick walls, where that ſort of material can be eaſily procured, and expence is not an object. But oak paling fences anſwer the purpoſe very well. Theſe fences, whether made of brick or wood, ſhould be eight, ten, or twelve feet in height. Where the extent of walling is ſufficient, Mr. Forſyth thinks ten feet walls better than ſuch as are higher, as being more convenient for various purpoſes. He alſo adviſes that they ſhould have borders or ſlips on the outſides of them, of from forty to ſixty feet or more in breadth, where the ground can be ſpared, which ſhould likewiſe be incloſed by an oak paling, ſix or eight feet in height, having a *chevaux de friſe* at the top to ſtrengthen the fence, and render the garden more ſecure. The latter may be conveniently formed, by planting a piece of wood four inches in breadth, and an inch and quarter in thickneſs, into the ſhape of the roof of a low pitched houſe on the upper ſide, then drawing a line on each ſide from end to end, at the diſtance of about an inch and quarter from the upper edge, driving twelve-penny nails through them in regular rows, at the diſtance of four inches from each other, ſo as to come out near the upper edge of the contrary ſide; each being oppoſite the middle of the ſpace between two nails on the other ſide. The nail heads ſhould be ſunk, and ſtrips of wood nailed over them, tenter-hooks being driven in between the nail points, and the whole nailed faſt to the outſide top of the fence; continuing pieces in this way till the whole is completed and rendered ſecure. It is ſuppoſed that by means of theſe incloſed borders or ſlips on the outſide of the garden walls, there will be plenty of ground for gooſeberries, currants, and ſtrawberries, and both ſides of the walls may be planted with trees, by which there will be a conſiderable increaſe of wall-fruit. And where there are parts of ſuch ſlips lying near to the ſtables, ſufficiently ſheltered and expoſed to the ſun, they may be converted to the purpoſes of a forcing-ground for raiſing melons, cucumbers, and other ſimilar kinds of fruit.

The advantages of this are that there will be no litter carried within the walls, to dirty the walks; the beds will be concealed from the ſight, and much time and labour ſaved in carting and wheeling the dung and other matters.

Where there are not theſe ſorts of ſlips, the forcing-grounds for melons, cucumbers, &c. ſhould be made in ſituations that are warm, and open to the influence of the ſun, being well incloſed, and as contiguous to the ſtable as the nature of the ſituation will admit. It is added that the great objection to having ſlips or borders on the outſides of the walls of gardens is that of the vaſt expence of erecting

two fences, where one is capable of anſwering the purpoſe, and by proper attention in the diſtribution of the internal parts, with perhaps nearly equal advantage.

The author of the work on "Country Reſidences," after obſerving that the northern ſide of ſuch garden-ſtrips ſhould be reſerved for common crops, and the ſouthern for early ones, ſuggeſts that a ſhrubbery may in ſome inſtances be introduced with propriety in a part of the ſpace towards the plantation, ſo as to range in order with mixed plants, from the humbleſt ſhrub in the edge of the walk, to the higheſt foreſt trees. In this way complete ſhelter may be afforded, and at the ſame time an agreeable effect produced at moſt periods of the year. But in many caſes its place may be ſupplied ſimply by a ſingle holly hedge placed on the top of the ſunk fence, by which means a larger portion of ground may be applied to the raiſing of culinary vegetables, and the character of utility be more fully preſerved. It occaſionally happens, from the declination of the ground in a ſoutherly direction, that the uniformity of ſuch "outer incloſure can be broken, and a large bay or receſs be made in the wood, either to contain all the hot-houſes, hot-beds, &c." or the latter only; which is always a great advantage.

Subdiviſion.—In the diſtribution of the quarters or parts of the garden, attention ſhould be had to the nature, form, and extent of the ground, ſo as that they may be laid out in the beſt manner, in reſpect to the convenience of managing them, expoſure, and ſize; but they ſhould never be made too ſmall, as there will be much loſs of ground by the walks, which are eſſentially neceſſary in their cultivation. With regard to their form, it may vary according to circumſtances, or the taſte of the proprietor; but the moſt convenient and economical one, in reſpect to ground, is the ſquare, where the garden has been laid out in that manner. It is uſual to have borders round the whole of the incloſing fences, whether they be conſtructed of brick, ſtone, or timber; and where there are croſs walls, they are generally introduced on the ſides of them. The breadths of theſe ſhould be proportioned to the height of the walls or palings, and the extent of the garden, as from ſix, to eight, ten, and twenty feet, eſpecially thoſe which have a ſouthern aſpect, and are intended for the reception of fruit-trees, as their roots will have more room to extend themſelves and procure due nouriſhment. Beſides, wide borders are the moſt advantageous and economical in the culture of different vegetable crops.

Where the gardens are large, other borders may be carried along on the ſides of the walks, between them and the eſpalier or ſtandard fruit-trees; but in other caſes this is inconvenient, as taking up too much of the quarters. Theſe ſhould not exceed ſix or eight feet in breadth.

With ſome it is the practice to have the edges of the borders made firm and even, and planted with dwarf box, or ſome other plant made uſe of for the purpoſe; but as theſe ſorts of edgings are very liable to be deſtroyed in different places by wheeling over them, and by that means become unſightly, it is probably a better method to only have the edges of the border made up firm and even, cloſe to the gravel of the walks.

Walks.—In common there ſhould be a walk introduced on the ſides of the borders all round, and likewiſe in the middle where the ground is of conſiderable extent. Croſs walks are alſo neceſſary where the garden has a great length. But as walks take up much ground, there ſhould be as few as poſſible. Thoſe on the ſides of the borders need not have more breadth than from four to ſix feet; but the middle one ſhould be ſeven feet wide, in order that a cart may be admitted when neceſſary.

It is alſo neceſſary to have walks about two feet or two feet and a half wide, and the ſame diſtance from the walls, where there are wall-trees, for the convenience of pruning, training, and nailing, as well as that of gathering the fruit, and admitting a barrow or garden-engine for watering them.

And beſides theſe permanent walks, when the gardens are of much extent, trodden path-walks will be requiſite in different parts, for the convenience of cultivation, and as diviſions between the crops of different kinds.

All the firſt ſorts of walks ſhould be laid out in a regular manner, and be firmly made up with brick rubbiſh, ſtone-maſons' chippings, or ſome other coarſe material; and neatly gravelled over. For this laſt purpoſe binding ſand anſwers extremely well, alſo good clean ſifted road drift, as they may be readily kept clean by the hoe and rake; but ſea-coal aſhes are preferred by ſome, as being ſtill more dry and firm, more eaſily kept in order, and cleaner to walk upon in thaws, as well as uſeful, while new and rough, in preventing ſlugs from travelling over them from the different quarters of the ground.

The narrow walks on the back ſides of the borders near the fruit-trees, need not be laid with any ſort of coarſe rubbiſh, being merely covered over to the depth of a few inches with ſand or ſea-coal aſhes, as by this means the ground may be occaſionally dug up, and the path re-laid.

Whatever ſort of material is made uſe of in forming the walks, it ſhould be ſpread in a neat even manner, ſo as to leave them in a regular moderate convex or rounded form, by which the water will be readily carried off to the ſides, and the walks kept perfectly dry. After the ſurface material has been thus applied, and evenly raked over, it ſhould be firmly rolled down by a heavy iron roller, and occaſionally repeated after being well moiſtened with rain.

Sometimes walks are laid with turf or ſward, but this is a very improper material, as being troubleſome to keep in order, and ſoon rendered diſagreeable to the ſight, by being wheeled and trampled upon in the work of the garden.

Walls.—In building the walls of kitchen-gardens, when the height is conſiderable, the foundation ſhould be from two to two bricks and a half in thickneſs, and the off-ſet not more than one brick above the height of the level of the border, being then brought to a brick and a half in thickneſs; where they are extenſive, they ſhould be ſtrengthened by piers at the diſtance of from forty to ſixty feet, according to their height. The projection of theſe piers ſhould not be more than about half a brick before the ſurface of the wall. Walls for fruit-trees ſhould always, if poſſible, be built with brick, as ſtone is found not by any means ſo favourable to the maturation of the fruit, and far more inconvenient in the nailing of the trees. The manner of conſtructing hot-walls for bringing fruit forward by artificial heat will be deſcribed hereafter. See HOT-WALL.

Where ſituations cannot be provided with convenience without the walls of the garden for the whole of the forcing apparatus, the pits and hot-beds may be placed in ſunk areas in the quarters of the gardens as near as convenient to the hot-houſes.

Copings.—Some adviſe projecting copings of ſtone or wood to be fixed upon the tops of the walls, and the author of the "Philoſophy of Gardening" conceives that they may be of great utility in the early vernal months in preventing the tender young ſhoots of fruit-trees from being

deſtroyed by froſt, as, from their being leſs imbued with the night-dews in conſequence of them, they will be leſs expoſed to danger from that cauſe; it being well aſcertained that the fine ſhoots of vegetables are moſt expoſed to the deſtruction of froſt when in a moiſt ſtate.

But Mr. Forſyth does not however approve of ſuch fixed copings, eſpecially when they project ſo far as is uſually the caſe; moveable wooden ones faſtened by iron hooks to pieces of wood built into the tops of the walls being in his opinion preferable. Beſides, they are uſeful to fix nettings, &c. to in the early ſpring, for protecting the trees. When fixed copings are adopted, they ſhould not, he thinks, extend above an inch on each ſide of the wall, as the ſlight projection will be ſufficient to preſerve it, and at the ſame time not prevent the dews and rains from falling upon the upper parts of the trees, by which they are greatly benefited. Copings are ſometimes formed of a ſort of brick made convex on the ſide which is upwards; but theſe are expenſive. A ſort of ſlate brought from Wales has lately been made uſe of for this purpoſe, which ſeems to anſwer very well. It is made to have the projection juſt mentioned. This ſort of coping has been employed in the extenſive gardens at Aſhted park, near Epſom, and may be had of different ſizes at Mr. Samuel Wyatt's ſlate-wharf near Blackfriars' bridge, London. Mr. Forſyth ſuggeſts that common copings ſhould have a little ſlope given them "towards the north or eaſt, according to the aſpect of the wall," by which the wet from the ſouth and weſt ſides may be taken away, and the danger of the early bloſſoms and fruit being injured on the ſouth and weſt walls in cold nights be avoided.

Drains.—Where the ſoil of a garden is naturally of a ſtiff retentive quality, and retentive of moiſture, proper under-draining will be eſſentially neceſſary in order to the production of good well taſted fruit, as well as fine culinary vegetables. In theſe caſes the main or leading drains ſhould be made under the walks, and thoſe from the quarters be formed to communicate with, and empty themſelves into them. They ſhould be conſtructed of bricks, either common or ſuch as are formed for the purpoſe, and be laid in ſuch directions as are the beſt adapted to the removal of the injurious wetneſs, and always of ſuch depths as to prevent their being injured by the ſpade in working the ground. By this means the ſoil will be kept in a ſuitable ſtate for the growth of the plants, and the walks preſerved in a fine ſtate of dryneſs, ſo as to be ſufficiently firm for carting or wheeling upon, even in wet ſeaſons.

Where the ground deſtined for the purpoſe of forcing is on a level conſiderably lower than that of the garden, the water from the latter may be made to ſupply the former, by having the main leading drain terminating in a tank, pond, or ciſtern conſtructed in it for the purpoſe, which in many ſituations may be extremely convenient and uſeful.

In many caſes, and eſpecially where the garden grounds are of a dry quality, it is of vaſt advantage to have them ſituated contiguous to rivers, brooks, or large baſons of water, from which they can be ſupplied by means of drains, pipes, or other contrivances, in the moſt hot and droughty ſeaſons of the year.

But where no ſupplies of water can be provided and brought to the garden in theſe ways, Mr. Forſyth ſuggeſts that where they lie on the ſides of public or other roads, and the level of the ground is ſuitable, hollow drains ſhould be formed in the moſt convenient parts, to receive the water that waſhes them in rainy ſeaſons, and convey it to large ponds or other places made for its reception in the higheſt part of the garden ground that will admit of it, from which it may be diſperſed to the different quarters that will allow of it by pipes, with cocks fixed at different places for turning it on, as may be neceſſary. Or, by having ſuitable channels cut, it may be turned upon different parts, as in the practice of watering meadow land, which, where the roads are repaired with calcareous materials, or there is much vegetable matter waſhed down them, may be highly beneficial in the way of manure. A proper ready exit for the ſuperabundant water muſt always be provided in theſe caſes, to prevent ſtagnation. And where the ground has been much enriched by ſtable manure, the practice ſhould be cautiouſly adopted, as more fertility may be conveyed away in the ſtate of ſolution than is brought by the water. The moſt convenient time for turning on water is generally during the night, which in dry ſeaſons is the moſt advantageous to the plants or crops that are upon the ground.

The expence in pipes, drains, channels, and other apparatus for theſe purpoſes, will be conſiderable at firſt; but the ſaving in labour, and time, in pumping and carrying water, it is conceived, will ſoon repay it. Where water is under the neceſſity of being pumped up from deep wells, large baſons or reſervoirs ſhould be provided, in which it ſhould remain ſome time expoſed to the influence of the atmoſphere, before it is made uſe of in the above or any other way in gardens.

Where garden grounds are of a wet ſpewy quality, Mr. Forſyth recommends baſons to be formed in the moſt convenient parts of them, for the reception of the water that proceeds from the drains, and which falls in rain on the walks and paths, as well as other parts.

Forming new Gardens.—In forming new kitchen garden grounds, where the ſoil is of a ſtrong, ſtiff, heavy quality, they ſhould be ploughed or trenched over three or four times, being expoſed to the effects of froſt, in pretty high ridges, for a winter, in order to bring them into a proper condition before the crops are put in. A crop of potatoes or beans alſo aſſiſts greatly in bringing them into a proper ſtate of pulverization for being planted upon with culinary vegetables.

When the land is become ſufficiently broken down and reduced, the wall and other trees, as well as different ſorts of vegetable crops, may be put in. Some, however, put the fruit-trees in before this has been accompliſhed; but it is not a good practice, as they are liable to be injured by the digging which afterwards becomes neceſſary in preparing the ſoil in a proper manner.

In planting wall-trees they ſhould be ſet at different diſtances according to the kinds: thoſe of the peach, nectarine, apricot, plum, and cherry deſcriptions at fifteen, eighteen, or more feet, and for figs and pears twenty are ſeldom too much, ſuitable aſpects being choſen according to the kinds. Between their wall-fruit trees, ſome at firſt introduce half or full ſtandards, that the walls may at once be covered, removing them afterwards. But this is a method that ſhould never be attempted where it can be avoided, as being very diſadvantageous. Trees of the eſpalier kind are likewiſe frequently introduced in ranges round the main quarters at the diſtance of about ſix feet from the ſide of the walk, and from fifteen to twenty in the rows, according to the ſorts that are made uſe of. Within theſe ranges of eſpalier trees,

good

good ſtandards of tall growth are occaſionally introduced at the diſtance of thirty, forty, or more feet in each direction. Where there are orchards this ſhould, however, always be avoided as much as poſſible.

Fruit-trees of the ſmall ſhrubby kinds, ſuch as gooſeberries, currants, raſpberries, &c. where there are not outſlips, are frequently introduced on the ſides of the quarters, and as diviſions to them when large, at the diſtance of eight or nine feet from each other. When planted in this way, they ſhould be trained in the fan form. But it is better, where it can be done, to have them in ſeparate plantations, eſpecially the firſt ſort.

Cropping.—In reſpect to the diſtribution of the vegetable crops, it muſt be regulated by the nature of the ſituation, their particular kinds, as well as the taſte and experience of the gardener. On the narrow borders under the wall-trees various ſorts of ſmall crops may be grown, both of the early and late kinds, according to the difference of the aſpects; but all the deep rooting ſorts ſhould be avoided, ſuch as cabbages, cauliflowers, beans, peaſe, except thoſe of the frame kind, as being injurious to the trees by the ſhade which they cauſe, as well as by depriving them of due nouriſhment.

But the large parts of the borders next the walks are proper for raiſing all ſorts of the more early crops, ſuch as thoſe of the raddiſh, lettuce, ſpinach, carrots, French beans, ſallad herbs, and all the dwarf pea kinds that are cultivated in wide rows; thoſe which have a ſouthern aſpect for the earlieſt crops; and the eaſtern and weſtern ones for ſucceſſion crops of the ſeveral kinds; and the northern ones, as being more cool, for raiſing and pricking out many ſorts of ſmall plants, ſlips, and cuttings in the ſummer ſeaſon, when the other parts are apt to be too dry and too much expoſed to the heat of the ſun.

All ſuch borders as are next to the ranges of eſpalier trees are well ſuited to the different low growing crops, ſuch as lettuce, ſpinach, endive, ſtraw-berries, &c. and for pricking out upon, at different ſeaſons, many ſorts of plants to be afterwards tranſplanted into different ſituations, in order to complete their growth.

But the quarters or large diviſions ſhould always be deſtined for the reception of the large principal crops, ſuch as thoſe of the onion, leek, carrot, parſnip, turnip, beet, potatoe, cabbage, cauliflower, brocoli, colewort, kale, pea, bean, ſcarlet-bean, celery, artichoke, aſparagus, and other ſimilar kinds.

The preparation of the ground, the methods of manuring, and putting in the crops, with their modes of after-culture and management, are fully explained under their reſpective general heads.

In every department the greateſt attention ſhould be paid to the keeping of the different parts fully cropped, as well as to neatneſs and regular order; and as the crops are removed from the ground in the autumn, it is often of great advantage to have it ridged up for the winter in a regular manner.

Where the garden has been thus laid out, planted, and finiſhed, Mr. Forſyth has found much advantage from having a plan of it, with the names of the different trees introduced in their proper places. By this means the memory is greatly aſſiſted, eſpecially in extenſive grounds, and the various operations performed with more regularity and exactneſs.

Mr. London adviſes that in complete reſidences the kitchen garden ſhould be laid out at firſt, and directed afterwards ſolely in the view of cultivating and producing culinary fruits and vegetables. Little or nothing of the ornamental kind ſhould be introduced, but utility every where predominate. Even the edgings of the walks ſhould be planted in moſt caſes with uſeful plants, ſuch as ſtraw-berries, parſley, &c.

The flower garden, green-houſe, plant-ſtoves, &c. ſhould be entirely by themſelves, though they are often intermixed with the others in leſs complete reſidences.

The plans of gardens may be varied very conſiderably according to the nature, ſituations, and other circumſtances of the places where they are to be formed; but that which is repreſented in the correſponding plate, ſeems to poſſeſs moſt of the advantages that have been introduced by modern improvements in the art of gardening.

Robbing gardens and orchards of fruit growing in them, ſtealing underwoods and hedges, and ſtealing or deſtroying any turnips, potatoes, or the roots of madder, when growing, are puniſhable criminally, by whipping, ſmall fines, impriſonment, and ſatisfaction to the party wronged, according to the nature of the offence, by the ſtatutes 43 Eliz. cap. 7. 15 Car. II. cap. 2. 23 Geo. II. cap. 26. and 31 Geo. II. cap 35. And by ſtat. 6 Geo. III. cap 36. and cap. 48. and 13 Geo. III. cap. 33. the ſtealing by night of any trees, or of any roots, ſhrubs, or plants to the value of 5*s*. is made felony in the principals, aiders, and abettors; and in the purchaſers, knowing the ſame to be ſtolen; and the ſtealing of any timber trees, as oak, beech, cheſnut, wallnut, aſh, elm, cedar, fir, aſp, lime, ſycamore, and birch, and of any root, ſhrub, or plant, by day or night, is liable to pecuniary penalties, for the two firſt offences, and for the third is a felony, liable to tranſportation for ſeven years.

GARDEN *Engine*, a contrivance of the pump kind, deſigned for the purpoſe of watering different ſorts of wall and other trees, ſhrubs, &c. Engines have likewiſe been invented for ſteaming hot-houſes, melon-pits, &c. in order to obviate the effects of the red-ſpider, &c.

GARDEN, *Floating*, a ſort of garden employed by the Mexicans, according to the account given by the Abbè Clavigero, in the lake of that name, on their being brought under the dominion of the Colhuan and Zepanecan nations. Induced by neceſſity and the deſire of benefit, they had recourſe to the forming of a kind of moveable or floating gardens, by plaiting and twiſting the branches of willows, and other marſh or aquatic plants that are light, together. Upon this baſis they firſt place the light bruſhwood that floats on the lake to ſome thickneſs, then over the whole the earth, mud, and dirt that are got up from the bottom of the lake. The figure in which theſe gardens are made, is regularly quadrangular, but varying in the length and breadth, though commonly about eight poles long, with not more than three in breadth, having only about a foot above the ſurface of the water. Theſe were, it is ſaid, the firſt portions of ground that theſe people cultivated after the founding of the city of Mexico. In theſe they firſt raiſed the maize, great pepper, and other plants the moſt neceſſary to their ſupport. Gradually as they became more numerous, from the exertions of the labourers, odoriferous and other plants, deſtined to the uſes of ſuperſtition and luxury, were introduced into them; and they are at preſent appropriated to the culture of moſt ſorts of garden plants and flowers. The abundant produce of theſe prolific gardens are brought daily by the canal in numerous ſmall veſſels, at ſun-riſe, to the great market-place of the capital to be ſold. The plants thrive in theſe ſituations in an aſtoniſhing manner; the mud of the lake being extremely fertile and productive, without the aid of rain. A ſmall tree and hut commonly ſhelter the cultivators of the larger ſorts of theſe gardens from the effects of rain and heat. Whenever the owners of theſe gar-

dens are inclined to change their ſituations, they get into their little veſſels, and by their own ſtrength alone, or, where that is not ſufficient, by the aſſiſtance of others, they get them afloat, and tow them after them wherever they pleaſe. This floating garden ſcene is highly curious and intereſting, ſo as to form a place of great recreation and amuſement.

GARDEN-*Frame*, a kind of frame employed in gardens for forcing different ſorts of vegetables, &c. See FRAME, and FORCING-*Frame*.

GARDEN, *Hanging*, a ſort of ancient garden, which is ſaid to have been formed in a raiſed manner, on arches, by Nebuchadnezzar king of Babylon, with the view of gratifying his wife Amyctis, who was the daughter of Aſtyages, king of Media. Theſe gardens are ſuppoſed by Quintus Curtius to have been equal in height to the city, which is fifty feet. They contained on every ſide a ſquare of four hundred feet, and were carried up in ſeveral terraces, ſurmounting each other, to which there were aſcents by different flights of ſtairs or ſteps, that had ten feet in width. The arches that ſuſtained the whole of this pile were raiſed above each other, being ſtrengthened by a wall on every ſide of above ſeven yards in thickneſs. The floors of the ſeveral terraces were laid firſt with large flat ſtones of conſiderable lengths and breadths, over which was placed a ſtratum of reed mixed very fully with bitumen, then two rows of bricks cloſely cemented together with mortar, and the whole afterwards covered with thick ſheet lead, upon which the mould of the garden was depoſited, to ſuch a depth as to admit large trees to take root and eſtabliſh themſelves in it. Trees, plants, and flowers of various kinds were introduced into theſe gardens.

The upper terrace was likewiſe provided with an aqueduct or engine, by which the water was drawn up from the river, and diſperſed over the whole of the gardens when neceſſary.

Some have condemned theſe gardens as unnatural, while others have conſidered them as deſerving of a portion of praiſe; but whatever merit may have been allowed them, they could certainly never have any thing of the natural or rural character about them. See PENSILES *Horti*.

GARDEN-*Implements*, the different ſorts of tools that are employed in performing the work of gardening. Theſe are of ſeveral kinds, as ſpades, hoes, rakes, ſhears, knives, ſaws, rollers, &c. as may be ſeen in the annexed plate.

GARDEN-*Roller*, ſuch as is made uſe of in gardening. They are of two kinds, as wood and iron; the former is the moſt uſeful upon graſs, but the latter where gravel is to be rolled down. See ROLLER.

GARDEN *Sheds*, ſuch as are neceſſary in gardens for containing tools, flower-pots, hot-bed frames, glaſs-ſaſhes, and for working in during rain or bad weather. They are beſt placed on the back ſide of the hot-houſe, by which means they may be made to hold the furnaces, fuel, and many other articles.

GARDEN *Traps*, a ſort of ſtrong iron traps of conſiderable ſize, conſtructed for the purpoſe of being placed in ſuch garden grounds as are much expoſed to the nocturnal depredations of robbers. They are capable of ſecuring a ſtrong man, as they act with prodigious power. They are uſually placed ſo as to be quite concealed. The form in which they are made is, in general, ſomewhat that of the common rat-trap. Wherever traps of this kind are ſet, it is neceſſary to have a notice fixed up.

There are ſeveral other ſorts of traps employed in gardens for taking mice and other kinds of vermin, &c. See VERMIN.

GARDEN *Bay*, in *Geography*, a bay on the eaſt coaſt of Newfoundland. N. lat. 49° 42′. W. long. 54° 50′.

GARDEN *Iſlands*, a cluſter of ſmall iſlands in the Pacific ocean. N. lat. 21° 45′. W. long. 146° 20′.

GARDEN-*ſnail*, in *Conchology*. See HELIX *hortenſis*.

GARDENER, a perſon who has the care and management of a garden. A complete gardener ſhould, beſides the cultivation of all ſorts of culinary vegetables, be perfectly acquainted with the different operations of pruning, training, budding, grafting, and layering, as well as thoſe of raiſing and forcing all ſorts of plants, fruits, roots, &c. It is only in this way that he can be fully qualified for his employment. It is very ſeldom, however, that the common gardener is much informed in reſpect to the higher branches of the art. The buſineſs of the gardener requires a continual care and attention to the different objects, and of courſe much ſteadineſs in the perſon who has the direction of it.

GARDENIA, in *Botany*, ſo named by Ellis in honour of his able friend and correſpondent Dr. Alexander Garden, F.R.S.: ſee that article.—Linn. Gen. 116. Schreb. 162. Willd. Sp. Pl. v. 1. 1225. Thunb. Diſſ. Bot. 1. Ait. Hort. Kew. v. 1. 293. Mart. Mill. Dict. v. 2. Juſſ. 201. Lamarck Illuſtr. t. 158. Gærtn. v. 1. 140. t. 28. f. 4, *Ceriſcus*. (Genipa; Plum. Ic. t. 136. Linn. Gen. 96. Schreb. 136. Juſſ. 201. Tourn. t. 436, 437. Randia; Linn. Gen. 85. Schreb. 111. Juſſ. 199. Gærtn. t. 26. Browne Jam. 143. t. 8. f. 1. Lamarck Illuſtr. t. 156. Muſſænda; Jacq. Amer. 69. t. 48, 49.)—Claſs and order, *Pentandria Monogynia*. Nat. Ord. *Contortæ*, Linn. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, in about five, more or leſs deep, upright, vertical, permanent ſegments. *Cor.* of one petal, funnel-ſhaped; tube cylindrical, longer than the calyx; limb ſpreading, in five, rarely more, deep, oblique or contorted ſegments. *Stam.* Filaments none; anthers five, linear, ſtriated, ſeſſile in the mouth of the tube, and half as long as the limb. *Piſt.* Germen inferior; ſtyle ſlightly club-ſhaped, as long as the tube; ſtigma prominent, obovate, obtuſe, lobed or furrowed. *Peric.* Berry coated, of from one to four cells. *Seeds* imbedded in pulp, numerous, depreſſed, imbricated.

Eſſ. Ch. Corolla of one petal, contorted. Berry coated, inferior, with many ſeeds. Stigma lobed. Anthers ſeſſile in the mouth of the tube. Segments of the calyx vertical.

Obſ. The moſt natural number in the parts of the flower is five; but in ſome ſpecies it varies, as Thunberg remarks, as far as nine in the anthers, as likewiſe in the diviſions of the corolla and calyx. The ſeſſile anthers, and the twiſted or vertical ſegments of the calyx, form the moſt important characters, eſpecially the firſt. Linnæus, from the ſhape and direction of the ſegments of the corolla, particularly in his original ſpecies, referred this genus to the natural order of *Contortæ*, but Juſſieu more properly reduces it to his own *Rubiaceæ*, an order whoſe limits and characters were not fully known to Linnæus, and which perhaps requires ſubdiviſion. *Genipa*, adopted by Linnæus from Plumier and Tournefort, is generally agreed to be a real *Gardenia*, notwithſtanding the very ſlight ſegments or teeth of its calyx; but that name, though of prior origin, is of barbarous derivation, and even Lamarck has agreed to ſink it in the well-merited *Gardenia*. The ſtamens of *Genipa* in Plumier's figure, copied by Tournefort and Lamarck, are erroneouſly repreſented. *Randia* is alſo a prior name to *Gardenia*, but we are by no means inclined to prefer it, independently of the great inconvenience of ſuch a change; nor are we ſure that *Randia* ought not to remain by itſelf, on account of the ſeemingly horizontal calyx-teeth.

The original idea and characters of this genus, are taken from

from G. *florida*, Linn. Sp. Pl. 305, commonly called the Cape Jaſmine. This was firſt brought to England by a Captain Hutchinſon, who, about the middle of the laſt century, met with a buſh of it in full flower, ſomewhere near the Cape of Good Hope, probably in a cultivated ſtate. He brought the whole plant in a pot to England, and it was preſerved in the collection of Mr. Warner, a great cultivator of exotics. Mr. Gordon the nurſeryman having obtained layers from this tree, propagated it ſo ſucceſsfully that he is ſaid to have gained more than 500*l.* by the produce. It is now frequent in gardens, treated as a ſtove plant, though it chiefly requires great heat in the early ſpring, to make it bloom, being at other times a hardy greenhouſe plant. The flowers with us are always double, like thoſe of the original ſhrub brought by Captain Hutchinſon, with only imperfect traces of anthers; but many ſpecimens with ſingle flowers have been brought from the Eaſt Indies, in ſeveral parts of which it grows wild, as well as in China and Japan. Miller and Ehret publiſhed figures of this beautiful ſhrub as a Jaſmine; but the more intelligent Ellis determined it to be a new genus, and publiſhed its characters with a plate in the Philoſophical Tranſactions, v. 51. The *ſtem* is ſhrubby, three or four feet high, much branched, ſpreading. *Leaves* oppoſite, on ſhort ſtalks, elliptical, various in breadth, bluntly pointed, entire, ſmooth, veiny, evergreen. *Stipulas* ſheathing, intrafoliaceous, obtuſe. *Flowers* ſolitary, terminal, ſtalked, of the ſize and aſpect of a double *Narciſſus poeticus*, with a ſweet and very powerful ſcent, reſembling the flavour of ginger. They turn buff as they fade.

The South-ſea plant, uſed by the inhabitants of thoſe iſlands to adorn their hair, appears to be a diſtinct ſpecies, as far as we can judge from an unpubliſhed plate communicated by ſir Joſeph Banks to ſeveral of his friends. The ſegments of its corolla are much narrower, the tube longer, and the leaves more obovate. Yet this plate is announced by Thunberg, in the 18th page of his diſſertation, as G. *florida*.

G. *radicans*, Thunb. Diſſ. t. 1. f. 1, a native of Japan, where it was firſt obſerved by Kœmpfer, is another genuine *Gardenia*. It is of more humble, decumbent or creeping growth, and ſmaller in every part, but otherwiſe much like the *florida*. We have ſeen it alive at Meſſrs. Lee and Kennedy's, Hammerſmith.

G. *Thunbergia*, Linn. Suppl. 162, (*Thunbergia capenſis* of Montin in the Stockholm Tranſ. for 1773,) is one of the fineſt and moſt indubitable ſpecies, a native of the Cape of Good Hope. Though frequent in our ſtoves it rarely bloſſoms. See Curt. Mag. t. 1004. The calyx in this burſts obliquely. The ſegments of the corolla are uſually eight or nine, with as many anthers.

The *Muſſænda formoſa*, and *M. ſpinoſa* of Jacquin above cited, very different in genus from the original *Muſſænda* of Hermann, Linnæus, and others, are very juſtly reduced to *Gardenia*.

We have ſeveral certain ſpecies beſides from the Eaſt Indies, with more that are doubtful. *Rothmannia* probably ought to be kept diſtinct, as Mr. Saliſbury has judged. See Parad. Lond. t. 65; and Curt. Mag. t. 690.

GARDENIA, in *Gardening*, contains plants of the flowering ſhrubby kind for the ſtove; of which the ſpecies cultivated are the fragrant Gardenia or Cape jaſmine (G. florida); and the round-leaved Gardenia (G. aculeata); of which the firſt ſort varies with ſingle and double flowers.

Method of Culture.—In the firſt ſort it may be effected by planting cuttings of the young ſhoots in pots of light rich mould in the ſummer ſeaſon, plunging them in a moderate tan hot-bed, and covering them cloſe with bell-glaſſes, giving due ſhade till they have ſtricken root. When this has been fully effected, they ſhould be carefully removed into ſeparate ſmall pots, and replunged in the hot-bed. When they are become well eſtabliſhed, they ſhould be gradually inured to the influence of the air. And the ſecond ſort may be raiſed by ſowing the ſeeds in pots filled with light freſh earth in the early ſpring months, plunging them in a bark hot-bed, frequent ſlight waterings being given. After the plants come up, they ſhould have free air in fine weather, and be often watered. When of ſome growth they ſhould be carefully removed into ſeparate pots, and be placed in the hot-bed, due ſhade being given till they are rooted, when they muſt have air and water in proportion to the warmth of the ſeaſon. As the autumn approaches they ſhould be removed into the bark-bed of the ſtove, where they are beſt kept the two firſt ſeaſons; but they may afterwards be expoſed in the open air in the hot ſummer months.

All theſe plants are uſeful for the variety which they afford in collections of ſtove plants, and have a fine effect amongſt them.

GARDENING, the art of forming, planting, cultivating, and managing garden grounds, whether of the ornamental or culinary kinds. In a more enlarged ſenſe, it is the buſineſs of rendering the rural objects of nature more agreeable, intereſting, and uſeful to mankind; in the execution of which the operator has the whole range of country ſcenery at his command, in order to ſelect with taſte ſuch parts as are the moſt appropriate and ſuitable to his particular views and purpoſes.

Gardening is one of thoſe arts that muſt obviouſly, from the neceſſities of mankind, have been practiſed at a very early period, ſo far at leaſt as herbs and fruits are concerned. It ſeems not improbable but that it almoſt immediately ſucceeded the forming of diſtinct habitations, and the poſſeſſion of individual property. It muſt, however, have remained long after its introduction in a very rude and imperfect ſtate, as, notwithſtanding the accounts that have been given of the magnificent gardens of early times, the Greeks and Romans ſeem to have been but little acquainted with them; for the garden of Alcinous, when diveſted of the beautiful language of the poet, appears to have been nothing but a ſort of orchard and vineyard ſomewhat adorned with the prevailing works of art; or thoſe of Lucullus, Cicero, and Pliny, among the Romans, any thing more than mere places of retreat, planted with various odoriferous flowers and ſhrubs, and embelliſhed with a variety of heavy unnatural works of ornament. This taſte in gardening would ſeem to have continued until the introduction of the Dutch ſyſtem by London and Wiſe, and the eſtabliſhment of that of the cutting, clipping, and ſhearing plan by Brown, and indeed to have been partially combined with theſe for ſome time afterwards by Repton and others of the ſame ſchool; though the genius of Milton had long before foreſeen and ſuggeſted the impropriety of employing ſuch abſurd and fantaſtic ornaments. The ſhearing of yew, box, and holly into figures of various kinds, and the ſhaving of river-banks, lawns, &c. however, went on until their abſurdity rendered them perfectly contemptible, and cauſed a better and more natural taſte. The keen and ſpirited ſtrictures of Mr. Knight on the folly of this practice are too juſt and intereſting to be omitted:

> "Shaved to the brink, our brooks are taught to flow
> Where no obtruding leaves or branches grow;
> While clumps of ſhrubs beſpot each winding vale,
> Open alike to every gleam and gale;

Each ſecret haunt, and deep receſs diſplay'd,
And intricacy baniſh'd with its ſhade.
" Hence, hence! thou haggard fiend, however call'd,
Thin meagre genius of the bare and bald;
Thy ſpade and mattock here at length lay down,
And follow to the tomb thy favourite Brown:
Thy favourite Brown, whoſe innovating hand
Firſt dealt thy curſes o'er this fertile land;
Firſt taught the walk in ſpiral forms to move,
And from their haunts the ſecret Dryads drove;
With clumps beſpotted o'er the mountain ſide,
And bade the ſtream 'twixt banks cloſe ſhaven glide;
Baniſh'd the thickets of high tow'ring wood
Which hung, reflected, o'er the glaſſy flood."
Landſcape, p. 25. ed. 2.

Verdant ſculpture, and that regular preciſion that marked the views of the preceding period, were now, however, wholly laid aſide, and more chaſte deſigns ſubſtituted in their places. Bridgman became at this time a leading deſigner, who, diſdaining the trammels of his predeceſſors, extended the plans, and rejected the notions of forming the different diviſions of the garden ſo as to tally with their oppoſites, which were common before. And though it muſt be confeſſed that he retained an attachment to ſtraight walks and high clipped hedges, it was only as a ſort of great outline, the reſt being diverſified by trees variouſly diſpoſed, ſo as to produce the moſt natural effects. Other uſeful improvements were alſo gradually introduced as he became more freed from the fetters of the age that had preceded him. But the circumſtance that led to the principal improvements that immediately ſucceeded, was the diſcovery of the means of avoiding the neceſſity of walls as boundaries, in the forming of ſunk-fences, called *ha ha's* by the common people, as expreſſive of ſurprize at being imperceptibly ſtopped in their progreſs. This mode of fencing had ſcarcely been introduced before the practices of levelling, rolling, mowing, &c. ſucceeded it. According to ſir William Temple, the adjoining ground of the park on the outſide of the ſunk-fence was to be in ſome meaſure made to harmonize with the ſhort graſſed lawn on the inſide; and the garden, in its turn, to be ſet free from its prim regularity, in order to aſſort with the more wild country without. "The ſunk-fence aſcertained the ſpecific garden; but that it might not draw too obvious a line of diſtinction between the neat and the rude, the contiguous out-lying parts came to be included in a kind of general deſign; and when nature was taken into the plan, under improvements, every ſtep that was made, he conceives, pointed out new beauties, and inſpired new ideas."

Things were in this ſtate when Kent appeared, who, Mr. Walpole, in his hiſtory of gardening, ſubjoined to the "Anecdotes of Painting," ſays, was "painter enough to taſte the charms of landſcape, bold and opinionative enough to dare and to dictate, and born with a genius to ſtrike out a great ſyſtem from the twilight of imperfect eſſays. He leaped the fence, and ſaw that all nature was a garden. He felt the delicious contraſt of hill and valley changing imperceptibly into each other, taſted the beauty of the gentle ſwell or concave ſcoop, and remarked how looſe groves crowned an eaſy eminence with happy ornament; and, while they called in the diſtant view between their graceful ſtems, removed and extended the perſpective by deluſive compariſon. Thus," continues he, "the pencil of his imagination beſtowed all the arts of landſcape on the ſcenes he handled. The great principles on which he worked were perſpective, and light and ſhade. Groups of trees broke too uniform or too extenſive a lawn; evergreens and woods were oppoſed to the glare of the champaign; and, where the view was leſs fortunate, or ſo much expoſed as to be beheld at once, he blotted out ſome parts by thick ſhades, to divide into variety, or to make the richeſt ſcene more enchanting, by reſerving it to a further advance of the ſpectator's ſtep. Thus, ſelecting favourite objects, and veiling deformities by ſcreens of plantation, ſometimes allowing the rudeſt waſte to add its ſoil to the richeſt theatre, he realized the compoſitions of the greateſt maſters in painting. Where objects were wanting to animate his horizon, his taſte as an architect could beſtow immediate termination. His buildings, his ſeats, his temples, were more the works of his pencil than his compaſſes. We owe," Mr. Walpole conceives, "the reſtoration of Greece and the diffuſion of architecture to his ſkill in landſcape."

His management of water was admirable, and calculated to introduce innumerable beauties on the face of nature. He bade adieu to all the ſtiff formal modes of canals, circular baſins, and caſcades tumbling down marble ſteps, "that laſt abſurd magnificence of Italian and French villas;" nor was the forced elevation of cataracts any more viſible. The placid ſtream was now directed to move in a ſerpentine courſe, apparently, in a natural manner, being concealed by properly interſperſed thickets, where interrupted by the difference of levels, ſo as to ſhew itſelf again in its gliſtening progreſs at ſome naturally expected diſtance. The borders were indeed ſmoothed, but all their features of waving irregularity effectually preſerved. The edges of the banks were occaſionally ſtudded with trees, to remove their ſameneſs; and, where its meandering courſe diſappeared among hills, ſhades deſcending from the heights inclined towards its progreſs, and framed the diſtant point of light under which it was loſt in turning in either direction.

Dealing, in this way, in none but the true colours of nature, and ſeizing upon its moſt intereſting features, a new creation was gradually preſented to the man of taſte. "The living landſcape," ſays Mr. Walpole, "was chaſtened or poliſhed, not transformed. Freedom was given to the forms of trees; they extended their branches unreſtricted; and where any eminent oak, or maſter beech, had eſcaped maiming, and ſurvived the foreſt, the buſh and bramble were removed, and all its honours were reſtored to diſtinguiſh and ſhade the plain. Where the united plumage of an ancient wood extended wide its undulating canopy, and ſtood venerable in darkneſs, Kent thinned the foremoſt ranks, and left but ſo many detached and ſcattered trees as ſoftened the approach of gloom, and blended a chequered light with the thus lengthened ſhadows of the remaining columns." But, with all his merit, Kent had many faults and imperfections; he frequently left the houſes too naked and expoſed; having followed and imitated nature with ſo much happineſs and ſucceſs, he knew not where to ſtop, but often puſhed his reformations much further than was juſtified by correct principles and true taſte.

Theſe defects have not only been corrected and improved, but a new and maſterly finiſhing applied by the taſte and genius of ſubſequent profeſſors, among whom may be ranked the names of Price, Knight, London, &c. The ſtrenuous and ſucceſsful attempts of ſome of the earlier deſigners, with thoſe of more modern times, have indeed not merely given a ſort of currency to a variety of improvements in the art of ornamental gardening, but introduced a much more natural and picturesque ſyſtem, and greatly contributed to the expulſion of the ſtiff formal practice of the Dutch ſchool, as well as that of Brown and his followers of more recent periods, the abettors of what they term "landſcape gardening." This is beautifully ſhewn in the lines below, which were left written on a

ſeat

ſeat at Havod, the elegant reſidence of Thomas Johnes, eſq. Cardiganſhire.

"Far hence! let Repton, Brown, and Eames
Zig-zag their walks, and torture ſtreams;
But let them not my dells profane,
Or violate my Naïad train;
Nor let their arrogance invade
My meaneſt Dryad's ſecret ſhade,
And with fantaſtic knots diſgrace
The native honours of the place;
Making the vet'ran oak give way,
Some ſpruce exotic to diſplay.
Their petty labours be defy'd
Who *taſte* and *nature* would divide."

Much effect has been produced in the richneſs and variety of our rural ſcenery by the gradual introduction of foreign trees, ſhrubs, and plants by different individuals, within the laſt half century, ſuch as thoſe of the fir, pine, larch, and others of ſimilar growth, and likewiſe the great number of tall, hardy, bold, and varied-leaved vegetables, natives of different countries and climates. The beauty and diverſity of colouring afforded in this way, in ſome inſtances, are highly curious and intereſting, but conſiderable taſte and attention are requiſite to introduce them with propriety, and ſo as to produce the beſt and moſt ſtriking appearances.

The improvers of culinary gardening have not been fewer in number, or leſs diſtinguiſhed by the utility and importance of their diſcoveries and improvements, than thoſe of the ornamental claſs. The more early gardeners of this kind ſeem, however, to have been much confined by the rules and abſurd reſtrictions of the art, and to have moved in but a very narrow ſpace. They only knew the proper methods of raiſing and cultivating a very limited number of herbs, roots, and plants, and theſe often in very imperfect ſtates. In this country the Dutch practice continued to remain for a great length of time, probably nearly to the period at which gardening became reduced into a much more regular order by the exertions of Miller and thoſe who immediately ſucceeded him; ſince which time it has continued to advance with more accelerated progreſs, and received the aid of much ſcientific improvement. The number of plants, herbs, roots, and fruits, cultivated here, have been greatly increaſed, and better methods of managing them introduced. The machinery of the art has been formed on more juſt and convenient principles, and the neceſſary buildings erected with more ſcientific views. In theſe intentions the writings of Speechly, Nicol, Anderſon, Forſyth, Knight, London, &c. as well as the publications of the writers of calendars, have been of conſiderable utility. It has, however, been lately aſſerted by an able writer, "that there ſcarce exiſts a ſingle ſpecies of eſculent plant or fruit, which (relative to the uſe of man) has yet attained its utmoſt ſtate of perfection: nor any branch of practical horticulture which is not ſtill ſuſceptible of eſſential improvement."

The late eſtabliſhment of a Horticultural Society in London is a circumſtance that promiſes much advantage to the art, and neceſſarily holds out more extenſive and beneficial improvements in its different departments.

This may be more confidently looked for, ſince the efforts of ſmall provincial aſſociations have been ſo particularly ſucceſsful in this way. In Lancaſhire the culture of the gooſeberry and onion have been thus carried to ſtates of perfection that are wholly unknown to the more ſouthern diſtricts of the kingdom. And it is not improbable but that the ſame thing may have happened in other ſituations from ſimilar cauſes.

Ornamental and *Culinary Gardening* have now indeed been brought to a ſtate of improvement in this kingdom that certainly render them deſerving of no mean rank among the liberal arts, though the former takes in a much wider range, and embraces a much greater number of objects than the latter.

Principles and Materials of Ornamental Gardening.—The principles and objects of *ornamental gardening* are principally thoſe of improving and rendering the ſcenes of nature more amuſing and agreeable by the application of correct taſte, and the judicious management of the different materials that are employed, which is effected by ſelecting, arranging, combining, diſpoſing, and exhibiting them in different ways, according to the nature of the places and other circumſtances. It may, in ſome meaſure, be diſtinguiſhed into pleaſure or flower gardening, the culture of wild plants and flowers, and the management of flowering plants of the ſhrub kind.

The materials of the art may be chiefly conſidered to be thoſe of lawn, ſand, gravel, ſoil, water, ſtones, rocks, woods, trees, ſhrubs, and flowers. There are a few others alſo that may be occaſionally made uſe of in this ſort of gardening, but they require much caution in their introduction. Theſe are moſtly of the ſtatue, inſcription, and other ſimilar kinds; buildings, ſeats, archways, &c.

Where ſingle objects are diſplayed, they are generally intended to ſhow ſome of the minor beauties, ſuch as thoſe of the flower or fruit kinds, and are, conſequently, placed in the moſt conſpicuous parts, and in ſuch modes as muſt neceſſarily excite attention in thoſe who may paſs. This is, perhaps, the loweſt branch of this department of gardening, and may have a reference to the nature, mode of growth, and form of the plants, as well as to the fruits and the ſhades of the foliage: ſometimes alſo to the whole in combination.

Another principle of this ſpecies of gardening is that of exhibiting beauties in a congregated, or collective manner, which is accompliſhed either by means of *arrangement*, or what is termed *grouping*.

Mr. London, in his uſeful treatiſe on "Country Reſidences," offers numerous juſt and intereſting remarks upon theſe different methods. Arrangement, he conceives, capable of being effected either "upon the principles of botany, of culture, of general nature, or artificial borderings." The firſt of which may be as various as the different ſyſtems which have been invented by botaniſts, whether natural or artificial, and "is employed in botanic gardens, or collections either of trees or plants." The ſecond mode "refers chiefly to ſuch plants or trees as require a particular attention with regard to ſoil, climate, &c." It includes "all the bulbous-rooted flowers, tender herbaceous plants, American plants and trees, and, in ſome inſtances, exotics," eſpecially "the firſt claſs, which are always, when in a cultivated ſtate, guided by it, as in Dutch parterres, &c." But he thinks "the arrangement univerſal in nature, is what will be moſt pleaſing to general admirers." Its principles are perfectly ſimple; being nothing more than this, "that one kind of objects, beauties, or characters, always prevails in one place: and that when another ſucceeds, it is generally done in a gradual manner, the interval between them being compoſed of characters, or beauties, irregularly blended together; which is beautifully illuſtrated throughout all nature, whether animal, vegetable, or mineral." It is, however, aſſerted to be a method that "has hitherto been totally neglected, as moſt of nature's laws have been in this branch of ſcience; while in its place is ſubſtituted, by cuſtom and ignorance, a mode of arrangement totally inconſiſtent with nature or good taſte," that of "the vulgar mode of mixing

different

different ſpecies together indiſcriminately; not only without the ſmalleſt regard to connection or difference of character, but in ſtudied oppoſition to it," as is ſeen in numerous inſtances of green-houſes, flower-gardens, ſhrubberies, and general planting. This is a principle the moſt generally applicable in this ſort of gardening, Mr. London thinks, "whether we regard their general diſtribution into lawn, flowers, and ſhrubs; or the ſmaller parts, compoſed of flowers, or ſhrubs only." And it is maintained that, "even a collection of beauties, exhibited ſingly, may ſtill be contrived agreeable to this principle. Thus, in a plot of finely varied auriculas, each minute variety may be kept by itſelf, and the ſame often (though not always) in beds of tulips, hyacinths, and ranunculuſes."

Grouping, it is obſerved, is the means by which "variety, intricacy, and harmony" are effected, and is capable of being "applied either to objects of the ſame kind, in which the chief principle is contraſt of the parts, or to objects of different kinds, in which the chief principle is diſpoſition or contraſt of different objects." This mode "is applicable to all the larger ſcenes" of this ſort of gardening, "in connection with all the natural principles of arrangement, except *culture* and *bordering*, where it would cauſe much inconvenience in pulverizing the ground." And "even there it may frequently be introduced with advantage and effect; but conſiderable judgment is requiſite to decide when ornamental effect ſhould give way to convenient culture. In ſhrubberies, and ſcattered trees or ſhrubs, either alone, or ſeen in *connection* with any other of the materials" of this deſcription of gardening, it "is an indiſpenſable requiſite, and can never be omitted, without foregoing one of the greateſt beauties of nature; one that is univerſally prevalent in every variety of natural ſcenery, which is inſtantly perceived, and ſo highly faſcinating to the man of taſte, that no other beauty can compenſate for its abſence." The beauty here meant is connection, "which, according to the objects connected, may either produce order, variety, intricacy, or harmony." This beauty is, however, ſuppoſed to be little felt by gardeners from ſeveral cauſes. Yet "the principles of natural effects are univerſal in their application, even with regard to utility. Theſe principles, and alſo the imitation of the effects produced by the extremes of their operation, will ever be the true criterion of beauty in the arts of taſte, or in ornamental productions."

The principal ſubjects of this ſpecies of gardening are thoſe of parterres, which are of ſeveral different kinds; hot-houſes, or ſtoves of different ſorts, conſervatories, green-houſes, &c. See theſe ſeveral heads.

There are alſo ſome others, ſuch as "ſmall groups of ſhrubs and flowers placed upon lawns, ſhrubberies, and pleaſure-grounds." The firſt, it is remarked by the author of the treatiſe on "Country Reſidences," when made uſe of in ſuch ſituations, "ſhould always be of very irregular ſhape;" but, "when upon gravel, this muſt depend upon circumſtances. If, in a part where art is avowed and ought to prevail, then the more artificial the form ſo much the better; but if merely a group for dividing or varying a road, walk, or natural path, at a diſtance from artificial ſcenes, then it ſhould be as irregular as thoſe upon a lawn." In general, "whether theſe groups are made regular or irregular, they require to be cultivated for ſome years afterwards;" which, "according to the preſent mode of digging them, produces a harſh and diſagreeable boundary line;" which, it is ſuppoſed, ſhould be deſtroyed as much as poſſible. This is ſaid to be eaſily effected by keeping "the earth on the margin of the group of the ſame level as the lawn or paſture, and to let both blend harmoniouſly together." Groups of this nature being only dug till the growth of the ſhrubs render it unneceſſary; it is ſuggeſted, that "the paſture ſhould be allowed gradually to encroach among the ſhrubs and flowers, until at laſt it wholly covers the ſurface." After this, the group becomes rough and pictureſque; the flowers, ſtill continuing to grow among the ſhrubs, will produce exactly what we ſee in natural groups, with only the "elegant difference" of having fine ſuitable plants inſtead of coarſe weeds.

Where ſhrubs are employed in this grouping way, it is obſerved, that "the great art is to put them in irregularly; for though the outline of the ground to be cultivated muſt, even under the beſt taſte, be ſomewhat formal, yet the ſhrubs can always be planted as irregularly as if no outline or form of group exiſted. This, however, is a thing never done; for whatever be the form of the ground which is to be dug, the ſhrubs are regularly diſtributed over every part of it: even when digging is no longer attended to, ſtill none of the ſhrubs are thinned out, but the whole left a formal, unconnected clump of vegetation; an appearance, it is remarked, as different from the irregular group-thickets of nature, as a green hillock is from a rocky precipice." It is admitted that "groups, or rather maſſes of formal ſhapes, ſuch as ovals in front of ſmall villas, or baſket-work patches upon a lawn in the front of a manſion, muſt always have determinate outlines, as being devoted chiefly to tender flowers and flowering ſhrubs, they will always require to be cultivated. Their outlines may either be formed of elegant maſonry, wood, baſket-work; or flowers, as thrift, daiſy, &c., or often a broad margin of turf, when ſurrounded by gravel." And it is ſuggeſted that "the general form of theſe maſſes may be oval, circular, pentagonal, or fanciful, according to pleaſure; and their ſurface may either be kept level with the lawn, or gradually raiſed from the margin to the centre. But when raiſed in this way, it is ſuggeſted, that the ſides ought always to preſent a concave ſlope, and not a convex one, as they commonly do, and which has a very bad effect." It is concluded, however, in reſpect to groups, "that neither thoſe of irregular, or of regular ſhapes, ought ever to be placed but where they have a proper relation and union with what ſurrounds them."

In regard to ſhrubberies, or the narrow belts or ſtrips of ſhrubs and flowers which occaſionally form the main ornament of ſmall reſidences, they are ſuppoſed uſeful in their effect, when executed according to the principles of nature and good taſte, though their "tawdry inſipidity" has been reprobated by Mr. Knight. They are commonly formed for the purpoſe of getting a walk to ſome particular ſituation or place, as the kitchen-garden, farm, wood, &c. or merely through the ſhrubbery for its own ſake, and ſuch views as it may afford. On this principle three things are conſidered neceſſary in forming them; the firſt of which is, that of "the arrangement and grouping of the trees, which ought to be that of general nature." The ſecond is that of "the intermixture of glades and paſture, which in moſt caſes is an eſſential requiſite." And the third, that of "the judicious introduction of views of more diſtant ſcenery;" which is moſt frequently deſirable, unleſs in ſuch parts as, by way of contraſt, are preſerved in umbroſity. This is "naturally connected with pictureſque improvements," and depends upon the general principles of this ſort of gardening. See SHRUBBERY.

Pleaſure-grounds are deſtined to comprehend a great variety of intereſting ſcenery of different kinds, introduced for the purpoſes of ornament, convenience, and utility; which are ſuggeſted as admitting of being arranged on the general principles of convenience, connection, particular

lar expreſſion, and pictureſque effect. See PLEASURE-*Ground.*

Culinary gardening is that branch of the art which comprehends the various methods of producing all ſorts of fruits, as well as uſeful vegetables, roots, herbs and plants for the ſupport and luxury of mankind. It is a ſort of cultivation moſtly confined within rather narrow limits, and which is performed in a great meaſure by human labour.

Principles of Culinary Gardening.—Its principles chiefly depend upon a correct knowledge of the nature, general economy, habits and modes of fructification of plants, trees, &c. in combination with thoſe of the proper preparation of the ſoil, the methods of cropping, and the management which is neceſſary afterwards. It is likewiſe capable of deriving great aſſiſtance from the application of different arts and ſciences.

Preparation of the Soil.—The proper performance of this depends upon a variety of circumſtances, ſuch as the nature of the land, the kind of crop that is to be cultivated, and the ſeaſon at which it is put in. After the primary operations of clearing and draining have been executed, it is generally neceſſary to break down and reduce the earth into a fine ſtate of mould by common or trench-digging; and the expoſure of a large ſurface to the action and influence of froſt, or the effects of heat and moiſture in alternation, as in ridging and ſummer-trenching. See RIDGING and TRENCHING.

There are other modes that contribute to the production of the ſame effect, ſuch as the growth of particular ſorts of crops, as celery, and thoſe of the carrot, parſnip, beet, and others of the tap-rooted kind: and the application of ſtrong hand-hoes to the ſuperficial parts at proper periods, as when the ſoil has a diſpoſition to fall down in a powdery condition. This laſt method will likewiſe at the ſame time extirpate and deſtroy a number of weeds, but the neceſſity of this ſhould be conſtantly well guarded againſt, by ſuffering none to run to ſeed in the garden.

Conſiderable advantage may alſo be gained in the view of rendering garden ground mellow, by the proper application of ſuitable manure. In this view the manure ſhould not have advanced too far in the ſtate of decompoſition. Compoſts and very rotten manures produce but a trifling effect in this way, though highly beneficial in various other reſpects. It ſeems not improbable but that, in hot ſeaſons, where the ſoil is inclined to be heavy and of courſe lumpy, benefit might be derived from the uſe of a ſmall roller upon the ſurface.

How far advantage is capable of being derived from the *reſting* of the ſoil in this ſort of culture, is perhaps not yet fully aſcertained; but certain kinds of garden crops are commonly ſuppoſed to grow better on new land than ſuch as have been long under cultivation, as thoſe of the onion, the carrot, the turnip, and the potatoe kinds. Therefore different methods of effecting this purpoſe have been propoſed, ſuch as laying down portions of garden-ground annually with grain and graſs ſeeds, and breaking others up. This can, however, be only practiſed in large gardens, either with convenience or the proſpect of ſucceſs; and in all caſes muſt be employed with much caution.

Another mode is by trenching to different depths alternately, as three and two ſpits, ſo as to have new or freſh ſurfaces from the top, middle, and bottom, cropping each three years, and letting the future ſurfaces reſt ſix. This practice has been recommended by Mr. Walter Nicol. But it can only be had recourſe to in particular inſtances, as few gardens admit of three ſpits' depth of good ſoil. Beſides, the expence of performing it affords a conſiderable objection.

Succeſſion of Crops.—This is a matter of conſiderable importance in culinary gardening, as the growth of good and healthy vegetables, and the keeping of the ſoil in a proper ſtate of heart, in a great meaſure, depends upon it. The main principle on which it proceeds is that of never growing what are termed exhauſting crops in ſucceſſion; or letting two or three of the ſame nature or ſort follow each other. It is well known to horticulturiſts, that under ſuch circumſtances they conſtantly become deteriorated in quality, and greatly leſſened in the quantity of produce. The cloſeneſs of ſhade afforded by the plants is alſo another principle that ſhould be carefully attended to in managing this buſineſs. In this practice it has been ſuggeſted by Mr. London that "the vegetables cultivated ſhould be divided into claſſes according to their reſpective *natures*, *modes of culture*, and *duration*." It is conceived that in reſpect to *natures*, they may be divided into, 1ſt. Such as have ramoſe roots, as the cabbage, cauliflower, brocoli, &c. 2d. Such as have fuſiform roots, as the carrot, beet, parſnip, &c. 3d. Such as are ſquamoſe, as the onion, leek, eſchalot, &c. 4th. Such as are fibrous, as the lettuce, endive, &c. 5th. Such as are tuberoſe, as the potatoe, Jeruſalem artichoke, &c. They are ſuppoſed capable of further diviſion, "into ſuch as partake of two of theſe diviſions, as the fuſiform and fibrous, exemplified in the bean, pea, kidney-bean, ſpinach, &c. &c."

The writer adds that "ſome crops require to be cultivated in large quantities, as peaſe, turnips, onions; others in ſmall portions, as moſt ſallad and pot-herbs. Some require very rich ſoil, and generally manure previouſly to planting or ſowing, as celery, cauliflower, and leeks; others require a tolerably rich ſoil, but are much injured by manure immediately previous to their inſertion, as carrot, beet, and moſt eſculent roots of fuſiform ſhapes."

In regard to *modes of culture*, it is ſuggeſted that culinary vegetables may be diſtinguiſhed "into, 1ſt, ſuch as are ſown upon the ſurface broadcaſt, as onions, turnips, ſpinach, &c. 2d. Such as are ſown or planted on the ſurface but in drills, as peaſe, beans, and potatoes. 3d. Such as are placed in hollow trenches, as celery, and ſometimes artichokes. 4th. Such as are ſown or raiſed on beds or ridges, as aſparagus, ſea-kale, and frequently early crops of peaſe, &c. 5th. Some require the ſoil to be often pulverized while growing, as potatoes, peaſe, and moſt drill-crops; others admit of it but in a ſmall degree, as onions, leeks, carrots, &c. Some are occaſionally and often materially injured by it, as ſtrawberries."

In relation to *duration*, it is obſerved that ſome are ſown and removed within three months: as early crops of turnips, radiſhes, braſſica plants, for removal, &c.; others continue double that time, as onions and potatoes; others treble, as frequently brocoli and cabbages; ſome continue two ſeaſons, as parſley, fennel, &c.; others for ſeveral years, as ſtrawberries, aſparagus, artichokes, &c. By attentively conſidering theſe and other diviſions which the ſubject admits of, it is ſuppoſed much advantage may be gained by the culinary gardener, and appropriate ſucceſſions of crops formed: "thus celery, by being planted in hollow trenches, pulverizes the ſoil in a high degree; by requiring a conſiderable quantity of manure it enriches it; both which properties are neceſſary for the production of plants of large, ramoſe, or faſciculate roots, which penetrate deep into the ſoil, ſuch as artichokes, ſcorzonera, aſparagus, &c. Again, theſe crops by remaining long on the ſoil, afford, when removed, an excellent ſituation for ſuch as are

more tranſitory, as peaſe, potatoes, &c." There are various other circumſtances that are deſerving of attention on this ſubject, as may be ſeen by conſulting the articles CROPPING and COURSE *of Crops*.

After-management.—There are ſcarcely any two plants that require exactly the ſame means in the whole of their cultivation, though in many inſtances the differences are but very ſmall. In the annual and biennial kinds, the ſimilarity in many caſes is very conſiderable; but in that of the perennial ſallad and pot-herb ſorts it moſtly differs in a high degree. The neceſſary culture in each may be under the names of the particular plants. Whatever the nature of the culture that is requiſite may be, in any ſort of plant or vegetable, it ſhould always be executed in due ſeaſon, and under proper circumſtances in reſpect to the ſtate of the ground. There are ſeveral other matters in the performance of this buſineſs that require the attention of the gardener, as will be ſeen under their proper heads.

Uſeful and important alterations and changes are capable of being produced in vegetables, by diverting their natural and uſual habits of growth and production. A very plain and eaſy method of accompliſhing this, in many caſes, is by ſetting and ſowing, at unuſual periods, as between thoſe in which it is uſually performed. The ſame thing is alſo capable of being effected by making uſe of different ſorts of ſoil for the purpoſe, as ſuch as are more early or late, in conſequence of their natural qualities. As the great or final purpoſe of every individual vegetable is that of the production of its flower, fruit, and ſeed, it naturally purſues its growth till theſe ends are fully effected; which is the caſe in very different lengths of time, according to the kind of plant or tree, being ſhort in ſome, while in others it takes up a very conſiderable length of time. In this view, by cutting the annual and biennial ſorts, ſo as to prevent theſe from taking place, they may be continued for ſeveral years. And in ſome caſes perennials may be made to afford crops at unuſual ſeaſons. The ſame thing happens to ſome fruit trees and ſhrubs when denudated of their leaves and flowers in the late vernal ſeaſon.

In different fruit-trees that do not uſually afford any produce for a great length of time, as the walnut and mulberry, it has been found by Mr. A. Knight, that by grafting them by approach with the bearing branches of old trees, they may be brought into bearing in the courſe of three years; and it is ſuggeſted that this method may probably be applied with ſucceſs in various other ſimilar caſes. See GRAFTING.

The practical operations of this branch of gardening divide themſelves under a variety of different heads, as conſervatory, eſpalier, green-houſe, hot-bed, hot-houſe, hot-pit, hot wall, muſhroom-houſe, orchard, planting, pruning, ſtandard-trees, training, vermin, wall-fruit, wall-tree, watering, watering-engine, weeding, &c.

GARDENING, in *Falconry*. To *garden a hawk*, is to put her on a turf of graſs, to cheat her.

Some alſo uſe the ſame phraſe for the giving her an airing, or letting her fly at large.

GARDENSEE, in *Geography*, a town of Pruſſia, in Oberland; 25 miles N.N.E. of Culm. N. lat. 53° 35'. E. long. 18° 43'.

GARDENSK, a town of Samogitia; 25 miles S. W. of Miedniki.

GARDENSTOWN, a ſmall town of Scotland, in the county of Bamff, ſituated in a bay at the entrance into the frith of Murray, with an harbour chiefly adapted to fiſhing-boats and ſmall veſſels; ſeven miles E. of Bamff. N. lat. 57° 37'. W. long. 2° 15'.

GARDICCHI, a town on the weſt coaſt of the iſland of Corfu; ſeven miles S.W. of Corfu.

GARDIE, PONTUS DE LA, in *Biography*, who flouriſhed in the middle of the 16th century, was ſon of a gentleman of Gardie, near Carcaſſone, in France. He ſerved firſt under marſhal Briſac in Piedmont, and afterwards in the troops ſent to Scotland by king Henry II. After this he went into the Daniſh ſervice, and was taken priſoner in an action againſt the Swedes. The Swediſh general, who was himſelf a Frenchman, recommended Gardie to the king, who immediately gave him a commiſſion in his army. He was afterwards knighted and created baron of Eckholm, and was ſent by John, king of Sweden, as ambaſſador to the emperor Rodolph, and to pope Gregory XIII. In 1580 he was made general of the Swediſh army in a war againſt the Ruſſians, from whom he took ſome important places. The government of Ingria and Livonia was conferred upon him for his great ſervices, and he proceeded in a career of ſucceſs, and was honoured with other important offices. In 1585 he was unfortunately drowned at the entrance of the port of Revel. He had married a natural daughter of the king, and from this union are deſcended the counts de la Gardie, who are among the principal nobles of Sweden. Moreri.

GARDINER, STEPHEN, an Engliſh prelate and ſtateſman, who flouriſhed in the ſixteenth century, and who, by the part which he took in the reign of Mary, has had his name tranſmitted with infamy to poſterity. He was a native of St. Edmunds Bury, and born about the year 1483. He is ſuppoſed to have been the natural ſon of Dr. Lionel Woodvill, biſhop of Saliſbury, and brother to Elizabeth, queen conſort to Edward IV. He took his ſurname from his reputed father, a menial ſervant of the biſhop, who married his mother with a view of preventing the conſequences which would have reſulted, had the real ſtate of the caſe been known. Of the early years of this remarkable man we have no account; but at the proper age he was ſent to Trinity-Hall, Cambridge, where he purſued his ſtudies with uncommon diligence, and in a ſhort time obtained a high degree of reputation for the brilliancy of his talents, for correctneſs and elegance in writing and ſpeaking Latin, and for extraordinary ſkill in the Greek language. As a claſſical ſcholar he read inceſſantly the works of Cicero, and imitated his ſtyle ſo cloſely, as to draw down the ſeverity of criticiſm on that account. He applied himſelf to the ſtudy of the civil and canon law, and took his degree of doctor in the year 1520. Different ſtatements are made reſpecting his firſt patron: according to ſome, it was Thomas Howard, duke of Norfolk, though others aſcribe the notice taken of him to cardinal Wolſey. To the latter it is known that Gardiner acted as a private ſecretary, and was for ſome time one of the cardinal's family. In this ſituation an incident happened which introduced him to the knowledge of the king. Cardinal Wolſey having projected an alliance with Francis I. king of France, Gardiner was employed to draw up a plan of it. While he was engaged upon the work, the king choſe to examine the progreſs which was made by the ſecretary, and being well pleaſed with the performance, and ſtill more with his converſation, and with his fitneſs for buſineſs, he not only expreſſed his ſatisfaction of the young man's talents, but admitted him into a confidential intercourſe, and from this period ſcarcely any ſtate affair of moment was concluded without the advice of Gardiner. In the year 1527, or 1528, he was appointed, in conjunction with Edward Fox, to an embaſſy to Rome, to negociate the buſineſs of the king's divorce from queen Catherine. Although Fox would naturally rank higher than his

his coadjutor, yet Gardiner, being eſteemed the beſt civilian in England, was appointed chief of the embaſſy, and having been already admitted into the king's cabinet council for this affair, was ſtyled in the cardinal's credentials to the pope, "Primary Secretary of the moſt ſecret counſels." The cardinal calls Gardiner "the half of himſelf, than whom none was dearer to him," and he aſſured the pope he might ſay with the utmoſt ſafety to Gardiner whatever he would deliver to himſelf. At firſt the pope ſeemed to be playing a double game, but by the repreſentations and addreſs of Gardiner he at length obtained a commiſſion from his holineſs, appointing cardinals Wolſey and Campeggi to determine the buſineſs in their own way. For this important ſervice Gardiner was highly applauded by his maſter, by the king, and by Anne Bullen, who under her own hand aſſured him ſhe felt every diſpoſition to render him all the grateful returns in her power. Having ſent home his colleague Fox, the ſecretary remained at Rome, hoping to ſecure the papal crown for Wolſey, to which he had long aſpired, and which the dangerous illneſs of Clement VII. gave him ſome hopes of attaining. Gardiner acted with ſo much zeal and diſintereſtedneſs on this occaſion, that he ſecured the ſuffrages of at leaſt one-third of the whole number of cardinals. The recovery of the pope put an end for a time to the hopes of the contending parties; nevertheleſs the cardinal was aware of the great obligations he was under to Gardiner for the zeal which he had ſhewn in his behalf: nor was he leſs pleaſed with him for reconciling the pope to the endowment of his two colleges at Oxford and Ipſwich out of the revenues of the diſſolved leſſer monaſteries. Gardiner was recalled from Rome to manage the king's cauſe of divorce before the legates, and immediately on his return he was appointed to the archdeaconry of Norfolk, which was the firſt inſtance of his preferment in the church, but on account of his great uſefulneſs to the ſovereign he was raiſed to the office of ſecretary of ſtate. In this ſituation he was conſidered as having a large ſhare in the management of all important affairs, and was particularly conſulted by the king when cardinal Campeggi declared that the cauſe of the divorce muſt be ſent back to Rome, and that himſelf and his colleague could proceed no farther. Gardiner, by the aſſiſtance of archbiſhop Cranmer, found a method of extricating the king from his difficulty. (See CRANMER.) The new method of proceeding in this buſineſs contributed to haſten the ruin of Wolſey, who had ſome time been ſuſpected by the monarch of being inimical to the divorce. In his diſtreſs the cardinal had recourſe to his old ſervant, the ſecretary, from whom it is believed he met with as ſincere returns of gratitude and real friendſhip as he could deſire or expect. In the year 1530 Gardiner was employed, in conjunction with Fox, to procure from the univerſity of Cambridge a declaration in favour of the king's cauſe. He was at this time maſter of Trinity Hall, and by the influence which this office gave him they ſucceeded in their plans. For this and for his other ſervices in behalf of the king he was rewarded by very valuable eccleſiaſtical promotions, till at length, in 1531, he was conſecrated biſhop of Wincheſter. In 1533 the new prelate ſat in the court with archbiſhop Cranmer, when the latter pronounced the ſentence by which queen Catherine's marriage was declared null and void. In the ſame year he was ſent ambaſſador to France, whither he was ſoon followed by Dr. Bonner. The object of this journey was to attend an interview between the pope and the French king at Marſeilles, and to diſcover their deſigns, which Henry and his council ſuſpected to be of a hoſtile nature againſt England. They did not, on this occaſion, ſcruple to declare that Henry VIII. would appeal to a general council, if the pope ſhould pretend to proceed to judgment in his cauſe. Upon the return of biſhop Gardiner he was called upon, with the other biſhops, to acknowledge the king as ſupreme head of the church, and to take the oath appointed for that purpoſe. With this ſummons he not only complied with the utmoſt readineſs, but publiſhed a defence of the king's ſupremacy. His pen was made uſe of upon other occaſions, in vindicating the king's divorce, his ſubſequent marriage, and his emancipation of the kingdom from the tyranny of the papal ſee, upon which ſubjects his various treatiſes obtain him a high degree of reputation. Gardiner was, however, zealouſly attached to the ſuperſtitions of the Romiſh church, and oppoſed with all his ſtrength any attempts made to introduce the principles of the Proteſtant reformation. In the year 1535 he was warmly engaged with Cranmer, who had ſent him notice that he ſhould viſit his dioceſe, and who had made a propoſal in the convocation to petition the king for leave to make an Engliſh tranſlation of the bible. About this period Gardiner reſumed his embaſſy to France, where he prevailed on the French king to remove from his dominions Dr. Reginald Pole, then dean of Exeter, a circumſtance that gave riſe to the animoſity which afterwards ſubſiſted between theſe churchmen. At this period he entered a ſtrong proteſt reſpecting a project of a religious league with the Proteſtant princes of Germany. In 1538 he was ſent ambaſſador to the German diet of Ratiſbon, where he acquitted himſelf with much credit as to the objects of the commiſſion, but he there fell under a ſuſpicion of holding a ſecret correſpondence with the pope, on the ſubject of rendering popery triumphant in England. But Henry was ſtill too much attached to the doctrines of Rome to bring his prelate into any trouble on account of his zeal on this ſubject: he even took pains, notwithſtanding his hoſtility to the court of Rome, to prevent his ſubjects from departing from their old eſtabliſhed creed. In ſome caſes he had recourſe to the aid of perſecution in juſtification of the cauſe of popery. John Lambert had written a paper againſt the doctrine of the real preſence, which fell into the hands of archbiſhop Cranmer, before whom and biſhop Latimer he was ſummoned, and there admoniſhed to retract what he had written. Lambert was not to be intimidated, as he could not be convinced; he appealed to the king, who, by the advice of Gardiner, cited him to appear in Weſtminſter-hall. Here the king ſat in great ſtate, ſurrounded by the biſhops, nobility, clergy, and council: a long debate enſued, in which the honeſt man was overwhelmed by the multitude of his opponents, and reduced to ſilence. Henry then demanded of him, if he were convinced, and whether he would live or die? He replied, with great humility, that "he committed his ſoul to God, and ſubmitted his body to the king's clemency." The king ſternly told him, for clemency never entered into the compoſition of Henry VIII., if he did not recant he muſt die, for he would not be a patron of heretics. Lambert was a hero, as well as an honeſt man; he refuſed to recant, and was burnt in Smithfield with circumſtances of uncommon cruelty. This tragical ſcene was unqueſtionably the reſult of Gardiner's advice, and on that account claims to be narrated in his life, though it muſt be again referred to. See HENRY VIII.

In 1539 Gardiner diſtinguiſhed himſelf by his exertions to procure the act of the ſix articles, commonly denominated the Bloody Statute; and very ſoon after the paſſing of this act, Dr. Barnes and two others were burnt in Smithfield for hereſy, at the ſame time that three papiſts were hanged for owning the pope's ſupremacy and denying the king's, which

cauſed the remark of a foreigner, "that in England there was a ſtrange method of managing matters, for thoſe that were the pope's adherents were hanged, and thoſe who were againſt him were burnt."

Upon the fall of Cromwell, in 1540, Gardiner was elected chancellor of the univerſity of Cambridge, in which ſituation he was the conſtant opponent of whatever was propoſed to be introduced in favour of improving the plans of education: he was the advocate for old cuſtoms and practices, becauſe they were old, though at the ſame time they might be vicious and abſurd. He even charged ſir John Clarke with endeavouring to remove "an evil well placed."

In 1542 a convocation was held to examine the merits of the tranſlation of the Bible. Gardiner and the popiſh party reprobated it as a moſt unfaithful verſion of the original, and to obtain a decree againſt it they offered to produce a better, fully expecting that the time requiſite for the accompliſhment of ſo great an undertaking, might afford fair opportunities for ſuppreſſing it altogether. Cranmer, however, had the addreſs to get it referred to the examination of the two univerſities; and, to the extreme mortification of Gardiner, he made ſome further progreſs in the work of reformation, by obtaining a mitigation of ſome of the ſevere acts concerning religion. Gardiner, about this time, was one of the commiſſioners appointed to conclude a treaty of peace with Scotland, and to negociate a marriage between the prince of Wales and the young Scottiſh queen; but in all his public employments he never loſt ſight of a favourable opportunity of impeding the progreſs of freedom and inquiry in religious concerns. With this view he probably employed perſons as ſpies upon the conduct of thoſe attached to the reformed principles; and, having been informed that ſeveral ſuch were to be found at Windſor, he moved the king in council that a commiſſion might be granted for ſearching ſuſpected houſes in that town, in which ſome books were found written againſt the ſix articles. Four perſons were apprehended, tried, and condemned for hereſy, of whom three were ſentenced to be burnt. After this, Gardiner himſelf fell under the ſuſpicion of the king, and an order was made out for committing him to the Tower; but the prelate, appearing in perſon in the preſence of his ſovereign, contrived to obtain a pardon before any ſteps could be taken to prove his guilt. In the year 1545 he oppoſed and defeated a deſign which Cranmer had formed, by a reviſion and reformation of the canon laws, to adapt them to the new order of eccleſiaſtical affairs in England, and to a period of ſtill further improvement. During this ſame year Gardiner was employed in Flanders to carry on political negociations with the emperor and the French king, and while he was abſent from the kingdom Cranmer endeavoured to obtain the king's conſent for the aboliſhing of ſome of the prevailing ſuperſtitions. Gardiner was appriſed of the plan, and writing to the king to ſay that his buſineſs was in a good train, he took that opportunity of earneſtly entreating him not to ſuffer any innovation in religion, for if he did there would be no hope left of ſucceeding with the emperor. Soon after Gardiner's return from the continent he contrived to ſet on foot a perſecution againſt the proteſtants upon the ſtatute of the ſix articles. A charge was firſt brought againſt Mrs. Anne Aſcough, a lady of unblemiſhed manners, exemplary piety, ready wit, and who had enjoyed the advantages of an excellent education. By making her the object of their perſecution, they expected to extort from her confeſſions which would furniſh matter of accuſation againſt ſome of the principal nobility and other high characters in the kingdom. After ſeveral examinations, in which the tortures of the rack were reſorted to, they condemned her to the flames, in which ſhe ſuffered, with three others, for ſpeaking againſt the real preſence. Sir George Blage, one of the gentlemen of the king's privy chamber, was likewiſe condemned to be burnt, but the king interfered and ſet him at liberty.

The next attempt made by Gardiner to cruſh the favourers of the reformation, which failed in its deſign, and which irrecoverably alienated the king's mind from him, was directed againſt Catherine Parr, to whom the king had been married three years. After this, Henry never admitted the biſhop into his preſence, excepting once, when he was informed that he came to tender him a benevolence, granted him by the clergy. On that occaſion he barely ſuffered him to approach, to deliver his meſſage, and when he had received it went into another apartment. So completely was the king alienated from Gardiner, that, though he had formerly appointed him one of his executors, and of the council to prince Edward, he now ordered a new will to be drawn, in which his name was omitted.

After the death of Henry, Gardiner, though the power was taken out of his hands, objected, as violently as ever, againſt the meaſures of reform which Cranmer was deſirous of introducing, and on this account he was impriſoned in the Fleet, where he was treated with much ſeverity. In this ſtate of confinement he continued to the end of the ſeſſion of parliament, when he was liberated by the king's pardon, though he had never been formally accuſed of any particular crime. Being ſet at liberty he repaired to his dioceſe, where he conformed himſelf, outwardly at leaſt, to the orders of the council, ſo that it was impoſſible to take any advantage againſt him; but no doubt was entertained that he did all that lay in his power, privately, to oppoſe the principles of the reformation. He even preached againſt them, and exhorted his people to beware of receiving any other doctrine than that which he had taught them. Of this conduct a complaint was made againſt him, in the council, before whom he was ſummoned in the year 1548, and, having been ſeverely reprimanded, was ordered to keep his houſe till he had given ſatisfaction, which was to be by preaching before the king, according to certain directions to be given him. On the day appointed he did preach, but his diſcourſe made the breach ſtill wider, and he was committed a cloſe priſoner to the Tower. Here he was detained two years, and then brought before the council, where he was informed that they ſat by a ſpecial commiſſion to judge him, and that he was required to ſubſcribe to the articles which had been ſent to him. Gardiner was inflexible, and refuſed; and, in conſequence of it, he was in the year 1551 deprived of his biſhopric for diſobedience and contempt of the king's authority. The biſhop proteſted againſt his judges, and objected to their commiſſion; and when ſentence was about to be given againſt him he appealed from the delegates to the king, but no notice was taken of the appeal. After this he was deprived of thoſe little indulgences, which had been before allowed him in his confinement, and he was kept priſoner in the Tower during the remainder of king Edward's reign. Here he ſpent his time in compoſing a variety of Latin poems, tranſlated into Engliſh verſe ſeveral of the poetical parts of the Old Teſtament, and wrote ſome controverſial tracts. He anticipated a change of circumſtances which ſhould put him in poſſeſſion of the degree of influence and proſperity that he formerly enjoyed. In the year 1553 his hopes were realized in the acceſſion of Mary to the throne of theſe realms. On the 8th of July, he was appointed to perform the Romiſh obſequies for the late king, who was buried at Weſtminſter, with the Engliſh ſervice, by archbiſhop Cranmer: and on the following day he reſumed the poſſeſſion of Wincheſter-houſe, after an abſence of five

years,

years, and on the 23d he was declared chancellor of England, and immediately became the queen's prime miniſter, and was entruſted with the chief management of public affairs. He now determined to re-eſtabliſh the popiſh religion, and to reconcile the kingdom to the ſee of Rome. Preaching, except by the queen's ſpecial licence, was inſtantly prohibited: images were ſet up by the popiſh party, and the old rites and the Latin ſervice were very generally introduced. Though the laws of Edward VI. were ſtill unrepealed, yet theſe practices, which were highly illegal, were connived at and abetted by the council, which, being modelled after Gardiner's own mind, harraſſed with impriſonment and very ſevere uſage, ſir James Hales, one of the judges who had ventured to inſtruct the juſtices in Kent, to put in execution the laws of Edward that were ſtill in force. The new government ſoon ſhewed a determined hoſtility to the Proteſtants, who, by the authority of Gardiner, were moleſted in the religious ſervices which the people attended with unuſual ſerioufneſs, under the apprehenſion that their liberties would ſoon be reſtrained. Spies were employed in all the churches in London, who, to pleaſe their ſuperiors, laid informations againſt the preachers. Theſe had no redreſs; they were obliged to ſubmit to the preſcribed terms, or were committed to priſon. October the 1ſt was appointed for the coronation of the queen, when a general pardon to all offenders was proclaimed, with the exception of thoſe who were impriſoned in the Tower and other places, on the charge of being Proteſtants. On the 10th of the ſame month Gardiner opened the firſt parliament in Mary's reign; and one of the early acts of this aſſembly was the paſſing a ſtatute for confirming the marriage of Catherine of Arragon, the queen's mother, with Henry VIII., in the preamble of which the divorce was pronounced impious and illegal, and the whole blame of it, againſt all truth and juſtice, attributed to archbiſhop Cranmer. He next cauſed a bill to be brought into the houſe of lords, which, after a debate of ſix days in the houſe of commons, was at length carried; by this, all the laws relating to religion made in king Edward's reign were repealed, and it was enacted at the ſame time that there ſhould be no other form of divine ſervice but what had been uſed in the laſt year of king Henry VIII. This was a prelude to the moſt ſevere and tyrannical meaſures: ſeveral Proteſtant prelates were deprived of their ſees; and their places were filled by Papiſts who had been excluded in the laſt reign. The commiſſion for the deprivation of the former was directed to Gardiner, Bonner, biſhop of London, and others. The Proteſtants who had the means, ſought for ſafety by withdrawing into foreign parts, and thoſe who were left behind began to feel the effects of the biſhop's vengeance. The priſons were crowded with victims, waiting with anxiety and terror the decrees of a bloody tribunal. In the mean time Gardiner was engaged in the management of a treaty of marriage between the queen and Philip, ſon of Charles V., king of Spain. This meaſure was extremely odious to the nation in general, and though the articles of the treaty were drawn with great art and plauſibility, and apparently much in favour of England, yet when they were publiſhed they gave no ſatisfaction to the people, who expected that if it took place, not only popery would be confirmed, but a Spaniſh government and inquiſition be eſtabliſhed, and, perhaps, England at length would be reduced to the degraded ſituation of a province to Spain. The general diſcontent on this ſubject gave riſe to the inſurrection headed by ſir Thomas Wyat. This was ſoon quelled, but the inſurgents were purſued with unabating fury, and the odium of the meaſures was caſt on Gardiner, which made him univerſally hated. On the ſame occaſion, the princeſs Elizabeth was ſent to the Tower, under the pretence of being concerned in Wyat's conſpiracy, but as he publicly acquitted her of this charge, and as nothing could be produced againſt her, ſhe was releaſed from her confinement. In 1554, Gardiner was enabled to conclude the treaty of the queen's marriage, and in July the queen met the Spaniſh prince at Wincheſter, where they were married by the biſhop. He now felt himſelf ſecure and determined to avenge himſelf on the Proteſtants in retaliation for what he had ſuffered from them during the preceding reign. Cardinal Pole was now admitted as the pope's legate in England, and ſoon after his arrival he declared to the parliament the object of his miſſion, and invited them to reconcile themſelves and the kingdom to the apoſtolic ſee. To this they readily agreed, and preſented a petition to their majeſties for the purpoſe, which, being ſignified to the legate in the royal preſence by Gardiner, the cardinal abſolved them, and received the people of England once more into the boſom of the catholic church. Almoſt immediately after this an act was paſſed, by which the authority of the Roman pontiff was re-eſtabliſhed, and a bill quickly followed it, by which the old ſtatutes againſt the heretics were revived in full force. From this period Gardiner gave full ſcope to his ſanguinary diſpoſition; he glutted himſelf with the blood of the Proteſtants, and was for ſome months perſonally concerned in the moſt ſavage acts of barbarity. Finding, however, that by his activity in the bloody work he had rendered himſelf ſufficiently odious, not only to Proteſtants, but to all the moderate perſons of his own party, he withdrew from taking an open part in it. He was now appointed with others to proceed to Calais, to a kind of congreſs which was held there for the purpoſe of mediating a peace between the emperor and the king of France. During this negociation, the pope died, and upon the elevation of his ſucceſſor, Gardiner took every precaution to ſecure to himſelf the dignity of cardinal, and the ſucceſſion to the ſee of Canterbury. In the month of October 1555, the biſhop opened the ſeſſions of Parliament, and in a ſhort time afterwards he was taken ill of a diſeaſe which terminated his life about the middle of November. The cauſe, and the exact time of this prelate's death, have been variouſly related. By ſome his laſt diſeaſe is ſaid to have been the gout; but by others it is regarded as a ſuppreſſion of urine, and ſome have imputed the immediate cauſe of his death to the effect of God's judgments on him for his cruelties exerciſed towards the biſhops Ridley and Latimer. By every hiſtorian he is repreſented as having ſuffered the moſt excruciating agonies on his death-bed, and to have felt the utmoſt remorſe in the recollection of his paſt miſdeeds. Frequently did he exclaim, with the utmoſt anguiſh of mind, "Erravi cum Petro, ſed non flevi cum Petro." But the errors of the apoſtle Peter were not to be compared, and ought not to be mentioned in connection with the foul deeds of the blood-thirſty Gardiner. The denial of his maſter in one caſe was probably the reſult of timidity only: the perſecutions of the biſhop of Wincheſter were the deliberate acts of a malignant heart, ſteeled againſt every ſentiment of charity, honour, and juſtice. The perſon of the biſhop perfectly correſponded with his mind, if the account given of it by his ſucceſſor Dr. Poynet can be relied on: "This doctor," ſays he, "hath a ſwarth colour, hanging look, frowning brows, eyes an inch within his head, a noſe hooked as a buzzard, noſtrils like a horſe, ever ſnuffing in the wind, a ſparrow mouth, &c." This was, probably, in ſome degree, a caricature repreſentation, dictated by perſonal hatred; nevertheleſs it is a portrait well adapted to a perſecutor. It has, however, been remarked, that with all the deformity

of his mind, he was occaſionally an encourager of learning, when the parties diſtinguiſhed by it were of the Catholic faith. He was the patron of ſome young men who became diſtinguiſhed public characters, and in two inſtances theſe were zealous Proteſtants as well as eminent for learning. The perſons referred to were ſir Thomas Smith, who had been ſecretary to Edward VI., and Roger Aſcham; with regard to theſe, his attention to the intereſts of learning triumphed over his ſyſtematic enmity to heretics: he permitted the former to live in a ſtate of privacy unmoleſted, granting him a penſion of 100*l. per ann.* and the latter he preferred to be Latin ſecretary to queen Mary. Gardiner himſelf was an author, but his pieces are of no great moment. Several of his letters to the duke of Somerſet, lord protector, and other perſons, are extant in the firſt edition of Fox's "Acts and Monuments," and ſome to Smith and Cheke, on the pronunciation of the Greek language in Bene't college library at Cambridge. The character given of this prelate by one of his biographers is, that "he was proud and arrogant, obſtinate and vain, of unbounded ambition, and maſter of the moſt profound diſſimulation. Though poſſeſſed of much natural courage and reſolution, as a courtier he was ſervile; and he ſcrupled not to violate his conſcience, when he had objects of intereſt or ambition in view. The part that he acted againſt the Papal ſupremacy in the reign of Henry VIII., and the conceſſions which he offered to make in the reign of Edward VI., compared with his ſubſequent conduct in the reign of Mary, afford abundant evidence of the truth of the preceding remarks. They alſo ſhew that he had no fixed principles of religion, and that his perſecuting ſpirit is to be attributed to falſe and narrow views of policy, and to a cruel malignant nature. When he pleaſed he could aſſume a winning addreſs, and diſplay no inconſiderable degree of eloquence, but when he was employed in trying heretics, as well as at other times, he would frequently deſcend to the loweſt abuſe, and the groſſeſt ſcurrility, and behave in a manner very unworthy of the character either of a gentleman or a ſcholar, and ſtill more thoſe of a Chriſtian and a biſhop." Biog. Brit. Burnet's Hiſt. of the Reform.

GARDINER, in *Geography*, a poſt-town of America, in Kennebeck county and ſtate of Maine, on the weſt bank of Kennebeck river.

GARDINER'S *Bay*, a large bay on the eaſtern extremity of Long iſland, on the coaſt of America. N. lat. 41° 3'. W. long. 72 15'.

GARDING, or GARDINGEN, a town of Denmark, in the duchy of Sleſwick; 28 miles W.S.W. of Sleſwick. N. lat. 54° 24'. E. long. 8° 52'.

GARDNER, a townſhip of America, in the county of Worceſter and ſtate of Maſſachuſetts, incorporated in 1785, and containing about 14,000 acres, well watered, chiefly by Otter river, and 667 inhabitants; 58 miles N.W. of Boſton.

GARDNER'S *Canal*, an inlet on the coaſt of New Hanover, extending about 40 miles from eaſt to weſt. N, lat. of the entrance 53° 35'. E. long. 231° 17'.

GARDNER'S *Iſland*. See AMARGURA.

GARDNER'S *Iſland*, or *Iſle of Wight*, an iſland of America, lying at the eaſt end of Long iſland, in the ſtate of New York, ſheltered within Oyſter pond and Montauk points; 10 miles N.W. of the latter, and as far S.W. of Plumb iſland. It contains about 3000 acres of fertile land, and yields excellent graſs, wheat, and corn. Fine ſheep and cattle are alſo raiſed upon it. It is annexed to E. Hampton, and is 40 miles S. weſtward of Newport, Rhode iſland.

GARDON, a river of France, which riſes in the department of the Lozére, traverſes that of Gard, receiving another river in its courſe, called "Gardon d'Alais," and runs into the Rhone, 4 miles N. of Taraſcon.

GARDONE, a town of Italy, on the Mela; 15 miles E. of Breſcia.—Alſo, a town of Hindooſtan, in Dowlatabad; 36 miles S. of Amednagur.

GARDOUCH, a town of France, in the department of the Upper Garonne; 15 miles S.E. of Toulouſe.

GARDSBY, a town of Sweden, in the province of Smaland; 28 miles N. of Wexio.

GARDSTRUM, a town of Sweden, in the province of Smaland; 7 miles N. of Calmar.

GARE, in our *Old Writers*, a coarſe wool, full of ſtaring hairs, ſuch as grow about the ſhanks of ſheep. 31 Edw. III. cap. 8.

GARED, in *Geography*, a town of Africa, in the kingdom of Suz, on the river Suz, famous for its Morocco leather.

GAREEA, a town of Bengal; 24 miles N.N.W. of Moorſhedabad.

GAR-EL-MAILAH, *i. e.* the *Cave of Salt*, a ſea-port of Africa, on the eaſt coaſt of Tunis; 4 miles W. of cape Zibeeb.

GARENCIERES, THEOPHILUS, in *Biography*, a phyſician of the faculty of Caen, was a native of Paris. He received his degree before the age of twenty, and came over to England, where he abjured the Roman Catholic religion, in which he was born. He was incorporated in the univerſity of Oxford on the 10th of March, 1657, and ſettled in London, where he was appointed phyſician to the French ambaſſador: but fortune was altogether adverſe to him, and he died overwhelmed with poverty and diſtreſs. He was, however, a man of ſome ſcience, as his works evince. They conſiſt of a treatiſe, in Engliſh, on the nature and properties of the tincture of coral, printed in 1676, in 12mo.; and another in Latin, entitled "Angliæ Flagellum, ſeu, Tabes Anglica numeris omnibus abſoluta," 1647, in 18mo. Eloy. Dict. Hiſt.

GARENGEOT, R. CROISSANT DE, an eminent French ſurgeon, was born at Vitre, a ſmall town in Brittany, on the 13th of July, 1688. His father practiſed ſurgery at that place, and ſuperintended his education, inſtructing him in the elements of his own profeſſion. In order to acquire a greater extent of practical knowledge, Garengeot ſpent five years in the hoſpital of Angers, and in the great naval hoſpitals of Brittany; and afterwards made two voyages in the navy. In 1711 he went to Paris, where, from the narrowneſs of his means, he lodged with a barber-ſurgeon, but ſtudied under Winſlow, Thibaut, Meri, &c. and alſo under the expert maſters of St. Côme, the moſt celebrated of the ſurgical ſchools. In 1725 he was admitted to the freedom of the corporation of St. Côme, through the favour of M. Mareſchal, then firſt ſurgeon to the king. Soon after this, he gave a courſe of lectures on anatomy in the medical ſchools; and henceforth his reputation extended even to foreign countries; for he was elected a member of the Royal Society of London. He was alſo appointed demonſtrator royal in the ſchools of medicine. On the eſtabliſhment of the Society of Academicians, under the patronage of the king, in 1731, Garengeot was choſen "Commiſſaire pour les extraits," which office he retained until the year 1742. He then ſucceeded Terryer in the place of ſurgeon-major of the king's regiment of infantry. He died at Cologne, in conſequence of an attack of apoplexy, on the 10th of December, 1759, at the age of 71.

The firſt of the works of Garengeot, entitled "Traité des Operations de Chirurgie," was publiſhed at Paris in

1720, and tranſlated into the Engliſh and German languages.—2. "Traité des Inſtrumens de Chirurgie," printed at Paris, and the Hague, 1723, and at Paris again in 1727, in two volumes, with plates.—3. "Myotomie humaine et canine, ou la manière de diſſéquer les Muſcles de l'homme et des chiens, ſuivie d'une Myologie ou Hiſtoire abrégée des Muſcles," Paris, 1724, 1728, 1750, two volumes, 12mo. The laſt of theſe editions is much more correct than the two former.—4. "Splanchnologie, ou, Traité d'Anatomie concernant les viſcères," Paris, 1728, 1729, in 12mo.; ibid, 1742, in two volumes, 12mo. A German edition was printed at Berlin, in 8vo. in 1733, which is ſaid to contain ſome valuable matter, but chiefly belonging to Winſlow and Morgagni. At the end of this work there is a diſſertation "Sur l'origine de la Chirurgie et de la Médicine, &c." in which Garengeot diſplayed an exceſſive pride and vanity, according to Portal; attempting to trace all the moſt brilliant diſcoveries in medicine to the ſurgeons; but forgetting the obligations which he himſelf owed to Du Verney, Winſlow, and Morgagni. For inſtance, he denied that Harvey was the diſcoverer of the circulation of the blood, which he attributed to Rueff, a Swiſs ſurgeon.—5. His laſt work was entitled "L'Operation de la Taille par l'appareil latéral corrigée de tous ſes defauts," Paris, 1730, in 12mo. Eloy. Dict. Hiſt.

GARET, in *Geography*, the moſt northern province of the empire of Morocco, on the weſtern banks of the Mulluvia, which divides Morocco from the province of Tremecen. This province, about 20 or 25 leagues in length, is bounded to the north by the Mediterranean, to the ſouth by mount Atlas, and to the weſt by the province of Rif.

GAREWDUN, a town of Thibet. N. lat. 33° 18'. E. long. 80° 50'.

GAREZZO, a town of France, in the department of the Stura, on the Tanaro; 9 miles S. of Ceva.

GARFETE, a town of Portugal, in the province of Alentejo; 12 miles W. of Crato.

GAR-FISH, in *Ichthyology*. See Esox *belone*.

GAR-FISH, *Great*. See Esox *oſſeus*.

GARGANEY, in *Ornithology*, a ſpecies of duck, the Anas querquedula of naturaliſts, diſtinguiſhed by having the ſpot on the wings green, and a white line over the eyes. Donov. Br. Birds.

This bird is ſeventeen inches in length, with varied plumage; the bill lead-colour; crown duſky with oblong ſtreaks; cheeks and neck purple with white ſtreaks; breaſt light brown with ſemicircular black bars; belly white; ſcapulars long, narrow, ſtriped with white, aſh-colour, and black; tail duſky, and legs lead-colour.

Female with an obſcure white mark over the eye; plumage browniſh-aſh; wings without green ſpot.

GARGANO, in *Geography*, a town of Naples, in the province of Capitanata; 7 miles N. of mount St. Angelo.—Alſo, a mountain of Naples, near the fore-mentioned town.

GARGANUS Mons, in *Ancient Geography*, *Mount St. Angelo*, a mountain of Italy, in Apulia, towards the north. One of its branches, projecting into the Ionian ſea, formed a promontory, called "Garganum promontorium."

GARGAPHIA, a fountain ſituated in Bœotia, near Platæa, the waters of which were poiſoned by Mardonius, in order to deſtroy the Greeks who were encamped in its vicinity; but the Platæans reſtored their original ſalubrity. Pauſan. in Bœot.—Alſo, a valley of Greece, in Bœotia.

GARGARA, a town of the Troade, near mount Ida. Strabo places it on one of the higher parts of this mountain, and ſays, that the promontory, on which Gargara was ſituated, was one of thoſe which formed the gulf of Adramyttium. Gargara is now a town of Aſiatic Turkey, in the gulf of Adramytti, in Natolia; 20 miles W. of Adramytti.

GARGARENSES, a people of Aſia, in Scythia, in the vicinity of the Amazons, at the foot of mount Caucaſus, on the northern ſide of it.

GARGARIDÆ, a people of India, attached to the worſhip of Bacchus, who inhabited the country near the Hypanis, and another river called Megarſas.

GARGARISM, Gargle, in *Medicine*, a liquid form of remedy, for diſorders in the mouth, gums, throat, &c.

The word is Greek, γαργαρισμα, formed of γαργαριζειν, *colluere*, to waſh, or the Hebrew *garghera*, the throat.

Gargariſms are compoſed of honey, ſalt, ſyrups, ſpirits, vinegar, waters, and decoctions; and produce their effects, by cleanſing, lubricating, &c. the parts.

Gargles are peculiarly uſeful in fevers and ſore throats; and they have this advantage above many other medicines, that they are eaſily procured and prepared: an uſeful gargle for ſoftening and cleaning the mouth may be made with a little barley water and honey, acidulated with vinegar. Gargles bear different appellations according to the uſes to which they are applied. An *attenuating* gargle, made by mixing ſix ounces of water, with one ounce of honey and a dram and a half of nitre, or by adding an ounce of honey and half an ounce of ſpirit of ſal ammoniac to the emollient gargle, may be uſed in the inflammatory quinſey or in fevers, for cleaning the tongue and fauces. A good gargle for this purpoſe may be made with ſtrong ſage tea, ſweetened with honey and ſharpened with vinegar. The *common* gargle, made by mixing ſix ounces of roſe-water with half an ounce of ſyrup of clove-July-flowers acidulated with ſpirit of vitriol, cleanſes the tongue and fauces, and ſerves alſo for a gentle repellent. The *detergent* gargle, prepared by mixing a pint of the emollient gargle with an ounce of tincture of myrrh and two ounces of honey, ſerves to cleanſe exulcerations and to promote the excretion of tough viſcid ſaliva. The *emollient* gargle, made by boiling an ounce of marſh mallow roots, and two or three figs, in a quart of water till near one half of it be conſumed, and ſtraining out the liquor, is beneficial in fevers, when the tongue and fauces are rough and parched, to ſoften theſe parts and promote the diſcharge of the ſaliva. Sir John Pringle recommends a decoction of figs in milk and water, with the addition of ſal ammoniac, as an uſeful gargle in the inflammatory quinſey, or ſtrangulation of the fauces.

GARGATHA Inlet, in *Geography*, a narrow channel between two ſmall iſlands, on the coaſt of Virginia. N. lat. 37° 44'. W. long. 75° 32'.

GARGAZA, in *Ancient Geography*, a town placed by Diodorus Siculus near the Palus-Mæotides. Ptolemy places it in Aſiatic Sarmatia.

GARGET, a diſeaſe of cattle, conſiſting in a ſwelling and inflammation of the head, affecting in particular the eyes and lips, and, at laſt, inflaming alſo the gums and tongue. This diſeaſe is ſometimes contagious. For the cure, the animal muſt be blooded every day, till the inflammation ſubſides Immediately after the firſt bleeding, give 2½ ounces of Epſom ſalts, diſſolved in a pint of warm ale; and then the following drink, given night and morning, has been recommended; take of warm ale half a pint, ſal prunellæ, or powdered nitre, half an ounce; Venice treacle, a quarter of an ounce, mixed and given in one doſe. The animal muſt be kept clean, dry, and quiet. If bliſters appear on

the tongue, they ſhould be broken, and dreſſed with ægyptiacum, or honey and vinegar. When the inflammation is likely to be very conſiderable, local bleeding is uſeful.

GARGIL, a diſtemper in geeſe, which by ſtopping the head frequently proves mortal. Three or four cloves of garlic, beaten in a mortar, with ſweet butter, and made into little balls, and given the creature faſting, are the ordinary cure.

GARGNAGO, in *Geography*, a town of Italy, in the department of the Benaco, on the left bank of the Garda lake; 21 miles N.E. of Breſcia.

GARGONZA, a town of Etruria; 14 miles S.W. of Arezzo.

GARHA, a river of Hindooſtan, which runs into the Chumbul, three miles N.E. of Suiſſopour, in Agimere.

GARHANA, in *Ichthyology*, a name by which ſome have called a large Braſilian fiſh, of the ſhape of our carp, more uſually known among authors by its Braſilian name *Acaraaya*.

GARIA, in *Geography*, a town of Perſia, in the province of Irak; 65 miles S.E. of Hamadan.

Garia *Bay*, a bay on the ſouth coaſt of Newfoundland; 22 miles E. of cape Ray.

GARIAN, a town of Africa; 37 miles S. of Tripoli.

GARICON, in the *Materia Medica*, a name given by the Arabian writers to the drug called agaric by the ancients.

The Arabians have ſaid nothing of this drug, but what they have tranſcribed from the Greek of Dioſcorides and others; it is certain, however, from the concurrent teſtimony of all the ancients, as to the form, nature, and virtues of agaric, that their's was not the ſame ſubſtance which we call by this name.

The ancients knew two kinds of what they call agaric; they diſtinguiſhed theſe by the common terms of male and female; the male was a root reſembling the ſilphium of a cubit long, and of an inch or two in diameter; the female was the corrupted wood of certain trees, particularly of the cedar, and other odoriferous woods.

Pliny makes it indeed the decayed wood of the oak, which ſhines like fire in the dark, and calls it the fungus, but this was not the agaric of the Greeks.

The female agaric, or the decayed wood of the cedar, was what they gave as an antidote and cordial: the male, or as others called it, the black agaric, was poiſonous. Dioſcorides places it among the poiſonous roots, and Avicenna condemns it, as hard and unfit for internal uſe; the other, or female agaric, being ſoft, friable, and tender. When it was thus in a great degree, however, it was condemned by the more accurate writers; and Dioſcorides, in particular, condemns the agarics of Cilicia and Galatia as too friable, and of no value: ſo that they ſeemed to fix upon a proper ſtage in the decay, as the neceſſary qualification of good agaric.

GARIDELLA, in *Botany*, ſo called by Tournefort, after his countryman Dr. Garidel, author of a folio hiſtory in French, with many plates, of the plants growing about Aix in Provence, diſpoſed alphabetically, and who claims the firſt diſcovery of the *Garidella* in France. Linn. Gen. 227. Schreb. 306. Willd. Sp. Pl. v. 2. 731. Sm. Prod. Fl. Græc. v. 1. 307. Mart. Mill. Dict. v. 2. Juſſ. 233. Tourn. t. 430. Lamarck Illuſtr. t. 379. Gærtn. t. 118. Claſs and order, *Decandria Trigynia*. Nat. Ord. *Multiſiliquæ*, Linn. *Ranunculaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of five ſmall, ovate, acute, deciduous leaves. *Cor.* Petals none, unleſs the calyx be taken for ſuch. Nectaries five, elongated, equal, with two lips; the outer one divided into two long, linear, obtuſe, flat ſegments; the inner ſhort and ſimple. *Stam.* Filaments moſtly ten, awl-ſhaped, ſhorter than the corolla; anthers erect, obtuſe. *Piſt.* Germens three, ovate, pointed, erect, connected; ſtyles ſcarcely any; ſtigmas ſimple. *Peric.* Capſules three, connected, oblong, pointed, compreſſed, of two valves; their inner future moſt convex. *Seeds* ſeveral, ſhort.

Eſſ. Ch. Calyx of five petal-like leaves. Nectaries five, two-lipped, cloven. Capſules three, connected. Seeds numerous.

Obſ. This genus is very nearly akin to *Nigella*, and what is calyx or petals in one, ought to be deemed ſo in the other. The other parts chiefly differ with regard to number, which in *Nigella* itſelf is irregular and variable.

1. G. *Nigellaſtrum*. Linn. Sp. Pl. 608. Curt. Mag. t. 1266. Figured in Garidel, t. 39. Native of fields in the ſouthern parts of Europe. The root is annual. *Stem* one or two feet high, erect, branched. *Leaves* chiefly in the lower part, finely bipinnatifid, reſembling fennel, but flat. *Flowers* ſolitary at the end of each branch, of a greyiſh hue ſpeckled with purple, and worthy of minute examination. *Fruit* granulated. It is eaſily cultivated like other hardy annuals, but has chiefly curioſity to recommend it.

Dr. Smith ſaw in M. Le Monnier's garden at Verſailles what was conſidered as a new ſpecies of this genus, but of this we have no further knowledge. See Tour on the Continent, ed. 2. v. 1. 75.

GARIGA, ſometimes written *Sariga*, in *Ancient Geography*, a town of Aſia, in Aria. Ptolemy.

GARIGLIANO, in *Geography*, a river of Naples, which runs into the gulf of Gæta, N. lat. 41° 15′. E. long. 13° 45′.

GARINDÆI, in *Ancient Geography*, a people of Arabia Felix, towards the lower part of the Arabic gulf.

GARINISH-Point, in *Geography*, a cape on the ſouth weſtern coaſt of Ireland, in the county of Cork, being near the ſouthern entrance of Kenmare river, and forming the S. weſtern point of Cuolagh bay. W. long. 9° 58′. N. lat. 51° 37′.

GARIOPONTUS, in *Biography*, a phyſician of the Salernian ſchool, who lived in the eleventh century, according to the teſtimony of Peter Damien, who died in 1072. He is called by various names by different writers; as Warimpotus, Raimpotus, Guaripotus, Garimpotus, &c. All that is known of him is, that he was the author of a work chiefly compiled from the obſervations of his predeceſſors, and eſpecially of Theodore Priſcian; but the ſtyle is extremely obſcure, in conſequence of the intermixture of Greek, Arabic, and Latin words. The following are its different editions and titles: "De morborum cauſis, accidentibus, et curationibus, libri viii." Lugd. 1516, in 4to. Baſil 1536, 8vo. "Paſſionarius Galeni de ægritudinibus à capite ad pedes," Lugd. 1526, 4to. "Ad totius corporis ægritudines remediorum praxecs, libri v." Baſil 1531, 4to. Eloy. Dict. Hiſt.

GARIS, in *Ancient Geography*, a town of Paleſtine, in Galilee, according to Joſephus.

GARISSOLES, Anthony, in *Biography*, was born at Montauban in the year 1587. Being intended for the profeſſion of theology, he received a ſuitable education, and made a rapid progreſs in all the elementary ſtudies to which his attention was directed. About the age of twenty-four he was admitted to the exerciſe of his miniſterial functions, and

and appointed paſtor of a church. In 1627 he was nominated to the office of profeſſor of divinity at Montauban, the duties of which he diſcharged with great diligence and fidelity till his death in 1650. He was moderator in the national ſynod held at Charenton in the year 1645. His numerous works are chiefly theological; but he was diſtinguiſhed alſo as a Latin poet. His principal poem was entitled "Adolphidos, ſive de bello Germanico, quod incomparabilis heros Guſtavus Adolphus et pro Germaniæ procerum et ſtatuum libertate geſſit." This was an epic poem, in twelve books, and is highly commended for its conſtruction and variety of images, noble ſentiments, and elegant Latinity. Gariſſoles wrote alſo a Latin poem on the coronation of Chriſtina, and another in praiſe of the four proteſtant Swiſs cantons. In teſtimony of their reſpect for his character, and their eſteem of his works, they ſent him in return four ſilver gilt cups, of exquiſite workmanſhip, accompanied with a Latin letter ſigned by the four ſyndics of the four cantons. Moreri.

GARITINA, in *Geography*, a town of European Turkey, in the Morea; 32 miles W. of Argos.

GARIVAN, a town of European Turkey, in Bulgaria, near the Danube; 22 miles S.W. of Driſtra.

GARIZZIM, in *Ancient Geography*, a mountain of Paleſtine, on which ſtood the Samaritan temple, oppoſite to which was mount Ebal, or Hebal; both of which were near the city of Schechem. Theſe two were parted only by a narrow valley of about 200 paces; the former being very fertile, and the latter very barren.

GARLAND, an ornament for the head, made in manner of a crown or chaplet.

The word is formed of the French *guirlande*, and that of the barbarous Latin *garlanda*, or Italian *ghirlanda*. Menage traces its origin from *gyrus*, through *gyrulus*, to *gyrulare*, *gyrlandum*, *ghirlandum*; and at length *ghirlanda*, and *guirlande*; ſo that *guirlande*, and *garland*, are deſcended, in the ſixth and ſeventh degree, from *gyrus*. Hicks rejects this derivation, and brings the word from *gardel handa*; which, in the northern languages, ſignify a *noſegay artfully wrought with the hand*.

Garlands are a ſort of chaplets, made of flowers, feathers, or even of precious ſtones, but eſpecially of flowers; to which the word, in our language, is more immediately appropriated. Janus paſſes in antiquity for the inventor of garlands. Athen. Deipnoſ. lib. xv.

GARLANDS alſo denote ornaments of flowers, fruits, and leaves intermixed; anciently much uſed at the gates of temples, where feaſts, or ſolemn rejoicings were held; or at any other places where marks of public joy and gaiety were deſired; as at triumphal arches, tournaments, &c. Garlands, or feſtoons, were alſo put on the heads of victims, in the ancient heathen ſacrifices. St. Paulinus, in his poem on St. Felix, does not forget the garlands, and crowns of flowers placed at the door of the church, and on the tomb of that ſaint.

The Italians have a ſort of artificers called *feſtaroli*; whoſe office is, to make garlands, or feſtoons, and other decorations for feaſts.

GARLAND, in *Mining*, ſignifies a ſpiral groove, made behind or in the ſtoning or ginging of a ſhaft, for collecting the water which oozes out of different ſtrata, to ſome upper level or ſough by which it can be diſcharged, or to a ciſtern from whence it can be pumped up, without deſcending to the bottom of the ſhaft. Sometimes garlands are conſtructed behind the ſtoning or bricking of a mine ſhaft from the top to the bottom, in order to render the ſhaft dry within-ſide, which is often a matter of ſufficient importance in preſerving the gin-ropes from decay, &c. to repay amply the care and expence of making ſuch garlands.

GARLAND alſo ſignifies a broad hoop of iron, or a ſquare frame of wood, which is uſed in coal-pits, to hold on the coals which are laſt heaped on the corves or gang-waggons, employed for conveying the coals from the bark or face of the work, to the bottom of the drawing-ſhaft, and up the ſame to the pit-hills or bank where they are landed, for ſale, or to be put into gang-waggons or trams above ground, to be conveyed to ſome wharf or great town, &c.

GARLAND, in a *Ship*, denotes a collar of ropes, wound about the head of the main-maſt, to keep the ſhrouds from galling.

GARLAND is alſo a ſort of net, whoſe opening is extended by a wooden hoop of ſufficient ſize to admit a bowl or platter within it. It is uſed by the ſailors as a locker or cupboard to contain their proviſions, being hung up to the deck, within the birth, where they commonly meſs between decks.

GARLAND, *Shot*, is a piece of timber nailed horizontally along the ſhip's ſide from one gun-port to another, and uſed to contain the round ſhot ready for charging the great guns in battle. For this purpoſe it is furniſhed with ſeveral ſemi-globular cavities, correſponding to the ſize of the cannon balls contained in it.

GARLICK, in *Botany*, &c. See ALLIUM.

GARLIC, *Wild*, a name given to a ſpecies of onion.

GARLICK, *Pear*. See CRATEVA.

GARLIESTON, in *Geography*, a ſea-port town of Scotland, in the county of Wigton, ſituated in a cave of Wigton bay, called "Garlieſton bay." It is of modern date, pleaſantly built in the form of a creſcent, and eſteemed an excellent fiſhing ſtation, with ſafe anchorage; ſix miles S. of Wigton. N. lat. 54° 50'. W. long. 4° 25'.

GARLIN, a town of France, in the department of the Lower Pyrenées, and chief place of a canton in the diſtrict of Pau; 16 miles N. of Pau. The place contains 1000, and the canton 7616 inhabitants, on a territory of 172½ kiliometres, in 29 communes.

GARMOUTH, or GARMACH, a burgh of barony in the ſhire of Murray, Scotland, ſtands near the mouth of the river Spey, which here forms a harbour. In this many veſſels are built from the timber out of the contiguous foreſts of Strathſpey and Badenoch. Beſides the ſhipping, and timber trade, Garmouth employs ſeveral ſloops in conveying ſalmon to the London market. The town conſiſts of 304 houſes, and contains about 1200 inhabitants. Moſt of the buildings are conſtructed of clay.

GARN, a town of Sweden, in the province of Upland; 12 miles N.E. of Upſal.

GARNACE, in *Ancient Geography*, a town of Leſſer Armenia, in the diſtrict of Muriana. Ptolemy.

GARNENBERG, a town of Sweden, in Dalecarlia; 5 miles N.E. of Hedemora.

GARNER, a river of England, which joins the Garran, and runs with it into the Wye, 4 miles S.W. of Roſs in Herefordſhire.

GARNER, in *Rural Economy*, a term employed to ſignify, in ſome places, a granary, or repoſitory for corn. It is likewiſe applied to a corn-binn.

GARNET, THOMAS, in *Biography*, was born at Caſterton, near Kirkby-Lonſdale, Weſtmoreland, on the 21ſt of April, 1766. He received his grammar-ſchool education at a village in the neighbourhood, and was, at the age of fifteen, put apprentice to the celebrated mathematician, Mr. Dawſon of Sedbergh, who was at that time a ſurgeon and apothecary. In the year 1785 he commenced his ſtudies at

at Edinburgh, where he took the degree of M.D. in 1788. He thence repaired to London, and purſued his profeſſional ſtudies with great zeal in the chief hoſpitals. He ſettled as a phyſician at Bradford in Yorkſhire in 1790, and began to give private lectures on philoſophy and chemiſtry. Here he wrote his treatiſe on the Horley Green Spa. Bradford did not afford ſufficient ſcope for his practice, and in 1791 he removed to Knareſbrough, ſpending the ſummer at Harrowgate, and the winter at that place: and in 1791 and 92 he publiſhed an analyſis of the different waters of Harrowgate. Whilſt at Harrowgate his reputation greatly increaſed, and he reſolved to leave his reſidence for a field ſtill more calculated to forward his views; and with this opinion he determined to ſail for America. While waiting to take his paſſage at Liverpool, however, he was ſolicited to unpack his apparatus, and to deliver a courſe of lectures there; with which he complied, and gave great and general ſatisfaction, and his fame ſpread around, inſomuch that he was afterwards induced to repeat his courſe at Mancheſter, Warrington, and Lancaſter. He was alſo invited to lecture at Birmingham and Dublin, when he was informed of the vacancy at Anderſon's Inſtitution at Glaſgow, the profeſſorſhip of which was handſomely offered to him, and he began his lectures there in Nov. 1796. In 1798 he began his tour to the Highlands, an account of which he publiſhed in 1800. At the formation of the Royal Inſtitution in London, Dr. Garnet was invited by count Rumford to become the lecturer; he accepted the appointment, and the lecture-room was crowded with perſons of the firſt diſtinction and faſhion. From the time of his arrival in London, however, he turned his thoughts to the practice of his profeſſion, as likely to afford the moſt permanent means of ſupport; but his plans and proſpects were all terminated by death on the 28th of June, 1802. A poſthumous volume, entitled "Zoonomia," was publiſhed for the benefit of his orphan family. See the preface to that work.

GARNET, in *Mineralogy*, a ſpecies conſidered as ſubordinate to the ſiliceous genus of foſſils. The ſubſtances that compoſe it exhibit a remarkable ſimilarity of external form, united, however, to great diſparity in colour, and particularly in the nature and proportion of their component parts. Hence ſeveral attempts have been made at ſubdividing this aſſemblage, and ſome lately diſcovered ſubſtances, obviouſly belonging to the garnet, have been introduced under new names, and as diſtinct ſpecies. Haüy, conformably to the principles of his ſyſtem, has conſolidated under the ſpecific name of *grenat*, the various ſubſtances deſcribed as precious and common garnet, almandine, pyrope, colophonite, topazolete, ſuccinite, and melanite. Werner's diviſion of this ſpecies into the two ſub-ſpecies of *noble* and *common* garnet, though it may not draw a perfect line of demarcation between the two ſubſtances, is ſtill of practical utility, and partly founded on chemical and geological obſervation. We ſhall adopt the ſame diviſion, but add likewiſe, as ſub-ſpecies, the pyrope and melanite, both of which, from geognoſtic conſiderations, are introduced as diſtinct ſpecies into the Wernerian ſyſtem. The uniting into one maſs extenſive ſuites of ſubſtances of various appearance and compoſition, merely becauſe we diſcover the ſame type of cryſtallization in them, is often productive of great inconvenience to the ſtudent; and the ſame may be ſaid of the oppoſite practice of founding ſpecific diſtinctions on characters not ſufficiently important. With regard to the garnet, it is for repeated chemical analyſis to aſſiſt in determining what rank the ſubſtances enumerated under the following ſub-ſpecies may hereafter occupy in the ſyſtem. The chemical diſtinction afforded by the preſence of a greater proportion of lime in the common garnet and the magneſia as a conſtituent part of the pyrope-garnet, though it may aſſiſt in, is ſtill much too vague entirely to regulate, the diſtribution of the granatine ſubſtances.

Sub-ſpecies—1. *Noble Garnet.*—*Almandine*, Karſten. *Oriental garnet.*—*Grenate oriental, ſurian, ſirien, &c.* Colour cherry and blood-red, of various intenſity, paſſing on one ſide into dark crimſon and columbine red, in which the blue often conſiderably predominates; and on the other into hyacinth-red and reddiſh yellow.

It is ſometimes found maſſive and diſſeminated, but generally cryſtallized. The principal modifications of the cryſtals are,

1. The rhomboidal dodecahedron, alſo denominated the garnet-dodecahedron, and which is at the ſame time the primitive form. It is ſometimes found elongated in ſuch a manner that ſix of its planes, taking the form of oblique-angled parallelograms, conſtitute the lateral planes of a ſix-ſided priſm, while three planes at each end preſerving their rhomboidal form, may be conſidered as acuminating planes ſet on the alternate lateral edges of the priſm. (Grenat primitif alongé, Haüy.)

2. The primitive cryſtal having each edge intercepted by a ſingle plane. This modification has 36 planes, 12 of which are rhombs, and 24 hexagons. (Grenat emarginé, Haüy, pl. 46. fig. 57.) It forms the tranſition into

3. The leucite cryſtallization, or roundiſh cryſtal with twenty-four equal, trapezoidal planes; which is deſcribed alſo as a low, double, eight-ſided pyramid, with the lateral planes of the one ſet on the lateral planes of the other, and having each ſummit acuminated by four planes ſet on the alternate lateral edges. (Grenat trapezoidal, Haüy, pl. 46. fig. 56.)

What is deſcribed as leucite cryſtal, in which the angles formed by the meeting of the different trapezoidal planes are truncated, is a variety of modif. N° 2. in which the rhombs are much ſmaller than the hexagons.

4. The garnet dodecahedron having each of its edges intercepted by three planes, or modif. N° 2, increaſed by 48 planes between the rhombs and hexagons, (Grenat trié-marginé, Haüy, pl. 46. fig. 58.)

5. Modific. N° 2, augmented by 24 planes; all the edges formed by the meeting of four hexagons being intercepted each by a narrow plane. (Grenat uniternaire, Haüy, pl. 46. fig. 59.)

Theſe modifications do not excluſively belong to the noble garnet; they all occur, though more rarely, in the common garnet, and at leaſt, N°' 1 and 2, in the melanite garnet.

The cryſtals are found of all ſizes, from that of the head of a ſmall pin to that of a clenched fiſt, and upwards; the latter belonging always to this ſub-ſpecies, and generally to Mod. N° 1. and its elongated variety. They are found imbedded or looſe, not in druſes. Their ſurface is generally ſmooth, but not ſeldom furniſhed with ſtriæ or furrows indicative of the decrement of the laminæ on the rhomboidal primitive planes.

While the external luſtre of the cryſtals and grains varies according to circumſtances, that of the interior is conſtantly more or leſs ſplendent; it is between vitreous and reſinous.

Its fracture is generally perfectly conchoidal, approaching ſometimes to uneven and ſplintery; and in ſome caſes it has been obſerved to border on foliated. Fragments indeterminately angular, more or leſs ſharp-edged; but the maſſive noble garnet, eſpecially that from Norway, is generally compoſed of fine or coarſe-grained concretions, producing, in the

the tranſparent varieties, the appearance of innumerable flaws.

Its tranſparency varies from perfectly tranſparent to tranſlucent at the edges only; and a ſlight degree of cloudineſs is obſerved even in the pureſt.

It is harder than quartz, and its hardneſs appears to be in a ratio with its purity and tranſparency.

It is brittle, and eaſily frangible.

Specific gravity greater or leſs according to the varying proportion of iron it contains: 4.352, Karſten.—4.230, Werner.—4.135, Gellert.—4.085, Klaproth.—4.188, Briſſon.—3.889 (that of Greenland), Lichtenberg.

The chemical characters of the noble garnet are not eaſily ſeized. It is fuſible before the blow-pipe, but requires a high degree and long continuance of heat. In the charcoal crucible it melts into a grey turbid glaſs; and 100 grains, thus fuſed, without any addition, yielded to Klaproth a globule of iron of 23 grains.

We poſſeſs the following analyſes of the noble garnet.

Klaproth.

Silica	35·75
Alumina	27.25
Oxyd of iron	36.0
Oxyd of manganeſe	0.25
Loſs	0.75
	100

Vauquelin, according to Haüy, found 102 parts of what he terms the trapezoidal red garnet of Bohemia to contain, ſilica 36, alumine 22, lime 3, oxyd of iron 41; and the compoſition of ſmall dodecahedral red garnet cryſtals, from Eres-lids, near Barège, the ſame diſtinguiſhed chemiſt ſtates to be ſilica 52, alumine 20, oxyd of iron 17, lime 7·7, loſs 3.3.

The liſt of the localities of the noble garnet, as it is given in the ſyſtems of Mineralogy, is not to be depended upon; moſt of the writers confounding this with ſome varieties of the other ſub-ſpecies: nor is it of any avail barely to know that a mineral is found in Pegu, Ceylon, &c. if we remain ignorant reſpecting the mode in which it occurs there. The lapidaries have much contributed in this reſpect to lead the mineralogiſt into error. Their cuſtom of dignifying by the term of "oriental" every ſtone they conſider of ſuperior quality, is too well known to miſlead; and we ſuſpect that the epithet *Surian* or *Syrian*, given to the noble garnet (but which is probably derived from *Soranus*, a name applied in the middle ages to ſome red ſtone or other), has firſt cauſed Syria, and afterwards Pegu (a town of which is called Sirian) to be introduced into the liſt of the localities of this ſtone. Of the places in Europe where the noble garnet is found, the following may be mentioned: Norway; Sweden (Fahlun, Grapenberg); Greenland; Scotland (Aberdeenſhire, Roſsſhire, and the Long iſland); Siberia; Saxony (Zöblitz, Galenz); Sileſia (Querbach, &c.); Bohemia; Tyrol (Zillerthal, &c.); Stiria (Stubner Alps, &c.); Switzerland; France, &c.

This ſub-ſpecies is a production of the primitive mountains: it is found in mica ſlate, chlorite ſlate, in hornblende and ſerpentine. In gneiſs and granite it occurs but ſeldom. It is never found as the production of any particular mineral repoſitory, ſuch as veins or beds.

The noble garnet is poliſhed and cut like the more valuable precious ſtones, and uſed for ornamental purpoſes. There are alſo ſome engravings to be ſeen in it, both modern and ancient. Of the latter we mention *inſtar omnium*, the Dog-Sirius, by ΓΑΙΟC, the greateſt maſter-piece exiſting in point of deep work and finiſh, which is in the collection of the duke of Marlborough, and is ſaid to be in garnet.

Obſervations.—1. The noble garnet from Greenland, conſiſting of curved lamellar concretions, has been hitherto found only maſſive, in rolled and indeterminately angular pieces.

2. Champeaux deſcribes amorphous and rounded pieces of noble garnet, of the ſize of a pigeon's egg, forming tubercles in a white indurated talc found in the mountains of Courſon, above Traſcuaire, in the Simplon.

3. Noble garnets and pyrope garnets, that have, by decompoſition, loſt their natural colour and become friable, are ſometimes improperly called *unripe garnets*.

4. The primitive form of the garnet is exactly the ſame as that of the cells of bees: the polyhedron exhibited by theſe two bodies is that which offers moſt capacity with the leaſt ſurface. Haüy.

Sub-ſpecies 2.—Pyrope Garnet; Pyrope, Werner; *Bohemian garnet.* It has not yet been found cryſtallized, but only in ſmall and middle-ſized angular and rounded pieces. Its colour is intenſely blood-red, appearing blackiſh red in the larger pieces. Internally its luſtre is ſtrong: it is ſplendent and vitreous. Its fracture is conchoidal, more perfectly ſo than that of the noble garnet: it is completely tranſparent. Hardneſs and ſpecific gravity between thoſe of the common and noble garnet: ſp. gr. 3.941, Werner; 3.718, Klaproth.

Its chemical character is nearly that of the noble garnet; from which it differs, however, according to Klaproth's analyſis, in having magneſia for one of its component parts

Silica	40.00
Alumina	28.50
Magneſia	10.00
Lime	3.50
Oxyd of iron	16.50
Oxyd of magneſia	0.25
Loſs	1.25
	100

Klaproth's Beitr. vol. ii.

The pyrope is almoſt entirely confined to the fletz-trap formation. In the Bohemian middle-mountains (at Meronitz, Podſedlitz, Chraſtian, Terzeblitz, &c.) it is found partly immediately below the upper mould, partly in a greeniſh-grey kind of wacke, and among baſaltic boulders and *contritus* of the ſame, lying immediately under a ſtratum of marle. At Ely in Fifeſhire, Scotland, it is, according to Jameſon, found in the ſand on the ſea-ſhore, and is probably derived from the neighbouring fletz-trap rocks. At Zoblitz, in Saxony, it is ſaid to occur in ſerpentine.

The pyrope or Bohemian garnet of the lapidaries, is next in value to that variety of the noble garnet called oriental or Sirien garnet, and is, like it, cut for ring-ſtones, necklaces, bracelets, &c. It is often a matter of difficulty to diſtinguiſh this ſub-ſpecies from the preceding, when cut; and, indeed, in whatever manner mineralogiſts may diſpoſe of the pyrope in their ſyſtems, the lapidaries can ſcarcely be expected to ſeparate it from the other precious garnet.

In Bohemia, the pyrope and noble garnets conſtitute an article of commerce of the greater importance, as they procure a livelihood to an extenſive claſs of people, who have no other means of ſubſiſting than the digging for and manufacturing this article of luxury. A principal place for theſe garnets is Meronitz, at the Stifleberg; but in ſtill greater abundance they are found at Podſedlitz, Drſkowitz, and Trzeblitz, villages in the circle of Leutmeritz, to the weſt

of the road that leads from Dreſden to Prague. At Meronitz they are dug up without further preparation; but at the laſt-mentioned places a regular ſyſtem of mining is adopted for obtaining them. The firſt proceſs conſiſts in removing the upper ſtratum of mould; after which a ſhaft is ſunk through the marle, where the boulders and the contritus of baſalt appear, the latter of which, being in the form of coarſe blackiſh gravel, is ſent up in baſkets and kept for uſe. Levels or drifts are then excavated, running in ſeveral directions from the bottom of the ſhaft, and, after having yielded their contents, are again filled up with the boulders and rubbiſh.

The next proceſs is that of ſeparating the pyrope garnets from the heterogeneous matter by which they are enveloped; to effect which the baſaltic gravel is put into veſſels filled with water, and ſtirred for a conſiderable length of time; after which the lighter particles are poured off with the water. This proceſs is repeated ſeveral times, till nothing remains at the bottom of the veſſel but the heavier pieces of rubbiſh with the garnets among them, which latter are carefully picked out by women.

The garnets are next paſſed through veſſels pierced with holes of various diameter, by which means they are ſorted into ſix different ſizes: of the largeſt about 32 go to an ounce; the next are thoſe of about 40, 75, 110, 165, 265, and 400 to an ounce of Nuremberg weight; while thoſe ſtill leſs in ſize are ſold partly to the apothecaries, who uſe them for regulating their ſcales; partly to the richer poſſeſſors of gardens, for ornamenting the walks. Pieces of which 16, 20, or 24 go to the ounce, are rarely ſeen; though there are a few inſtances of pieces having been found of as much as one-fifth of an ounce in weight.

The art of cutting and boring theſe garnets occupies a great number of men. The latter of theſe operations is performed in the following manner: The garnet is properly placed and faſtened, after which the diamond, which is fitted up like a glazier's diamond, is placed on the top and rapidly turned by means of a bow. A workman can bore 150 a day.

The larger of the pyrope garnets are cut and poliſhed, which is performed with emeril on a diſk cut out of ſand ſtone. A workman generally finiſhes thirty in a day. This art, which is of very long ſtanding in Bohemia, eſpecially at Carlſbad and Turnau, has been carried to the higheſt perfection at Freiburg and Waldkirch, two towns in Suabia, the latter of which has no leſs than twenty-four mills, and 140 maſters occupied in the manufacturing of this article of commerce.

Sub-ſpecies 3.—*Common Garnet*; *Silex Granatus vulgaris*; *Roche de Grenat*, *&c.*—Its colour is chiefly green and brown of various ſhades; the former occurs as olive, leek, mountain, piſtachio, and graſs green, and alſo paſſes into greeniſh-grey; while the latter, as liver, reddiſh, and yellowiſh-brown, paſſes into browniſh and hyacinth red, and rarely into orange and iſabel, or cream yellow. Both the brown and green varieties appear ſometimes nearly black.

It generally occurs maſſive and diſſeminated, ſeldom as imbedded grains, but frequently cryſtallized. The cryſtals aſſume all the forms belonging to the noble garnet; but they are almoſt conſtantly aggregated and formed into druſes. They ſeldom ſurpaſs the middle ſize, but are uſually ſmall.

Internally the common garnet is more or leſs gliſtening; luſtre between reſinous and vitreous.

Fracture uneven, coarſe, and ſmall-grained, ſometimes approaching to ſplintery, and alſo to ſmall conchoidal. Fragments indeterminately angular, not particularly ſharp edged. When maſſive it often appears to conſiſt of coarſe or fine-grained concretions, of various degrees of coheſion, ſometimes perfectly friable.

It is ſeldom ſemi-tranſparent, generally more or leſs tranſlucent, often only at the edges, ſometimes completely opaque. Hardneſs inferior to that of the noble and pyrope-garnet; it is brittle and eaſily frangible.

Specific gravity 3.737 (green var. from the Bannat) Werner; 3.754 (green, from the Teufelſtein near Schwarzenberg) id.; 3.668 (green var. from Sweden) Karſten.

The common garnet yields much ſooner to the fire than the noble. Before the blow-pipe it loſes its colour and melts without difficulty. The green, before it melts, generally turns grey.

Conſtituent parts.—The green garnet from the Ehrenberg at Ilmenau contains, according to

	Wiegleb	and Merz,
Silica	26.46	40
Alumine	22.70	20
Lime	17.91	8
Iron	16.25	20
Loſs	16.68	12
	100	100

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The conſiderable deficit in both theſe analyſes is remarkable.

The reſult of Klaproth's analyſis of the olive-green garnet, from the river Wilui, in Siberia, is

Silica	44
Lime	33.50
Alumine	8.50
Oxyd of iron	12
—— of manganeſe (a trace only).	
Loſs	2
	100

Klapr. Beitr. vol. iv.

The pitch garnet of Karſten, deſcribed by ſome mineralogiſts under the name of *Colophonite*, but which is nothing but common garnet of a yellowiſh-brown colour, generally occurring in diſtinct granular concretions, conſiſts, according to M. Simon, of

Silica	35
Alumine	15
Lime	29
Magneſia	6.5
Iron	7.5
Manganeſe	4.75
Oxyd of Titane	0.5
Water	1
Loſs	0.75

Bulletin des Sc. Apr. 1808.

From the Daniſh Naturh. Selſkap Skrifter, vol. ii. n. 2. it appears that Prof. Becker found 200 grains of the green garnet from Norway to conſiſt of ſilex 78, iron 64½, alumine 14, lime 42; the loſs being 1½.

Wiegleb, an accurate chemiſt, who examined the green common garnet, from the Teufelſtein in Saxony, could not diſcover a veſtige of alumine in that variety.

Its principal localities are Saxony, (Schwarzenberg, Ehrenfriederſdorf, Berggieſhübel, Schneeberg, Geier, &c.); Sileſia; Bohemia (in ſeveral parts); Hungary (Dognatzka,

Orawitza, Wadarna, Saſka, Dobſchau); Saltzburg (Zillerthal, Thal-Achen, mountains of Brennthal, &c.); Tyrol (Schwatz); Norway (var. called Colophonite, and others); Sweden (Garpenberg, Fahlun, Dannemora); Siberia; Ireland; Kamtſchatka (fine bright green variety.)

The geognoſtic ſituation of the common garnet is that in beds, in the older primitive rocks, where it occurs partly maſſive, partly cryſtallized in druſes; and it is (contrary to what we know of the noble garnet) but ſeldom ſeen diſſeminated in, or mixed with, other rocks. Sometimes it forms entire beds by itſelf, for inſtance in the Saxon and Bohemian Ertzgebirge, &c. It accompanies various ores, ſuch as copper and iron pyrites, magnetic and red iron ſtone, galena, blende, &c. It occurs with epidote, with ſahlite, and other varieties of pyroxene, in the iron mines of Norway; with table-ſpar, tremolite, calcareous ſpar, &c. at Dognatzka, and in other places of the Bannat.

The uſes to which the common garnet is applied are by no means various. In ſome countries where the green variety is found in abundance, it is, on account of its eaſy fuſibility, and of the conſiderable portion of iron that enters into its compoſition, advantageouſly employed as a flux in the ſmelting of iron ores.

Obſervations.—1. The brown variety often reſembles tin ſtone, and is by ſome called tin garnet; whence, probably, the miſtaken notion ſo often repeated by authors, that tin enters into the compoſition of ſome garnets.

2. The *Hyacinthe la belle*, conſidered by ſome as a variety of the common garnet, is (if we have the right ſpecimen before us) the lighteſt reddiſh-yellow variety of the noble garnet.

Subſpecies 4.—*Melanite Garnet; Black Garnet.*—Colour deep or velvet-black when freſh; worn off it becomes greyiſh-black.

It occurs cryſtallized; cryſtals thoſe of N° 1, and particularly of N° 2, of the noble garnet; they are middle-ſized and ſmall. The rounded pieces are the ſame, only diſturbed in their developement. Externally they are more or leſs ſmooth and ſhining; internally gliſtening.

Fracture imperfectly ſmall conchoidal. Fragments indeterminately angular, ſharp-edged.

It is perfectly opaque, not particularly hard, but very brittle. Specific gravity 3.800, Werner; 3.691, Karſten.

Conſtituent parts, according to Klaproth's analyſis,

Silica	35.5
Alumine	6
Lime	32.5
Oxyd of iron	25.25
Oxyd of manganeſe	0.4
Loſs	0.35
	100

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The melanite has been found at Fraſcati near mount Veſuvius, imbedded, as it is ſaid, in a baſaltic maſs, which alſo includes feldſpath, Veſuvian, and hornblende; the looſe cryſtals are generally picked up in the fields of the ſame neighbourhood, as alſo about Rome. Near mount Somma it occurs imbedded in a calcareous rock, according to Breiſlak. It is likewiſe found in Bohemia in the Brenzlau-circle, and near Teplitz; for, from the deſcription given by Reuſs (in Sammlung Nat. Hiſt. Aufsätze, p. 307), the two foſſils occurring there in baſalt, the one accompanied by hornblende and augite, the other by common olivine, mica, and calcareous ſpar, appear to agree in all the eſſential characters with the Italian melanite.

Whether the black garnet of Eres-lids, analyſed by Vauquelin, belong to this ſub-ſpecies, remains ſtill to be determined. It conſiſts of ſilica 43, alumine 16, lime 20, oxyd of iron 16, and water 4.

The mineral ſubſtance from Arendal in Norway, deſcribed by Mr. Ingverſen as melanite, is, by Mr. Emmerling, ſuſpected to be nothing but augite (Pyroxène, Haüy.)

GARNET, in a *Ship*, is a tackle having a pendant coming from the head of the main-maſt, with a block ſtrongly ſeized to the main-ſtay, juſt over the hatch-way; in which block is reeved the runner, which hath a block at one end, in which are hitched the ſlings; and at the other end is a double block, in which the fall of the runner is reeved; ſo that by its means any goods, or caſks, that are not over heavy, may be haled and hoiſed into, or out of the ſhip: when this garnet is not uſed, it is faſtened along by the ſtay at the bottom of it.

GARNET, *Clew.* See CLEW-*garnet*.

GARNIER, ROBERT, in *Biography*, was born in 1545 at La Fertè Bernard, in Maine. He was educated for the profeſſion of the law, and attained to conſiderable rank in that line, but in his advanced years Henry IV. created him a counſellor in his grand council. He died at Mans in the year 1601. He was attached to poetry in his youth, and while ſtudying at Toulouſe obtained a prize in the Floral games of that city. He was afterwards known as a writer of tragedies, and is conſidered as one of the creators of the French theatre. Moreri.

GARNISH, in ſome ancient writings and ſtatutes. To garniſh the heir ſignifies to warn the heir. 27 Eliz. cap. 3.

GARNISHEE, in *Law*, the party in whoſe hands money is attached within the liberties of the cities of London; ſo called in the ſheriff's court, becauſe he has had garniſhment, or warning, not to pay the money, but to appear and anſwer to the plaintiff-creditor's ſuit.

GARNISHING is popularly uſed for the furniture, aſſemblage, or fortment, neceſſary for the uſing or adorning any thing.

The word is French, formed of the verb *garner*, to furniſh, or fit out.

The garniſhing of a diſh conſiſts of certain things which accompany it, either as a part and ingredient thereof; in which ſenſe pickles, muſhrooms, oyſters, &c. are garniſhing: or as a circumſtance, or ornament; as when leaves, flowers, roots, &c. are laid about a ſervice to amuſe the eye.

The ſame word is uſed for the finer herbs, fruits, &c. laid about a ſallad: garniſhings are of lemon, piſtachios, pomegranate, yolks of hard eggs, artichoke-bottoms, capers, truffles, ſweet-bread, &c.

GARNISHMENT, in *Law*, denotes a warning given any one to appear, for the better furniſhing of the cauſe, and court. Thus, if one be ſued for the detinue of certain charters; and ſays, they were delivered to him, not only by the plaintiff, but by J. S. alſo; and therefore prays, that J. S. may be warned to plead with the plaintiff, whether the conditions are performed or not. In this petition he is ſaid to pray garniſhment; which may be interpreted, a warning to J. S. to provide himſelf for a defence; or elſe a furniſhing the court with all parties to the action, whereby it may thoroughly determine the cauſe.

GARONNE, in *Geography*, a river of France, which riſes in the Pyrenées, and joining with the Dordogne, about 12 miles below Bourdeaux, changes its name to Gironde.

GARONNE,

GARONNE, *Upper*, one of the departments of France, in the S.W. or Garonne region, formerly Upper Languedoc, in 43° 20′ N. lat. is bounded on the N. by the department of the Lot, on the N.E. by the department of the Tarn, on the S.E. by the departments of the Aude and the Arriege, on the S. by Spain, and on the W. by the departments of the Upper Pyrenées and the Gers. It takes its name from the river Garonne, which paſſes through it. Its capital is Toulouſe. Its extent is 8,077½ kiliometres, or 408 ſquare leagues, and it contains 432,263 inhabitants, in five diſtricts *viz.*: Caſtel-Sarrazin, including 66,397 inhabitants, on 1,220 kiliometres, and 86 communes; Toulouſe, having 126,140 inhabitants, on 1,695 kiliometres, and 142 communes; Villefranche, containing 53,356 inhabitants, 955 kiliometres, and 99 communes; Muret, including 78,905 inhabitants, 1,800 kiliometres, and 130 communes, and St. Gaudens, having 107,465 inhabitants, 2,407½ kiliometres, and 234 communes. Its contributions amount to 4,554,341 francs, and the expences charged upon it for adminiſtration, juſtice, and public inſtruction, amount to 432,316 fr. 66 cent. This department, lying between Lot and the frontier of Spain, conſiſts of hills, and tolerably fertile plains; producing grain, fruits, wine of an indifferent quality, paſtures, and conſiderable foreſts, with quarries of marble, and mineral ſprings.

GARONNE and *Lot*. See LOT and *Garonne*.

GAROSMUS, in *Botany*, from γαρον, *garum*, the liquor of pickled fiſh, and οσμη, *a ſmell*. Dodoen. Pempt. 616. A name very well applied by Valerius Cordus to the *Chenopodium olidum*, Fl. Brit. 277. Engl. Bot. t. 1034, whoſe intolerable fetor, when the plant is touched, reſembles corrupted ſalt-fiſh. Lobel relates a ſtory of its being peculiarly attractive to dogs.

GAROUAI, or GAROVAY, in *Geography*, a town of Africa, on the Grain coaſt, on the river St. Clement.

GARRA, LANA, or *Neratte*, in *Ancient Geography*, a town of Mauritania Cæſarienſis, mentioned by Ptolemy; it was ſituated towards the N.E. of Victoria, and had been epiſcopal.

GARRACHICA, in *Geography*, a town of the iſland of Teneriffe, which had formerly been a ſea-port; but the harbour being deſtroyed by an earthquake and eruption of the volcano on the peak in 1704, the houſes are now built where the ſhips lay at anchor.

GARRACOURY, a town of Hindooſtan, in Marawar; 20 miles S.S.E. of Trumian.

GARRAF, town of Spain, in Catalonia, near the ſea-coaſt; 10 miles S.W. of Barcelona.

GARRAN, a river of England. See GARNER.

GARRARD, a county of Kentucky, in America, S.E. of Madiſon county, on the ſouth ſide of Kentucky river.

GARRAWAY, a town of Africa, on the Slave coaſt. N. lat. 4° 10′. W. long. 8°.

GARREFIO, a town of France, in the department of the Stura; 9 miles S.W. of Ceva.

GARRETS, the uppermoſt rooms of a houſe in whole or in part in the roof. When the roof comes very low in the garrets, the angles are cut off by aſhlering, ſo as to have a conſiderable upright on the ſides.

GARRET-DENNIS, in *Geography*, an iſland in the eaſtern Pacific ocean, about 42 miles in circumference, inhabited by blacks, who are armed with lances, bows, and arrows; ſituated to the north of New Ireland. S. lat. 2° 30′. E. long. 151° 25′.

GARRIA, in *Ancient Geography*, an epiſcopal town of Africa, in the Byzacene territory.

GARRICK, DAVID, in *Biography*, was born in Hereford in the year 1716. He was deſcended from a French family, who fled to England on the revocation of the edict of Nantes. His father was a captain in the army, and uſually reſided at Litchfield, but at the time of David's birth he was, in the duties of his profeſſion, at Hereford. The youth was educated partly at the grammar-ſchool at Litchfield, and partly under the celebrated Dr. Johnſon. He was in very early life diſtinguiſhed by his ſprightlineſs, and by a great paſſion for the drama. When he was but eleven years of age, he engaged his young companions to aſſiſt in getting up and acting the Recruiting Officer, in which he took the part of ſerjeant Kite. It was not till he was about nineteen years old, and after he had made a trial in buſineſs, that he was placed under Dr. Johnſon to improve in polite literature. At this period the love of the ſtage had taken ſuch firm poſſeſſion of the mind of young Garrick, that it left little room for claſſical ſtudies, and he was writing ſcenes in comedies, of his own invention, when he ought to have been compoſing ſcholaſtic exerciſes. Whatever might have been his youthful failings, he had the addreſs to ingratiate himſelf with his tutor, and they travelled together to the metropolis about the year 1737. Garrick was at firſt ſent to reſide with Mr. Colſon, an eminent mathematician at Rocheſter, with the intention of obtaining ſome general knowledge previouſly to entering at the Temple. After this, by a change of circumſtances in his family, he entered into partnerſhip with his brother in the wine trade, which he ſoon relinquiſhed with a determination of following his favourite plan of becoming an actor by profeſſion. In 1741 he began a ſummer's campaign at Ipſwich, and played a variety of parts with uniform ſucceſs. From Ipſwich he came to London, and in October of the ſame year he made his appearance at the theatre in Goodman's Fields. He choſe for his firſt part the character of Richard III. as one that would not require a dignity of perſon which he did not poſſeſs; while it would give ſcope to all thoſe ſtrong marks and changes of paſſion in which his principal excellence ever conſiſted. His natural mode of recitation, though a novelty in tragedy to a London audience, produced its intended effect, and never was an audience betrayed into more hearty and unfeigned applauſe. The part was repeated for ſeveral ſucceſſive nights, and was followed by others both in tragedy and comedy; "and ſuch," ſays a critic, "was the blaze of fame attending the new actor, that the eſtabliſhed theatres were deſerted, and ſtrings of carriages from the polite part of the town thronged the ſtreets of the city." While he was at Goodman's Fields he appeared as a dramatic writer in two pieces, entitled "The Lying Valet" and "Lethe," which were well received, and which are ſtill occaſionally acted. In 1742 he was drawn over to the theatre at Drury Lane, and at the cloſe of the ſeaſon he went to Dublin, where he was received with an admiration bordering upon extravagance. Here the theatre was ſo crowded that an epidemic diſeaſe, which broke out in that capital, was called the Garrick fever. Upon his return to London he took up ſome new parts, and among others that of Abel Drugger, in which he excited great ſurprize, by baniſhing from one of the moſt lively and expreſſive countenances every veſtige of ſenſe, and putting on the ſtare of ſtupidity. By this theatrical degradation he is ſaid to have wrought an unlucky cure in a young lady of fortune who had fallen in love with him in the characters of Chamont and Lothario. No actor, it is ſuppoſed, ever more thoroughly adopted, for the time, the characters which he ſuſtained; and his attention to propriety was uniformly

uniformly ſupported by every look and geſture while he continued in ſight of the audience, whether ſpeaking or ſilent. In the ſpring of 1747 he commenced his career as a theatrical manager. He was admitted as an equal partner, and on moderate terms, with Lacy the patentee. The two managers wiſely took different provinces: that of Lacy was the care of the ſcenes, and the domeſtic economy, while Garrick ſuperintended the choice of plays, the diſtribution of parts, and the treaties with authors and actors. The theatre was opened in September 1747, with a prologue by Mr. Johnſon. This was the prelude of a better era of dramatic exhibitions; in particular it uſhered in the revival of a number of Shakſpeare's plays, freed from the taſteleſs and incongruous additions which had been made to them by the writers of the paſt century. Garrick was the living commentator of the great dramatiſt, and by the force of his action he called forth all the latent beauties of the author, and excited in the audience ideas which might otherwiſe for ever have eſcaped their notice.

In 1749 Garrick entered into the marriage life with Mademoiſelle Violetti, who had been a dancer on the ſtage, but who had borne a moſt irreproachable character. The union was a ſource of mutual felicity till it was diſſolved by death. In his character of manager he was frequently engaged in unpleaſant controverſies with authors, though it is admitted on all hands that his treatment of dramatic writers was more liberal than that of former managers. He, however, ſometimes paſſed a judgment upon works which the event proved to be erroneous, nor was he diſpoſed to revoke a ſentence once given. But in general he kept on good terms with the moſt reſpectable writers, and received from many of them that praiſe, to attain which ſeemed almoſt the chief object of his life. By the public, Garrick was ſometimes cenſured as parſimonious, with reſpect to the providing of thoſe ornamental decorations and ſplendid exhibitions, which are as neceſſary to pleaſe the eye, as the more rational part of the entertainment is to ſatisfy the judgment.

In 1763 our author and actor reſolved to relax from his great cares and fatigues in a tour to the continent. Accompanied by his wife, from whom he was inſeparable, he viſited ſeveral parts of Italy and France, and met with flattering notice from many perſons of diſtinction. At this time Mademoiſelle Dumeſnil was the favourite actreſs in Paris, but Garrick, without heſitation, ventured to foretel that Clairon would excel all her competitors, and the reſult verified his predictions. Garrick returned after an abſence of 18 months, and was welcomed with raptures. The prologue ſpoken by him on his firſt night was one of the happieſt efforts of the kind, and he was obliged to repeat it 10 ſucceſſive nights. He was thought to be even improved in his ſtyle of acting, and likewiſe in his general knowledge of drama; and in 1766 he brought out the comedy of "The Clandeſtine Marriage," the joint production of himſelf and Colman. An important event in the life of Garrick was the celebration of the Shakſpeare jubilee. A mulberry-tree, planted at his native town, Stratford-upon-Avon, by the immortal bard, being cut down, the wood of it was converted into a number of toys and implements, which were eagerly purchaſed. The corporation of the town preſented to Garrick the freedom of the place in a box made from the wood of the tree, as a proper compliment to one who had done the poet ſo much honour. This incident ſuggeſted to him the idea of a feſtival in commemoration of Shakſpeare, upon the very ſpot where he was born, and the idea was put into execution in the autumn of 1769. Temporary buildings were raiſed for the occaſion, and various entertainments were planned to ſuit a variety of taſtes. Company of almoſt all ranks, and from diſtant parts of the kingdom, aſſembled to celebrate the memory of the poet. The jubilee laſted three days, but the weather was exceedingly unfavourable, and the pleaſure enjoyed was by no means equal to that which the enthuſiaſtic admirers of Shakſpeare had anticipated. Nevertheleſs Garrick, who was the ſoul of the feſtival, exerted all his talents to gratify both the eye and the underſtanding. He compoſed ſeveral ſongs for muſic, and an ode of conſiderable length to the honour of his hero. Here he expended a conſiderable ſum of money, and in the winter he took a method of reimburſing himſelf. "The jubilee was made a theatrical exhibition, which became ſo popular that it was repreſented, night after night, for more than half the ſeaſon, to crowded audiences."

In 1773 the death of Mr. Lacy threw the ſole management of the theatre on Mr. Garrick, but his health was on the decline, and the period of his life ill adapted to additional labours. He continued, however, in the diſcharge of his profeſſional duties ſome time longer, and rendered an eſſential ſervice to the profeſſion, which he had dignified, by perfecting the plan of an inſtitution for the relief of decayed actors, and he contributed to its fund with much liberality. At length he determined on his retreat, and in January 1776 he parted with a moiety of the Drury-lane patent for the ſum of 35,000*l*. The laſt character in which he appeared was Don Felix in the "Wonder," for the benefit of the theatrical fund. At the concluſion of the play he made a brief farewel addreſs to the audience, which the genuine feelings of regret on both ſides rendered truly pathetic; and few perſons ever quitted a public ſtation with more deſerved plaudits. About Chriſtmas, 1778, being upon a viſit at the ſeat of earl Spencer, he was ſeized with ſome alarming ſymptoms, which induced him to haſten to London. He died on January 20, 1779, and his remains were interred with great pomp in Weſtminſter-abbey, attended by many perſons of the firſt diſtinction in rank and talents. The whole life of Garrick was active, and full of occurrences, which cannot in this ſketch be given with any degree of preciſion. He continued, however, in the unmoleſted enjoyment of his fame and unrivalled excellence to the moment of his retirement. He never had a competitor. Tragedy, comedy, and farce, the lover and the hero, the jealous huſband who ſuſpects his wife without cauſe, and the thoughtleſs lively rake who attacks without deſign, were all alike his own. Rage and ridicule, doubt and deſpair, tranſport and tenderneſs, compaſſion and contempt; love, jealouſy, fear, fury, and ſimplicity, all took, in turn, poſſeſſion of his features, while each of them appeared, on the proper occaſion, to be the ſole poſſeſſor of his heart. In ſhort, Nature, the miſtreſs from whom alone this great performer borrowed all his leſſons, being in herſelf inexhauſtible, this her darling ſon appeared as her trueſt repreſentative, and found an unlimited ſcope for change and diverſity in his manner of copying from her various productions. There is one part of his theatrical conduct which ought to be recorded to Garrick's honour, ſince the cauſe of virtue and morality, and the formation of public manners, are conſiderably dependent upon it; and that is, the zeal with which he aimed to baniſh from the ſtage all thoſe plays which carry with them an immoral tendency, and to prune from thoſe which do not abſolutely, on the whole, promote the intereſts of vice, ſuch ſcenes of licentiouſneſs and liberty as a redundancy of wit and too great livelineſs of imagination have induced ſome of our comic writers to indulge themſelves in, and to which the ſympathetic diſpoſition of the age has given ſanction.

Garrick was in character a man of the world, whoſe vivacity and apparent volatility did not interfere with the ſteady purſuit

purſuit of fame and fortune. In this he was guided by great good ſenſe and diſcretion, and a ſpirit of order and economy. He has been reproached with the imputation of avarice; but his mode of living was hoſpitable and generous, and his bounty frequently flowed in a large ſtream of munificence. His principal foible was vanity, which made him inordinately fond of adulation, as he was impatient of cenſure and ridicule. This propenſity rendered him culpably jealous of rivals, and he is charged with endeavouring to keep down thoſe riſing talents from which he feared competition. In his commerce with the great he was attentive and reſpectful, yet with freedom enough to make him an excellent companion. As an actor, it ſeems to be allowed that none ever ſurpaſſed him in the truth and nature with which he identified himſelf with the fictitious object of his repreſentation, ſo that he ſeemed to have darted his ſoul ſucceſſively into all the forms which he aſſumed. This faculty he diſplayed equally in the moſt comic and the moſt tragic parts, and it has ſcarcely yet been decided in which of the two his chief excellence lay. His voice and his eye were calculated for every poſſible expreſſion of mental feeling. Expreſſion, indeed, was his great ſtrength, and the parts in which he beſt ſucceeded were thoſe in which paſſion moſt predominated. In the enunciation of calm ſentiments, decorated by poetical language, he had ſuperiors. His literary talents were reſpectable; he compoſed ſome ſmart epigrams, many pleaſant and well adapted prologues, entertaining and dramatic pieces, and lively poems of the humorous and familiar claſs.—Davies' Life of Garrick.

GARRIDER, in *Geography*, a town of Hindooſtan, in Guzerat; 60 miles W.S.W. of Gogo.

GARRISON, in the *Art of War*, a body of forces diſpoſed in a fortreſs, to defend it againſt the enemy, or to keep the inhabitants in ſubjection, or even to be ſubſiſted during the winter ſeaſon.

Du-Cange derives the word from the corrupt Latin *garniſio:* which the later writers uſed to ſignify all manner of munition, arms, victuals, &c. neceſſary for the defence of a place, and the ſuſtaining of a ſiege.

Garriſon, and winter quarters, are ſometimes uſed indifferently for the ſame thing; and ſometimes they denote different things. In the latter caſe, a garriſon is a place wherein forces are maintained to ſecure it, and where they keep regular guards; as, a frontier town, a citadel, caſtle, tower, &c. The garriſon ſhould always be ſtronger than the townſmen.

Winter quarters ſignify a place where a number of forces are laid up in the winter ſeaſon, without keeping the regular guard. The ſoldiers, therefore, like better to be in winter quarters than in garriſon.

GARRISON *Carriages* are thoſe on which all ſorts of garriſon pieces are mounted. See CARRIAGE.

GARRISON *Guns*. See CANNON.

GARRISON *Town*, denotes generally a ſtrong place in which troops are quartered, and do duty, for its ſecurity; keeping ſtrong guards at each poſt, and a main guard in, or near the market-place.

GARROWS, in *Geography*, a country of Aſia, ſituated between Bengal and Aſſam.

GARRULUS, in *Ornithology*, a ſpecies of AMPELIS, which ſee. This bird is alſo denominated *garrulus Bohemicus*, the Bohemian magpie, or chatterer. It has a ſharp-pointed creſt on the head reclining backwards, and horny appendages from the tips of ſeven of the ſecondary feathers, of the colour and gloſs of the beſt red-wax; the bill, throat, legs, and tail, are black. The native country of theſe birds is Bohemia, from whence they wander over Europe, feeding on grapes where vineyards are cultivated; and they are eſteemed delicious food. Pennant ſays they appear but by accident in South Britain; about Edinburgh in February, which they viſit annually, feeding on the berries of the mountain-aſh, and as far ſouth as Northumberland, making the berries of the white thorn their food.

GARRULUS is a name given by Briſſon to ſeveral ſpecies of the *Corvus*, which ſee.

GARRULUS *Argentoratenſis*, a name given by Ray to the CORACIAS *Garrula*, which ſee.

GARRY, in *Geography*, a river of Scotland, which runs into the Tay, ſix miles N. of Dunkeld.

GARSCHAW, a town of Pruſſian Pomerelia; 16 miles S. of Dantzic.

GARSDEN, a town of Samogitia; 30 miles W. of Miedniki.

GARSTADT, a town of the principality of Wurzburg; three miles S.S.W. of Schweinfurt.

GARSTANG, a market, corporate town, and pariſh in the hundred of Amounderneſs, and county of Lancaſter, England, contains only 62 houſes and 731 inhabitants. It is ſeated on the weſtern bank of the river Wyre, and on the great road between Lancaſter and Preſton, about eleven miles diſtant from each of thoſe places. This town was incorporated by king Charles II., and is governed by a bailiff and ſeven capital burgeſſes, who are inveſted with authority to try all miſdemeanors committed within their liberty. It has a weekly market on Thurſday, with three annual fairs; and the Lancaſter canal, which now paſſes by it, will be of eſſential advantage in a commercial view, and tend to ſurmount thoſe obſtacles which have operated againſt the eſtabliſhment of any conſiderable manufactory in the town. The pariſh church, which is about a mile to the ſouth, at a place called Garſtang-church-town, having been weakened and undermined by an inundation of the river Wyre, was taken down and rebuilt in the year 1746, at the expence of 1910*l*. It was formerly impropriated to the abbey of Cockerſand, and has chapels at Market-Garſtang and Pilling.

A large printing cotton and calico manufactory has been long eſtabliſhed at Catteral, about two miles ſouth of the town; and at Seorton, three miles; Dolphinholm, five miles; and Catſtraw, ſeven miles, all to the north-eaſt, are various ſpinning manufactories; and another about three miles to the ſouth-eaſt.

Within a mile north-eaſt of Garſtang are the ruins of Greenhaugh caſtle, of which only one tower remains, and that in a very ſhattered ſtate; but it ſeems to have conſiſted originally of ſeven or eight towers of great height and ſtrength. Some writers have dated its foundation in the times of the Saxon heptarchy; but others attribute it to Thomas Stanley, the firſt earl of Derby, in the reign of Henry VII., as a place of protection from the nobles, whoſe eſtates he had obtained on their being proſcribed as traitors.

In the vicinity of the town are Kirkland-hall, the ſeat of Alexander Butler, eſq.; Myerſcough-houſe, an ancient manſion, the ſeat of Charles Gibſon, eſq.; and Claughton-hall, the ſeat of William Fitzherbert Brockholes, eſq. who has greatly improved a large moraſs on his eſtate by means of draining, &c. The Brockholes' family appear to have reſided here from the time of Henry VII.

About three miles W. of Garſtang, is the eaſt-ſide of Pilling-Moſs, the ſcene of a phenomenon, of which an account, to the following effect, was given in the Philoſophical Tranſactions, No. 475. "On Saturday, the 26th of January, 1744-5, a part of Pilling-Moſs, lying between Heſcomb-houſes and Wild Bear, was obſerved to riſe to a ſurpriſing height.

height. After a ſhort time it ſhrunk as much below the level, and moved ſlowly towards the ſouth ſide; and in half an hour it covered twenty acres of land. The improved land adjoining to that part of the moſs, which moves in a concave circle, containing near 100 acres, is nearly filled up with moſs and water, and in ſome parts is thought to be five yards deep. One family is driven out of their houſe, which is quite ſurrounded, and the fabric is tumbling down. The part of the moſs, which is ſunk like the bed of a river, runs north and ſouth, and is above a mile in length, and half a mile in breadth. When the moſs began to move, a man was paſſing over it from the weſt, who perceived, to his great aſtoniſhment, that the ground moved ſouthward. By a ſpeedy return, he had the good fortune to eſcape being ſwallowed up."

GARTACH, a town of Wurtemberg, on a ſmall river which runs into the Necker; 5 miles N.W. of Heilbrunn.

GARTAU, or GARTO, a town of Germany, in the principality of Luneburg-Zell; 48 miles E.S.E. of Luneburg.

GARTEMPE, a river of France, which runs into the Creuſe, near Roche-Poſay, in the department of the Indre and Loire.

GARTER, περιοχελι, a ligature to keep up the ſtockings; it is alſo particularly uſed for the badge or cognizance of a noble order of knights, hence denominated the

GARTER, *Order of the*, a military order, next in dignity after the nobility, inſtituted by king Edward III. in 1344, under the title of the "ſovereign and knights-companions of the moſt noble order of the Garter."

This order conſiſts of twenty-ſix knights, or companions, generally peers or princes; whereof the king of England is the ſovereign, or chief.

The habits and enſigns of this order, moſt of which have been occaſionally varied, with regard to their form, materials, or colour &c. conſiſt of the garter, mantle, ſurcoat, hood, George, and collar.

The *garter* gives denomination to the order, and is deemed ſo honourable, that the bare inveſtiture with it makes the perſon, who receives that honour, a companion of the moſt noble military order ever known. The garter uſed in the ceremony of election, and which each knight wears on the left leg a little below the knee, is of blue velvet, edged with gold; with this motto; "honi ſoit qui mal y penſe," *q. d. ſhame to him that thinks evil hereof*, which is wrought on the garter in ſolid gold; and they bear this motto ſurrounding their arms. The buckle and pendant are richly chaſed and engraved. The meaning of the motto is ſaid to be, that king Edward, having laid claim to the kingdom of France, retorted ſhame and defiance upon him that ſhould dare to think amiſs of the juſt enterpriſe he had undertaken for recovering his lawful right to that crown; and that the bravery of thoſe knights whom he had elected into this order was ſuch as would enable him to maintain the quarrel againſt thoſe who thought ill of it.

They are a college or corporation, having a great and little ſeal; their officers are a prelate, chancellor, regiſter, garter king at arms, and the uſher, or black rod.

Beſides which, they have a dean and twelve canons, with petty canons, vergers, and twenty-ſix penſioners, or poor knights.

The prelate is the head; and the office is veſted in the biſhop of Wincheſter; next to him is the chancellor, which office is veſted in the biſhop of Saliſbury, who keeps the ſeals. The office of regiſter is annexed to the deanery of Windſor. All theſe officers, except the prelate, have fees and penſions.

The order is under the patronage and protection of St. George of Cappadocia, the tutelar ſaint of this kingdom. Their college is held at the caſtle of Windſor, within the chapel of St. George, and the chapter-houſe, erected by the founder for that purpoſe. Their robes, &c. are the garter, decked with gold and gems, and a buckle of gold, to be worn daily; and at feaſts and ſolemnities, a mantle, ſurcoat, high velvet cap, collar of SS's, compoſed of roſes enamelled, &c.

The mantle is the chief of thoſe veſtments made uſe of on ſolemn occaſions. It is of blue velvet lined with white taffeta; and to its collar is faſtened a pair of long ſtrings, with large taſſels, called "cordons," made of blue ſilk intermixed with gold. On the left breaſt of this mantle are placed the arms of the order within the garter, richly embroidered. The mantle worn by the ſovereign is diſtinguiſhed by having a longer train than that of the knights. The mantle, worn by the founder at the firſt feaſt of the order, was of fine woollen cloth, as the mantles then made for the knights undoubtedly were: mantles made of velvet firſt occur about the beginning of the reign of king Henry VI. The colour of theſe mantles is, by the founder's ſtatute, appointed to be blue; and it ſo continued till the reign of queen Elizabeth, when it was changed to purple, and this was retained till about the 12th year of king Charles I., when he reſtored the colour of the mantle to its original inſtitution. In the reign of king Henry VI., it ſeems to have been the mode to ornament the mantle with three or four welts drawn down the ſides and round the bottom.

The *ſurcoat*, or *kirtle*, as well as the mantle, was originally compoſed of woollen cloth, and ſo continued, at leaſt till the reign of Edward IV., about which time it was made of velvet. Anciently, the colour of this veſture changed every year, commonly into blue, ſcarlet, ſanguine in grain, or white; it is now made of crimſon velvet, lined with white taffeta.

The *hood* was formerly worn on the head at all public ceremonies, and made of the ſame materials as the mantle, and ſometimes was trimmed or ſet off with a ſmall proportion of garters; but it is not now uſed in the ſame manner as formerly, but remains fixed to the mantle as part of the habit; and, inſtead of the hood, the ſovereign and knights now wear on their heads a cap of black velvet, deep in the crown, lined with taffeta, and adorned with a large plume of oſtrich feathers, in the centre of which is a tuft or aigrette of heron's feathers; theſe feathers are uſually fixed to the cap by a band of diamonds. The cuſtom of wearing theſe caps and feathers, at the great ſolemnities of the order, had ſometimes been omitted, in and before the reign of James I., and therefore, in a chapter held on the 13th of April, in his 10th year, the cuſtom of wearing the cap and feathers was eſtabliſhed.

The *collar* of the order is of gold, weighing 30 ounces Troy; it is compoſed of 26 pieces, in the form of the garter enamelled blue, with the motto of the order in gold; in the centre of each garter is a roſe, enamelled red, ſeeded gold, and leaved green: theſe 26 garters are faſtened together with as many knots of gold. At the middle of it, pendent to one of the garters, is the *badge* of the order, being the figure of St. George armed, ſitting on horſeback, and with a ſpear, encountering a dragon, which lies on his back under the horſe's feet.

The ſovereign and each knight wear in common the above badge, a figure of St. George within the garter, all of gold, (called the Leſſer George) appendant to a broad deep blue ribbon, which ties on their left ſhoulder, and paſſes thence down

down to their right hip. They are not to appear abroad without the garter, on penalty of 6*s.* 8*d.* paid to the regiſter. On the left breaſt of their coats, cloaks, riding habit, or upper garment, they alſo wear a ſtar of eight points, embroidered with ſilver, having in the centre of it the arms of the order, *viz.* argent, a croſs gules, within a garter.

The manner of electing a knight-companion into this moſt noble order, and the ceremonies of inveſtiture, are as follow. When the ſovereign deſigns to elect a companion of the garter, the chancellor of the order draws up the letters, which, paſſing both under the ſovereign's ſign manual, and ſignet of the order, are ſent to the perſon by Garter principal king at arms; and are to this effect: "We, with the companions of our moſt noble order of the garter, aſſembled in chapter, holden this preſent day at our caſtle at Windſor, conſidering the virtuous fidelity you have ſhewn, and the honourable exploits you have done in our ſervice, by vindicating and maintaining our rights, &c. have elected and choſen you one of the companions of our order. Therefore, we require you to make your ſpeedy repair unto us, to receive the enſigns thereof, and be ready for your inſtallation upon the day of this preſent month, &c." The garter, which is of blue velvet, bordered with fine gold wire, having commonly the letters of the motto of the ſame, is, at the time of election, buckled on the left leg by two of the ſenior companions, who receive it from the ſovereign, to whom it was preſented on a velvet cuſhion by Garter king at arms, with the uſual reverence, whilſt the chancellor reads the following admonition enjoined by the ſtatutes: "To the honour of God omnipotent, and in memorial of the bleſſed martyr St. George, tie about thy leg, for thy renown, this noble garter; wear it as the ſymbol of the moſt illuſtrious order, never to be forgotten or laid aſide; that thereby thou mayeſt be admoniſhed to be courageous, and having undertaken a juſt war in which thou ſhalt be engaged, thou mayeſt ſtand firm, valiantly fight, and ſucceſſively conquer." The princely garter being thus buckled on, and the words of its ſignification pronounced, the knight elect is brought before the ſovereign, who puts about his neck, kneeling, a ſky-coloured ribbon, to which is appendant, wrought in gold within the garter, the image of St. George on horſeback, with his ſword drawn, encountering with the dragon. In the mean time the chancellor reads the following admonition: "Wear this ribbon about thy neck, adorned with the image of the bleſſed martyr and ſoldier of Chriſt St. George, by whoſe imitation provoked, thou mayeſt ſo overpaſs both proſperous and adverſe adventures, that having ſtoutly vanquiſhed thine enemies both of body and ſoul, thou mayeſt not only receive the praiſe of this tranſient combat, but be crowned with the palm of eternal glory." Then the knight elected kiſſes his ſovereign's hand, thanks his majeſty for the great honour done him, riſes up and ſalutes all the companions ſeverally, who return their congratulations.

The order of the Garter appears to be the moſt ancient and noble lay-order in the world. It is prior to the French order of St. Michael, by 50 years; to that of the golden Fleece, by 80 years; to that of St. Andrew, by 190 years; and to that of the Elephant, by 209 years.

Since its inſtitution, there have been eight emperors and twenty-ſeven or twenty-eight foreign kings, beſide numerous ſovereign princes, enrolled as companions thereof.

Its origin is ſomewhat differently related: the common account is, that it was erected in honour of a garter of Joan, counteſs of Saliſbury, which ſhe dropped in dancing, and which king Edward picked up, whereupon ſome of his nobles ſmiling, as at an amorous action, he turned it off with a reply in French, "Honi ſoit qui mal y penſe;" adding, that ſhortly after they ſhould ſee that garter advanced to ſo high an honour, that they would account themſelves happy to wear it; but our beſt antiquaries ſet this aſide as fabulous.

Camden, Fern, &c. take it to have been inſtituted on occaſion of the victory obtained over the French at the battle of Creſſy: that prince, ſay ſome hiſtorians, ordered his garter to be diſplayed as a ſignal of battle; in commemoration of which, he made a garter the principal ornament of the order erected in memory of this ſignal victory, and a ſymbol of the indiſſoluble union of the knights.

Fa. Papebroche, in his analecta on St. George, in the third tome of the "Acta Sanctorum," publiſhed by the Bollandiſts, has a diſſertation on the Order of the Garter. This order, he obſerves, is no leſs known under the name of St. George than under that of Garter, and that, though it was only inſtituted by king Edward III. yet it had been projected before him by king Richard I. in his expedition to the Holy-Land, if we may credit an author who wrote under Henry VIII. Papebroche adds, however, that he does not ſee on what that author grounds his opinion; and that, though the generality of writers fix the epocha of this inſtitution to the year 1350, he rather chuſes, with Froiſſard, to refer it to the year 1344, which agrees better with the hiſtory of that prince, where we read, that he called an extraordinary aſſembly of knights that year.

It appears from Raſtel's Chronicle, lib. vi. quoted by Granger in the Supplement to his Biographical Hiſtory, that this order was deviſed by Richard I. at the ſiege of the city of Acre, when he cauſed twenty-ſix knights, who firmly ſtood by him, to wear thongs of blue leather about their legs, and that it was perfected in the nineteenth year of Edward III. If Edward III. eſtabliſhed this order, he might be induced to do it partly with a view to a reward appropriate to military actions, and partly from a ceremonious reſpect for the ladies.

In 1551, Edward VI. made ſome alterations in the ritual of this order: that prince compoſed it in Latin, the original whereof is ſtill extant in his own hand-writing. He there ordained, that the order ſhould no longer be called the order of St. George, but that of the Garter: and, inſtead of the George, hung at the collar, he ſubſtituted a cavalier, bearing a book on the point of his ſword, with the word *protectio* graven on the ſword, and *verbum Dei* on the book; with a buckle in the left-hand and the word *fides* thereon. Larrey.

For a farther account of the order of the Garter, ſee Camden, Aſhmole, Dawſon, Leland, Polydore Virgil, Heylin, Legar, Glover, and Fauyn.

Erhard, Cellius, and the prince of Orange, adds Papebroche, have given deſcriptions of the ceremonies uſed at the inſtalment of knights. A Ciſtercian monk, named Mendocius Belvaletus, has a treatiſe, intitled La Garretiere, or Speculum Anglicanum, ſince printed under the title of the Catechiſm of the Order of the Garter; wherein he explains all the allegories, real or pretended, of thoſe ceremonies, with the moral ſignifications thereof.

GARTER *principal king at arms*. This office was inſtituted by Henry V.; ſir William Bruges, who, in the year 1417, was Guyenne king of arms, being the perſon who firſt enjoyed the office of garter. Mr. Anſtis has clearly proved, that Bruges muſt have been ſo advanced on the feſtival of St. George, which was held after the 22d of May, and before the 3d of September in the year 1417.

Garter, and *principal king at arms*, are two diſtinct offices united in one perſon: Garter's employment is to attend the ſervice of the order of the garter; for which he is allowed a

mantle

mantle and a badge, a houſe in Windſor caſtle, and penſions both from the ſovereign and knights, and, laſtly, fees. He alſo carries the rod and ſceptre at every feaſt of St. George, when the ſovereign is preſent, and notifies the election of ſuch as are newly choſen; attends the ſolemnity of their inſtallations, and takes care of placing their arms over their ſeats; and carries the garter to foreign kings and princes, for which ſervice it has been uſual to join him in commiſſion with ſome peer, or other perſon of diſtinction.

Garter's oath relates only to ſervices being performed within the order, and is taken in chapter before the ſovereign and knights. His oath, as king at arms, is taken before the earl marſhal. The ſucceſſive garter kings of arms have been conſtituted, for ſome ages paſt, by their reſpective patents "in principalem regem Armorum Anglicorum, et præcipuum officiarium armorum inclyti ordinis Garteri;" with the name, ſtile, and title of Garter. We have the following account of the office by Stephen Martin Leake, eſq. who himſelf filled the ſaid office; "Garter was inſtituted by king Henry A.D. 1417, for the ſervice of the moſt noble order of the Garter, and was made ſovereign, within the office of arms, over all other officers, ſubject to the crown of England, by the name of "Garter King of Arms of England." In his patent he is ſtiled principal king of Engliſh arms, and principal officer of arms of the moſt noble order of the Garter, and has power to execute the ſaid office by himſelf, or deputy, being an Herald. By the conſtitution of his office, he muſt be a native of England, and a gentleman bearing arms. To him belongs the correction of arms, and all enſigns of honour, uſurped or borne unjuſtly; and alſo to grant arms to deſerving perſons, and ſupporters to the nobility and knights of the Bath; to go next before the ſword in ſolemn proceedings, none interpoſing except the Conſtable and Marſhal; to adminiſter the oath to all the officers of arms; to have a habit like that of the Regiſter of the order; Baron's ſervice in the court; lodgings in Windſor caſtle; to bear his white rod, with a banner of the enſigns of the order thereon, before the ſovereign; alſo, when any lord ſhall enter the parliament chamber, to aſſign him his place, according to his dignity and degree; to carry the enſigns of the order to foreign princes; and to do, or procure to be done, what the ſovereign ſhall enjoin, relating to the order; with other duties incident to his office of Principal King of Arms; for the execution whereof he hath a ſalary of 100*l.* a year, payable at the Exchequer, and 100*l.* more out of the revenue of the order, beſides fees."

Garter is alſo a term in *Heraldry*, ſignifying the moiety, or half of a bend.

GARTH, *Sir* Samuel, in *Biography*, an excellent poet and phyſician, was born of a good family in Yorkſhire, and educated at Peter-houſe college in Cambridge, where he took the degree of doctor of phyſic on the 7th of July 1691. His taſte for polite literature induced him to continue his reſidence in college until the period of his graduation; ſoon after which he ſettled in London with a view to practiſe his profeſſion, and was admitted a fellow of the College of Phyſicians on the 26th of June, 1692. At this time the college was embroiled in a diſpute, in conſequence of a charitable inſtitution which they had reſolved to eſtabliſh, for the purpoſe of giving gratuitous advice to the poor, and of furniſhing them with medicines at prime coſt. But this project was oppoſed by the apothecaries, who found means to raiſe a party in the college itſelf againſt it. Dr. Garth, diſapproving the behaviour of the apothecaries, as well as ſome members of the faculty, in this affair, reſolved to expoſe them in a ſatire; which he accordingly executed, with peculiar ſpirit and vivacity, in his admirable poem entitled "The Diſpenſary." The firſt edition of this poem was publiſhed in 1694, and it went through three impreſſions in a few months, in conſequence of which ſucceſs he afterwards made many additions and corrections; and in 1706 he publiſhed a ſixth edition, with ſeveral deſcriptions and epiſodes not before printed. In 1697 he ſpoke the annual ſpeech in Latin, called the Harveian oration, before the college, which was ſoon after publiſhed, and led to a diſcuſſion, whether he was moſt entitled to admiration as a poet or as an orator. In this oration he ridiculed the multifarious claſſes of the quacks with a juſt ſpirit and inimitable humour.

So much literary merit gained him a high reputation as a polite ſcholar, and introduced him to the ſociety and friendſhip of the moſt diſtinguiſhed characters. He was one of the firſt members of the famous Kit-kat club, which conſiſted of above thirty noblemen and gentlemen of diſtinguiſhed talents, and was inſtituted in 1703; with the deſign of ſupporting a warm zeal for the proteſtant ſucceſſion in the houſe of Hanover. On the acceſſion of king George I. to the throne, Dr. Garth had the honour of being knighted with the duke of Marlborough's ſword, and was appointed the king's phyſician in ordinary, and phyſician general to the army. He is ſaid to have had a very extenſive practice, which has rarely fallen to the lot of phyſicians who have commenced their career by the cultivation of poetry. In his practice he conducted himſelf with great moderation as to his views of pecuniary reward, and with a ſtrict regard to the honour and intereſt of the faculty, never ſtooping to proſtitute the dignity of his profeſſion, through mean and ſordid views of ſelf intereſt, to any, even the moſt popular and wealthy apothecaries. In a ſteady adherence to this principle, he concurred with the celebrated Dr. Radcliffe, with whom he was often joined in medical conſultation.

The diſeaſe which ſeized him, and terminated with his life, in January, 1719, occaſioned a general concern, and was particularly lamented by lord Lanſdown, a brother poet, though of a different party, in ſome excellent verſes, as well as by Mr. Pope, in one of his letters. He was buried in the church of Harrow-on-the-Hill, on the 22d of January. See Biograph. Dict. Eloy. Dict. Hiſt.

Garth is uſed in ſome parts of England for a little backſide or cloſe. It is an ancient Britiſh word. *Gardd*, in that language, ſignifies garden, and is pronounced and written garth.

Garth, a term ſometimes employed to denote a ſmall garden, yard, or croft. It is alſo applied to a dam, or wear.

Garth-*men* is uſed in our ſtatutes for thoſe who catch fiſh by means of fiſh-garths or wears.

By ſtatute it is ordained, that no fiſher nor garthman ſhall uſe any nets or engines to deſtroy the fry of fiſh, &c. 17 Ric. II. cap. 9. The word is ſuppoſed by ſome to be derived from the Scotch word *gart*, which ſignifies *forced* or *compelled*; becauſe fiſh are forced by the wear to paſs in a loop, where they are taken.

GARTZ, or Garz, in *Geography*, a town of Pomerania, in the iſland of Rugen, built on the ſcite of an ancient city, called "Carenz," which was deſtroyed by the duke of Pomerania, in the 12th century.—Alſo, a town of Anterior Pomerania, on the Oder, ſurrounded with walls in 1258; 15 miles S. of Old Stettin. N. lat. 53° 16'. E. long. 14° 28'.

GARU, a town of Sweden, in the province of Upland; 20 miles N.N.E. of Stockholm.

GARVAGH, a poſt town of the county of Londonderry, Ireland, near the river Agivey, over which it has two bridges. It is alſo a market and fair town, but is a very ſmall place. It is 100½ miles N. from Dublin, and eight miles S. from Coleraine.

GARVAO, a town of Portugal, in Alentejo, on the Tagus; 12 miles E. of Abrantes.—Alſo, a town of Portugal, in Alentejo, ſix miles W. of Ourique.

GARVELACH, a ſmall iſland near the weſt coaſt of Scotland, in the county of Argyle; eight miles S.E. of Mull iſland. N. lat. 56° 14′. W. long. 5° 44′.

GARVILANS, a ſmall iſland on the north coaſt of Ireland, in the county of Donegal; about two miles E.S.E. from Malin head.

GARUM, a word in very common uſe among the old writers on medicine, who expreſſed by it a pickle, in which fiſh had been preſerved. The principal kind of fiſh they preſerved in this manner was the mackarel.

The garum principally conſiſted of the juices of the fiſh and ſalt; but we find the old writers ſpeaking of ſeveral kinds of it: one they call Spaniſh garum, from the place whence they had it; another kind from its colour was termed the black garum: this laſt kind ſeems to have been that called *fæcoſum* by the Latin poets, as if the fæces and remains of the fiſh were left among it; and by others *garum ſanguineum*, from its being ſometimes tinged with their blood to a reddiſh colour. The Romans ſometimes called the Spaniſh kind, which was eſteemed the beſt, *garum ſociorum*; and Galen ſays that the black garum was called *oxyporum*, but he only means by this, that it was uſed in the preparations called oxypora. It ſerved to dilute them, and thence took the name of them to itſelf, by way of diſtinction from the Spaniſh, and other kinds, not uſed to this purpoſe. Pliny tells us, that garum was compoſed of all the offals of fiſh, of every kind, macerated in ſalt; it had its name, he ſays, from its being originally made of a fiſh, called by the Greeks *garos*, but in his time the beſt ſeems to have been made with the mackarel; but that there were ſeveral other kinds uſed both in food and medicine, ſome of which muſt have been made from ſcarce fiſh, for they were of great price. They were uſed in glyſters, and externally applied in ſeveral kinds of cutaneous eruptions: the ancients had a great opinion of them in glyſters, for removing the pain in the ſciatica, and other like caſes; and the coarſer ſorts were their common medicine for curing cattle of the ſcab, by making inciſions in the ſkin, and laying over the part cloths wetted with them. See Strabo, lib. iii. 109. Plin. lib. xxxi. cap. 8.

The true way in which the ancients prepared their garum, which they ſo much valued as a delicacy at their tables, is unknown to us; but it appears that ſome kinds of garum had no fiſhy matter in them, from Aetius, who gives the following preſcription of a liquor, which he calls by this name: take of common water thirty-one pints, of ſea-ſalt two pints, and of dried figs fifty; let theſe all macerate together, and afterwards be ſtrained clear for uſe. All the garums were eſteemed hot and drying by the ancients, and were ſometimes given as laxatives before food. The modern writers underſtand the word garum in a much more limited ſenſe, meaning no more by it than the brine or pickle in which herrings or anchovies are preſerved.

GARUMNA, in *Ancient Geography*, a river of Gaul, which, as Cæſar informs us, divided the Gauls from the Aquitans; now the *Garonne*, which ſee.

GARWOLIN, in *Geography*, a town of Poland, in the palatinate of Maſovia; 12 miles E. of Czerſk.

GARY, a town of Hindooſtan, in Guzerat; 57 miles E. of Janagur.

GARYENUM, in *Ancient Geography*, a river of Britain, mentioned by Ptolemy, and ſuppoſed to be the river Yare, the mouth of which is at Yarmouth.

GARZETTA, Egret, in *Ornithology*, a ſpecies of *Ardea*, with a creſted head, white body, black bill, and the ſpace about the eyes and the legs greeniſh. The feathers of the creſt are very ſoft and white, and are much valued. It is eaten in Venice and Italy, and common in the markets there. It is the Ardea alba minor, or the ſmall white heron; and it is alſo called *Gaza giovane*. See Heron.

GARZIL, a term ſometimes applied provincially to hedging-wood.

GARZIS, in *Geography*, a town of Africa, in the kingdom of Fez, ſurrounded with walls, and with houſes built of black ſtone, ſituated in a fertile country on the Mulu; 56 miles S. of Melilla.

GARZO, a river of Italy, which paſſes by Breſcia, and joins the Mela, near Manerbio.

GARZONI, Tomaso, in *Biography*, born in 1549 at Bagnacavallo, near Ferrara; he was a regular canon lateran, died in his own country 1589, at 40 years of age. He was author of ſeveral moral works, printed at Venice, 1617, in 4to. But the principal production of this active writer and general reader is entitled "La Piazza univerſale di tutti le profeſſioni del mondo," a work of infinite labour and conſiderable uſe at the time it was written, as the author had almoſt all the materials to ſeek, there being no direct model on ſo extenſive a ſcale then extant. Among innumerable ſubjects included in his plan, his 42d Chap. is appropriated to muſic and muſicians, as well vocal as inſtrumental, to the time when his work was publiſhed. This *diſcorſo* may well be called an epitome of the hiſtory of muſic, ancient and modern, with a liſt of its moſt renowned profeſſors. Whatever muſical hiſtorian had been ſo fortunate as to ſee this work when collecting and ſelecting materials, he would have been ſaved infinite trouble in his reſearches, by finding where muſic had been treated incidentally as well as *ex profeſſo*. This author had chiefly educated himſelf, and learned, without a maſter, Hebrew and Spaniſh. His "Piazza Univerſale" ſeems firſt to have been publiſhed at Venice, the year in which he died, and afterwards went through innumerable editions. Superficial knowledge only is to be found in his book; but it points out where more and better information may be found. It has been truly ſaid by Father Niceron, that the works of Garzoni prove him to have dipt into all the ſciences, and ſufficiently manifeſt the extent of his knowledge, and of what he would have been capable with a regular education and a longer life. His reflections, when he allows himſelf time to make them, and room in his book for their inſertion, are excellent. But the taſk he had ſet himſelf was too great for a ſingle mind, or the bodily labour of an individual.

It is extremely difficult to render the title of this book in Engliſh; the word Piazza has twelve or fourteen different meanings and ſhades of meaning in the Cruſca: it implies a ſquare or market-place appropriated to commerce. Perhaps "the univerſal commerce of all the arts and profeſſions in the world" may nearly expreſs the author's meaning.

It is ſingular that this work is unnoticed in the Bibl. Ital. of Fontanine.

GAS, a generic name given by Van Helmont to elaſtic fluids, and now generally adopted. The term *air* was made generic

generic by Prieſtley; but this ſeems rather to imply that elaſtic fluids are only modifications of common or atmoſpheric air, the contrary to which is now known to be true. The term gas is therefore properly preferred.

Though the obſervations of Van Helmont, Boyle, Hales, Black, and Cavendiſh, ſeemed to leave no doubt that there exiſted three or four kinds of air or fluids agreeing in the property of elaſticity, yet no very diſtinct notion was formed on the ſubject, till the diſcoveries of Prieſtley and thoſe of Lavoiſier illuminated the ſphere of chemical ſcience. Since then moſt chemical enquiries have been connected with the knowledge of gaſeous bodies, and great addition has been made to the number of gaſes and to the knowledge of their diſtinctive properties. Elaſtic fluids have in fact been divided into two genera, *gaſes* and *vapours*; the former ſignify ſuch elaſtic fluids as retain their elaſticity in all known temperatures; the latter ſignify thoſe elaſtic fluids which loſe their elaſticity by cold, and become liquids, &c. This diſtinction may have its uſe; but there is great reaſon to believe the difference is not in kind but in degree only; and that all the gaſes would loſe their elaſticity provided the temperature could be ſufficiently reduced.

The mechanical properties of the gaſes, or thoſe relating to their elaſticity and gravitating energy being, as far as is known, the ſame as thoſe of the atmoſphere, will be ſtated under the head of PNEUMATICS. The other general properties, which fall rather under a chemical than mechanical head, will be pointed out and explained in what follows; and a more detailed account of each gas will be found under its ſpecific name.

Gaſes may be conſidered as *ſimple* or *compound*. The ſimple gaſes, according to our preſent knowledge, are three; namely,

1. Hydrogen.
2. Oxygen.
3. Azote or nitrogen.

The compound gaſes and vapours which have been clearly diſcriminated from each other are,

4. Nitrous gas, from azote and oxygen.
5. Nitrous oxyd, from azote and oxygen.
6. Carbonic oxyd, from carbon and oxygen.
7. Carbonic acid, from carbon and oxygen.
8. Carburetted hydrogen, from carbon and hydrogen.
9. Olefiant gas, from carbon and hydrogen.
10. Sulphuretted hydrogen, from ſulphur and hydrogen.
11. Sulphurous acid, from ſulphur and oxygen.
12. Fluoric acid, from hydrogen and oxygen?
13. Muriatic acid, from hydrogen and oxygen?
14. Oxymuriatic acid, from muriatic acid and oxygen.
15. Ammoniacal gas, from azote and hydrogen.
16. Phoſphuretted hydrogen, from phoſphorus and hydrogen.
17. Arſeniuretted hydrogen, from arſenic and hydrogen.
18. Nitric acid, from azote and oxygen.
19. Nitrous acid, from azote and oxygen.
20. Aqueous vapour or ſteam, from oxygen and hydrogen.
21. Alkoholic vapour, from carbon and hydrogen.
22. Ethereal vapour, from carbon and hydrogen.

It is particularly remarkable that in all the above liſt of compound gaſes no one has been proved to contain more than two elements. Though Berthollet and ſome others conceive certain gaſes to contain *three* elements; namely, carbon, hydrogen, and oxygen, and hence denominate them *oxy-carburetted* hydrogen; yet they have given no deciſive proof of the exiſtence of ſuch gaſes. Indeed it is almoſt obvious that all the gaſes which have been adduced of this triple character are nothing but mere mixtures of hydrogen, carbonic oxyd, and carburetted hydrogen from ſtagnant water. We may well heſitate to admit ſuch diſtinction till ſome one can point out a method of obtaining a gas uniformly the ſame, and which cannot be procured by mixing the above three or any others in any proportion. The conſtitution of the fluoric and muriatic acid gaſes is not yet fully known; but there is great reaſon to ſuſpect, from the recent diſcoveries of Davy, that oxygen and hydrogen are the chief, if not the only elements. Poſſibly it may be found that *three* elements cannot unitedly conſtitute an elaſtic fluid.

We ſhall now conſider, 1ſt. The nature of ſimple gaſes; 2d. The nature of compound gaſes; 3d. The nature of gaſeous mixtures; and, 4th. We ſhall exhibit tables ſhewing the more remarkable properties of the gaſes in one point of view, with obſervations, &c.

1. *The Nature of ſimple Gaſes.*—The conſtitution of an elaſtic fluid was firſt pointed out and demonſtrated by Newton in the 23d prop. of the ſecond book of the Principia; namely, that it conſiſts of particles which repel one another by a force which varies in the ſimple inverſe ratio of the central diſtances. At leaſt a fluid ſo conſtituted would exhibit the ſame mechanical properties as atmoſpheric air. On the nature of this repulſive power there have been ſeveral ſpeculations; ſome have imagined it to be magnetical; others electrical; and others, with more ſeeming probability, have aſcribed it to heat. Indeed, when it is conſidered that the elaſticity increaſes and diminiſhes with the temperature to the moſt diſtant points we can attain, heat muſt be a principal if not the ſole cauſe of aerial repulſion. On this idea a particle of an elaſtic fluid may be ſuppoſed an indefinitely ſmall, hard, and indiviſible body, ſurrounded by an infinitely fine and ſubtile fluid, heat, forming a kind of atmoſphere around it of comparatively great extent, but variable according to preſſure, &c. This atmoſphere will be of greateſt denſity at the ſurface of the particle, and of leſs denſity in ſome proportion to the diſtance.

Mr. Dalton has developed and extended this notion, of heat being the cauſe of repulſion, in his New Syſtem of Chemical Philoſophy. He deduces a very curious concluſion, and very important one, if it be true, that all elaſtic fluids contain the ſame quantity of heat attached to their ultimate particles, whether ſimple or compound, in like circumſtances; and that a greater or leſs attraction of the particles for heat will have no influence in this reſpect, but only to condenſe a greater number of them into the ſame ſpace. If this concluſion be correct, the capacities of elaſtic fluids for heat will be proportional to the number of their particles in a given volume. Aſſuming *data*, the accuracy of which he promiſes to demonſtrate, namely, the relative weights of the ultimate particles of certain gaſes, as in the following table, he derives the ſpecific heats agreeable to the above hypotheſis, as follows.

	Relative Weights of ultimate Particles.	Specific Heat of equal Weights.
Hydrogen	1	9.382
Azote	5	1.866
Oxygen	7	1.333
Atmoſpheric air	0	1.759
Nitrous gas	12	.777
Nitrous oxyd	17	.549
Carbonic acid	19	.491
Ammoniacal gas	6	1.555
Carburetted hydrogen	7	1.333
Olefiant		

	Relative Weights of ultimate Particles.	Specific Heat of equal Weights.
Oleſiant gas	6	1.555
Nitric acid	19	.491
Carbonic oxyd	12	.777
Sulphuretted hydrogen	16	.583
Muriatic acid	22	.424
Aqueous vapour	8	1.166
Ethereal vapour	11	.848
Alkoholic vapour	16	.586
Water	0	1.000

2. *The Nature of compound Gaſes.*—By a compound gas we mean an elaſtic fluid which ariſes from the chemical union of the elements of two or more elaſtic fluids, or of one elaſtic fluid and another inelaſtic body; thus, a certain quantity of carbonic oxyd gas and oxygen gas may be combined ſo as to make carbonic acid gas, which is different from either of the ingredients in volume, and in other eſſential properties. Alſo, from oxygenous gas and ſulphur may be formed ſulphurous acid gas. Theſe compound gaſes are chiefly modern diſcoveries, and their nature has never yet been very ſatisfactorily explained. They are obſerved to agree with the ſimple gaſes in their mechanical relations. From this fact it would ſeem that by applying the Newtonian doctrine they muſt be conſtituted of particles repulſive of each other, like the ſimple gaſes. Theſe particles muſt be compounded, and in all probability of the elementary particles of the ſimple gaſes; that is, a particle of a ſimple gas, A, muſt be united to one, or more, particles of another body B; and the new compound may be ſurrounded with an atmoſphere of heat, and form a particle of a compound gas C. In this way, if we may ſuppoſe all ultimate particles of the ſame kind to be exactly alike, compounds of various, but ſimple relations in quantity, ſuch as thoſe of 1, 2, 3, may be formed; and many of the phenomena indicate ſuch relations. For inſtance, the above-mentioned carbonic acid gas contains, according to the beſt experiments, juſt *twice* as much oxygen as the carbonic oxyd contains from which it is produced, indicating that if a particle of the latter gas contains *one* of oxygen, a particle of the former muſt contain *two* particles of oxygen.

3. *The Nature of gaſeous Mixtures.*—Dr. Prieſtley, in the courſe of his intereſting enquiries in pneumatic chemiſtry, could ſcarcely fail to notice a remarkable fact which ſubſequently has occaſioned much diſcuſſion; namely, that gaſes of different ſpecific gravities intermix in oppoſition to their gravitating tendencies, and when once completely diffuſed through each other, remain ſo notwithſtanding their reſt. Yet it does not appear that any chemical affinity is exerciſed; or, if it were, would it account for the phenomena. He has given us a ſection on this very ſubject, wherein he eſtabliſhes the fact by experiments; but he does not ſatisfy himſelf by any explanation. The fact has ſince been corroborated by a ſeries of experiments directed towards this point by Dalton, in the Mancheſter Memoirs, vol. i. new ſeries, and by Berthollet, in the ſecond volume of the Memoires d'Arcueil. The latter of theſe philoſophers, however, finds a conſiderable difference in the *times* which the different gaſes take to become uniformly diffuſed through each other. Thus, hydrogen is diffuſed more quickly, and carbonic acid more ſlowly than the reſt. The atmoſphere is an example of two gaſes of different ſpecific gravities, which permanently continue to be diffuſed through each other. Many modern philoſophers reſt ſatisfied with the explanation which aſcribes the effect to a ſlight chemical affinity; but though this might perhaps be admitted, were it only required to account for gaſes remaining in a ſtate of diffuſion, yet it does not provide for a heavy gas, as carbonic acid, being drawn up to the top of a receiver to the diſtance of a foot or more from its natural ſituation. Mr. Dalton, ſome time ago, ſuggeſted an hypotheſis which effectually explained the whole phenomena, but the hypotheſis on other accounts was deemed too improbable. It conſiſted in the ſuppoſition that the particles of different gaſes were neither attractive nor repulſive of each other, but neutral; ſo that any gas was impelled by its own repulſion to fill any ſpace in which it might be found, juſt as if it were the only gas preſent. This hypotheſis the author himſelf has abandoned, and now, in conſequence of further elucidation which time and reflection have produced, he aſcribes the effects in queſtion to the different ſizes of the ultimate elaſtic particles of different gaſes. He attempts to eſtabliſh the poſition "that every ſpecies of pure elaſtic fluid has its particles globular and all of a ſize, (meaning the ſolid central atom, together with its atmoſphere of heat,) but that no two ſpecies agree in the ſize of their particles," the preſſure of temperature being the ſame. Alſo that heat is the cauſe of repulſion. From theſe conſiderations he concludes that no one elaſtic fluid can reſt permanently on another, unleſs they happen to have ultimate particles of exactly the ſame ſize, which probably does not take place in any two gaſes. This explanation deſerves attention; time will ſhew how far it is ſatisfactory. See New Syſtem of Chemical Philoſophy, page 188.

Some gaſes, when mixed, combine with each other; others are merely diffuſed through the whole ſpace. Of ſome of theſe mixtures it may be proper to take a little notice.

1. Hydrogen mixes with azote, nitrous gas, carbonic oxyd and acid, carburetted, ſulphuretted, and phoſphuretted hydrogen, ammoniacal gas, &c. without undergoing any change.

2. Hydrogen mixes with oxygen and nitrous oxyd without any change; but an electric ſpark unites the oxygen to the hydrogen, and forms water, and in the latter caſe azotic gas likewiſe.

3. Hydrogen mixes with oxy-muriatic acid without any change in the firſt inſtance; but an electric ſpark converts the mixture into muriatic acid and water. This effect may alſo be produced by expoſing the mixture of gaſes to the ſun's rays, when after a few moments an exploſion takes place.

4. Oxygen and nitrous gas inſtantly combine and form nitric or nitrous acid; oxygen mixes with moſt or all other gaſes without any change; but an electric ſpark unites it to ſome element, when mixed with carbonic oxyd, oleſiant gas, carburetted, ſulphuretted, and phoſphuretted hydrogen, and ammoniacal gas.

5. Azotic gas mixes with all other gaſes without any change.

6. Oxymuriatic acid gas converts nitrous gas into nitric acid. When mixed with hydrogen, and expoſed to light, water and muriatic acid are formed; if expoſed to the direct rays of the ſun, when above 30° of altitude, an exploſion enſues, as has lately been diſcovered by Gay Luſſac, and Thenard in France, and by Dalton in England. When mixed with with carburetted hydrogen, carbonic oxyd, or oleſiant gas, and expoſed to the ſun, over water, a pretty rapid combuſtion enſues. Moſt of theſe mixtures too explode with an electric ſpark, that with carbonic oxyd excepted. This gas acts upon ſulphuretted and phoſphuretted hydrogen gaſes in mixture; and converts ſulphurous acid gas into ſulphuric acid.

7. Ammoniacal gas combines with the ſeveral acid gaſes and forms with them ſalts.

4. *Tables exhibiting the weights, ſpecific gravities, conſtituent principles, &c. of the principal gaſes.*

1.—TABLE

Of the weights, ſpecific gravities, and volume of the gaſes abſorbed by water

N. B. The weights, &c. are at a mean temperature and preſſure; and water is ſuppoſed 820 times the weight of common air.

Kind of Gas.	Weight of 100 cubic Inches in Grains.	Specific Gravity.	Volume of Gas abſorbed by a given Volume of Water.
Atmoſpheric air	31	1.00	$\frac{1}{50}$
Hydrogen	2.5	0.08	$\frac{1}{64}$
Oxygen	34	1.10	$\frac{1}{27}$
Azote or nitrogene	30.2	0.97	$\frac{1}{64}$
Nitrous gas	32.2	1.04	$\frac{1}{27}$
Nitrous oxyd	50	1.60	1 nearly
Carbonic oxyd	29	0.94	$\frac{1}{27}$
Carbonic acid	47	1.52	1
Carburetted hyd. from ſtagnant water	18.6	0.6	$\frac{1}{27}$
Olefiant gas	29.5	0.95	$\frac{1}{8}$
Sulphuretted hydrogen	36	1.16	1
Sulphurous acid	71	2.30	20
Fluoric acid (ſilicated)	130	4.20	400
Muriatic acid	39.5	1.24	400
Oxymuriatic acid	76	2.46	2
Ammoniacal gas	18.6	0.60	400
Phoſphuretted hydrogen	26	0.84	$\frac{1}{27}$
Nitric acid	76	2.4	—
Aqueous vapour	21	0.7	—
Alkoholic vapour	65	2.1	—
Ethereal vapour	70	2.25	—

The weights and ſpecific gravities in the above table are taken from the moſt reſpectable authorities. Indeed the reſults have been obtained ſo nearly the ſame by different authors, that there can be no doubt of their being good approximations to truth. A ſtill greater degree of accuracy is however both deſirable and attainable. Some of the above tabular numbers muſt be conſidered as more doubtful than others; becauſe few experiments have been made, and thoſe liable to objections. This obſervation applies more directly to fluoric, oxymuriatic, and nitric acid gaſes, and to phoſphuretted hydrogen, and to the vapours.

In regard to the quantity of any gas abſorbed by water when duly agitated together, it is obſervable that water takes juſt its own volume of ſome of the gaſes; in other inſtances, it takes ſome fractional part of its volume, which fraction has always for its numerator unity, and for its denominator the cube of ſome one of the ſeries 1, 2, 3, &c. thereby indicating that the diſtance of the particles of air in the water is always 1, 2, 3, &c. times their diſtance out of the water. There is an apparent exception in atmoſpheric air; but this is in reality a confirmation of the rule; for the atmoſphere is compoſed of 4 parts of azotic gas, and 1 of oxygen; and $\frac{4}{5}$ of $\frac{1}{64} + \frac{1}{5}$ of $\frac{1}{27} = \frac{1}{50}$ nearly. Whether the elaſticity of the gaſes in this their connection with water is impaired or deſtroyed are objects of enquiry. According to Dr. Henry's experiments, the quantity of any gas abſorbed (not exceeding unity) is in direct proportion to the preſſure of the gas of its own kind; and that preſſure being removed, the internal or abſorbed gas is conſtantly making its eſcape. It muſt therefore retain its elaſticity. The obſervation will apply even to thoſe gaſes that are ſo largely abſorbed by water; their elaſticity muſt indeed be amazingly impaired by the action of the water, but it is not deſtroyed; for the gaſes are conſtantly making their eſcape from the water, unleſs reſtrained by an incumbent atmoſphere of their own kind. It ſhould ſeem then, that the connection of theſe gaſes with water, which have not their elaſticity impaired, is purely of a mechanical nature; whilſt that of the very abſorbable gaſes is partly of a mechanical and partly of a chemical nature.

The following table exhibits the volumes of certain elaſtic fluids which combine, and the correſponding volume of the new compound, when elaſtic; alſo the proportional weights of the ſimple elements in a given weight of the compound.

2.—TABLE

Of the Proportions of the conſtituent Principles of compound Gaſes.

Compound Gaſes, &c.	Conſtituent Principles in Meaſures.			Conſtituent Principles in Weights.			
	Meaſures.	Meaſures.	Meaſures.	Weight.	Weight.	Weight.	
Ammoniacal gas	100	= 52 azote	+ 133 hydrogen	83 azote	+ 17 hydrogen	= 100	
Water	—	= 100 oxyg.	+ 200 hydrogen	87½ oxyg.	+ 12½ hydrogen	—	
Nitrous gas	100	= 47 azote	+ 55 oxygen	42 azote	+ 58 oxyg.	—	
Nitrous oxyd	100	= 99 azote	+ 58 oxygen	59 azote	+ 41 oxyg.	—	
Nitric acid	—	= 180 nitrous gas	+ 100 oxygen	27 azote	+ 73 oxyg.	—	
Nitrous acid	—	= 360 nitrous gas	+ 100 oxygen	33 azote	+ 67 oxyg.	—	
Oxymuriatic acid	100	= 150 mur. acid	+ 50 oxygen	76 mur. acid	+ 24 oxyg.	—	
Sulphurous acid	100	= 100 oxygen	+ ſulphur	52 oxyg.	+ 48 ſulphur	—	
Sulphuric acid	—	= 100 ſulphurous acid	+ 50 oxygen	79½ ſulphurous acid	+ 20½ oxygen	—	
Carbonic oxyd	100	= 47 oxygen	+ charcoal	55 oxygen	+ 45 charcoal	—	
Carbonic acid	100	= 100 oxygen	+ charcoal	72 oxygen	+ 28 charcoal	—	
Carburetted hydrogen	100	= 200 hydrogen	+ 1 part charcoal	27 hydrog.	+ 73 charcoal	—	
Olefiant gas	100	= 200 hydrogen	+ 2 parts charcoal	15 hydrog.	+ 85 charcoal	—	
Sulphuretted hydrogen	100	= 100 hydrogen	+ ſulphur	7 hydrog.	+ 93 ſulphur	—	
Phoſphuretted hydrogen	100	= 100 hydrogen	+ phoſphorus	10 hydrog.	+ 90 phoſphorus	—	
Muriate of ammonia	—	= 100 mur. acid	+ 100 ammon. gas	65 mur. acid	+ 35 ammon. gas	—	
Carbonate of ammonia	—	= 100 carb. acid	+ 80 ammon. gas	76 carb. acid	+ 24 ammon. gas	—	
Sub-carbonate of ammonia	—	= 100 carb. acid	+ 160 ammon. gas	61 carb. acid	+ 39 ammon. gas	—	

In the 2d vol. of the Memoires d'Arcueil, Gay Luſſac has two ingenious eſſays, the one on the combination of gaſeous ſubſtances one with another, and the other on nitrous vapour and nitrous gas, in which he advances an hypotheſis that gaſeous ſubſtances always combine with each other, either in equal volumes, or in volumes which are ſmall ſimple multiples one of the other. For inſtance, he argues that 100 meaſures of oxygenous gas united with 200 meaſures of nitrous gas, conſtitute nitric acid, and with 300 meaſures of nitrous gas, nitrous acid. Now every one, who has had experience on this ſubject, knows that 100 meaſures of oxygen are convertible into an acid vapour by 180 of nitrous gas or leſs, if properly mixed. What then is this acid? It cannot, according to Gay Luſſac, be either the nitric or nitrous. Again, by proper treatment, 100 meaſures of oxygen may be made to unite with 320, 340, or 360 nitrous gas, by preſenting two thin ſtrata of the gaſes to each other over water in a wide veſſel. And as all intermediate proportions between 140 and 360 meaſures of nitrous gas may eaſily be united with the oxygen, there is not any apparent reaſon for ſelecting 200 and 300 meaſures of nitrous gas as forming the only definite compounds. Gay Luſſac has given a table analogous to the above, founded on his hypotheſis, but our proportions differ very materially from thoſe of his table, and we have no doubt as to their ſuperior accuracy in general, as they are the reſults of experience.

We ſhall conclude this article with the following table of the proportions of certain combuſtible gaſes and oxygen, which unite by the electric ſpark in Volta's eudiometer, and the products formed.

3.—TABLE

Of the Combination of combuſtible Gaſes with Oxygen, and the Products.

Meaſures of pure Gas.	Meaſures oxygen.	Meaſures carbonic acid.
100 Carbonic oxyd, unite to	47	products 94
100 Carburetted hydrogen	200	—— 100 + water
100 Olefiant gas	285	—— 190 + water
100 Sulphuretted hydrogen	150	—— 100 ſulphurous acid + water
100 Phoſphuretted hydrogen	150	—— phoſphoric acid + water
100 Ammoniacal gas	67	—— 52 azote + water

GAS, in *Agriculture* and *Vegetable Economy*, an aëriform fluid material, which is ſuppoſed to be taken up as the food of plants. There are ſeveral kinds that are believed to be uſeful in this way, as the ammoniacal, the carbonic acid gas, &c. See FOOD *of Plants*, and VEGETATION.

GAS *Light, Apparatus for producing*. The light and heat procured by the combuſtion of carburetted hydrogen gas, is one of thoſe recent inventions which promiſes to be of the moſt general utility, though it may be ſaid to be at preſent in its infancy; the inflammability of the gas, produced from the diſtillation of pit coal, has long been a fact familiar to chemiſts, though it is only within theſe few years that experiments have been made, with a view to determine the beſt form of an apparatus for producing the gas, at the leaſt expence of fuel for the diſtillation, and at the ſame time to ſeparate from it the tar and ammoniacal fluid which are thrown out from the coals with it; and would, if ſuffered to remain with the gas, cauſe many inconveniences from their intolerably offenſive ſmell, but may, when ſeparated, be applied to uſeful purpoſes.

Mr. Murdoch was probably the firſt perſon who put in practice gas lights on an extenſive ſcale; he commenced his experiments on this ſubject in the year 1792, and in 1798 he applied it for the lighting part of the very extenſive manufactory of Meſſrs. Boulton, Watt, and Co. at Soho near Birmingham, and in 1802, at the time of the Peace, the illumination of the Soho works was made by gas. Since this period, the method has been adopted in many places by different individuals, who, proceeding from their own ideas, naturally introduced various forms of the apparatus, the moſt perfect of which we propoſe to deſcribe with drawings, in ſuch a manner as to enable mechanics to conſtruct them, this being the moſt probable means of their being farther improved, and their advantages more fully eſtabliſhed. The carburetted hydrogen gas is produced in the following manner: A quantity of pit coal is introduced, and cloſed up in an iron retort, diſpoſed in a proper furnace, by which it can be heated ſo as to throw out the volatile portions of the coals; theſe are conducted by a pipe into a refrigeratory, where the tar and ammoniacal fluid are depoſited: the gas then enters into a gazometer, being in its way paſſed through water to waſh and take from it any remaining tar or other impurities which may cauſe an unpleaſant ſmell. The gazometer is fitted up in the ſame manner as for other chemical experiments, riſing and falling freely in water to regulate the admiſſion of the gas, which is conveyed by pipes from it to the burners or lamps where it is conſumed. Theſe are formed in various ways, either a tube ending with a ſimple orifice, at which the gas iſſues in a ſtream; and if once lighted will continue to burn with the moſt ſteady and regular light imaginable, as long as the gas is ſupplied. At other times a number of very minute holes are made in the end of a pipe, which form as many *jets de feu*, and have a very brilliant appearance. This may ſometimes be placed in the focus of a parabolic reflector. In caſes where the light is required to be thrown to a diſtance, other burners are conſtructed upon the ſame principle as the Argand lamp, forming a cylinder of flame, and admitting a current of air both to the inſide and outſide.

Fig. 1. of *Plate* XVII. *Miſcellany*, is a ſection of an apparatus for producing the gas adopted by Mr. Samuel Clegg of Mancheſter, and communicated to the Society of Arts in 1808, when they voted Mr. C. a ſilver medal for the communication. A repreſents a caſt iron retort, in which are put the coals, to be decompoſed by the heat of a fire applied beneath it. The retort is ſituated in a chamber repreſented by the dark ſpace, in which the flame from the coals placed upon the grate B circulates all round the retort, and eſcapes by the chimney D; E is the aſh-pit beneath the grate; the double thickneſs of metal beneath the retort denotes a ſaddle or half cylinder of caſt iron, which preſerves that part of the retort which is moſt expoſed, and cauſes it to be heated more uniformly; F is the mouth where the coals are introduced, it has a flaunch and a cover ground together, air tight, and faſtened by a ſcrew in the centre, or by one at each ſide; *a* is an iron pipe conducting from the retort to a veſſel G, ſituated

G, ſituated beneath the gazometer: in this veſſel the tar and other condenſible products are ſeparated from the gas, which aſcends the pipe *b*. The upper end of this is covered in the manner of a hood by a cylindric veſſel *d*, open at bottom, but partially immerſed beneath the ſurface of the water contained in the ciſtern of the gazometer, and perforated round, near the lower edge, with a number of ſmall holes. The gas diſplaces the water from the receiver *d*, and eſcapes through the ſmall holes riſing in bubbles through the water, ſo as to expoſe a large ſurface to its action, that it may be waſhed and purified from any ſmell. After riſing through the water, the gas enters the gazometer H H, which is ſuſpended to move up and down by the chains and pulley *e e*, and balance weights *f*, *f*. In the centre of the gazometer a tube *g* is fixed, having ſome ſmall holes at its upper end, by which it communicates with the interior of the gazometer. This tube includes another, *h*, fixed perpendicular from the bottom of the ciſtern, and communicating with others *k*, which convey the gas to the burners. The fixed pipe *h* forms a guide to keep the gazometer always perpendicular; and the pipe in the centre of the gazometer prevents any gas paſſing away except it has aſcended to the top of that veſſel, and is tranſparent and fit for uſe. The gazometer is made of iron plate rivetted together, and ſuſtained by a ſtrong hoop at top and another at bottom. Each hoop has radial bars which ſupport the tube *g* in the centre, and at the ſame time they ſtrengthen the whole. The gazometer muſt be painted within and without to preſerve it from ruſting. Mr. Clegg ſays, a veſſel of this kind, to contain 700 cubic feet of gas, will weigh about 20 cwt.

When the operation commences, the gazometer is ſunk down nearly to a level with the ſurface of the water in the ciſtern L L; but as the gas enters, it riſes up to receive it. It is to be noted, that the balance weights *f*, *f*, ſhould not be quite ſo heavy as the gazometer, in order that ſome preſſure may be exerted, to force the gas out of the burners with a proper jet. The gas which iſſues from the retort enters the receiver G, aſcends the pipe *b*, into the veſſel *d*, from which it diſplaces the water, and paſſes out at the ſmall holes as before deſcribed, riſing through the water into the gazometer, and raiſing it up: the gas then paſſes away to the burners. In this manner the proceſs proceeds, until the whole of the volatile products of the coals in the retort is evaporated. The uſe of the gazometer is, to equalize the emiſſion of the gas which comes from the retort more quickly at ſome time than others. When this happens, the veſſel riſes up to receive it, and when the ſtream from the retort diminiſhes, the weight of the gazometer expels its contents. When the proceſs is finiſhed, the retort is ſuffered to cool, and its lid is then removed to repleniſh it with coal. The caput mortuum, which is found in the retort, is the moſt excellent coak, and in value returns a conſiderable portion of the whole expence of fuel when the retort cools. The veſſel *d* contains a ſufficient quantity of gas to ſupply any abſorption which takes place without raiſing the water into the retort.

In Mr. Clegg's original apparatus the chains for the balance weight are attached to the top of the gazometer; and the ciſtern L, for containing the water of the gazometer, is repreſented as a well ſunk in the ground. This method is cheap and ſimple, though at the ſame time it is liable to have leaks, which are not eaſily diſcovered or acceſſible to be ſtopped; and it requires conſiderable length of pipes to draw off the matter from the receiver G; whereas in the conſtruction repreſented in the plate, they are drawn off by the cock at *x*. Of theſe products we ſhall ſpeak more in another place.

Figs. 2 and 3 repreſent one of the gas lamps on the principle of Argand; the ſpace between the two concentric tubes *a*, *b*, is ſupplied with gas by a pipe, *c*, in which is a cock, *d*, to regulate or occaſionally intercept the gas. The ſpace between the two tubes is covered at top with a circular ring, ſhewn in *fig.* 2, pierced with a number of ſmall holes, at which the gas iſſues, forming a cylinder of flame, to which a current of air is brought through the internal tube *d*. The air has alſo paſſage beneath the glaſs chimney, *f*, to ſupply the outſide of the flame, which is rendered the moſt ſteady and regular imaginable, by the draught cauſed by the chimney: *g* is a ſmall button affixed to a ſtem, which ſlides up and down in the interior tube with ſufficient friction to retain its poſition. The button conveys the current of air riſing through the tube in an expanded cone to the inſide of the flame, and aſſiſts the combuſtion in a great degree.

The next apparatus for gas lights which we ſhall deſcribe is by Dr. Stancliffe, as ſhewn in *fig.* 4. A is a veſſel of caſt-iron, forming the retort, and is ſet in brick-work in any proper furnace; E is a rim caſt in the ſame piece, incloſing the top of the former, ſo as to make a deep groove all round in the top of the veſſel. In this groove the head, F, of the veſſel is received; and to make the fitting air-tight, a quantity of fuſible alloy is placed in the groove. This melts by the heat of fire, and forms a fluid luting, which prevents the eſcape of the gas. G is a tube leading from the head to the refrigeratory E F; the joining of this tube with this veſſel is formed by a joint, on a ſimilar principle to the joining of the head with the retort: *a* is a tube paſſing through the lid of the veſſel, and another, *b*, is fixed concentric to and ſurrounding the former at a ſmall diſtance. The ſpace between theſe is filled with water, and the tube, G, which connects with the head, is immerſed in the water which forms the joint round the pipe, and by this means the tube, G G, and the head, F, of the retort, can be removed together to take out the coak and introduce freſh coals. The refrigeratory is made in two diviſions E and F, one above the other; the tube G goes down nearly to the bottom of the loweſt diviſion, and the gas bubbles up from the end of it through the water, with which the lower partition is partly filled: it then paſſes out at the pipe, *d*, to the burners. Theſe muſt not be of ſuch a number as to conſume the gas as faſt as the retort produced it; by this means it will be under a conſiderable preſſure in the veſſel, which is found conducive to the ſeparation of the tar, &c. When the gas comes over quickly from the retort, it preſſes upon the ſurface of the water, and cauſes it to aſcend through the pipe, *e*, in the partition into the upper chamber, where its weight conſtantly acts to cauſe a preſſure, and expel the gas at the pipe, *d*, whenever the ſupply of the retort diminiſhes; *f* is another pipe through the partition to allow the eſcape of the gas, if it forces out the water ſo low as the bottom of the pipe: the gas which then riſes into the upper diviſion gets away by the pipe *g* into the chimney of the funnel. Dr. Stancliffe has recently taken out a patent for the method of luting of the head and joint at G, as applied to the diſtillation of any other matter.

Fig. 5. is an apparatus by Mr. B. Cooke of Birmingham, recently communicated by him to the Society of Arts, and rewarded by them with a ſilver medal. The pipe A leads the gas from the pot or retort, and is fitted, in a manner ſimilar to Dr. Stancliffe's, to a veſſel B B, called the purifier. This is filled half full of water, and has five partitions, *a*, *a*, *a*, *a*, *a*, ſoldered to the lid, and extending beneath the ſurface of the water; at the lower edge a number of holes are pierced in the plates through which the gas iſſues, and riſes in bubbles through the water on the oppoſite ſide. In this manner it proceeds through all the plates, and is by that means waſhed and purified moſt perfectly, the cold water condenſing and depoſiting in the bottom of the veſſel the tar and ammoniacal liquor, which can be drawn off by the

cock *b*; M is the pipe which conveys the gas away from the end of the purifier, and leads it to the bottom of the tube, L L, of the gazometer, which is omitted in the drawing, as it is the ſame as in Mr. Clegg's apparatus, and furniſhed with balance weights in the ſame manner: N is the pipe to take the gas away to the burners. Mr. Cooke has placed his connecting pipes, M and N, inclined, and at the loweſt point a ſhort pipe *n*, which is immerſed in the water contained in a veſſel *m*, ſo as to prevent the eſcape of any gas, but at the ſame time to allow any tar, &c. to drain down the pipe and depoſit itſelf in the water. By this means the tar, which will unavoidably reſt in theſe pipes, is diſpoſed of without danger of clogging or ſtopping the paſſage, as might happen in courſe of years, though the quantity was ever ſo minute. Mr. Cooke recommends for dwelling-houſes, where the gas is required to be particularly free from ſmell, that it ſhould be paſſed through a ſecond purifier containing lime water, which will render it perfectly pure.

In any of theſe apparatuſes, it is eſſential that the water uſed for waſhing and purifying the gas ſhould be changed for freſh as ſoon as it becomes dirty; and unleſs this is done the gas will not be perfectly purified by waſhing, but retain an unpleaſant ſmell after it. The tar which depoſits itſelf at the bottom of the veſſel, in the conſiſtence of treacle or thick oil, is firſt drawn off by the cock: for that purpoſe this ſubſtance is found very uſeful, and in many points forms a ſubſtitute for the vegetable tar. By boiling it, the volatile parts are evaporated, and it becomes pitch. If the evaporation is performed in a retort, the matter which comes over is a ſpirit, which, according to Mr. Cooke, may be uſed inſtead of that kind of turpentine, known by the term tar ſpirit, in painting and japanning: and he gives particular directions for the manner of performing this diſtillation in the 28th vol. of the Tranſactions of the Society of Arts. The reſiduum left in the retort is pitch; or, if further boiled, makes aſphaltum, or a ſubſtance which is equally applicable, for the various arts in which it is employed.

It is proper that we ſhould here notice Mr. Winſor's proceſs for procuring gas, coak, and many other products, from pit-coal: but as this proceſs has not been wholly made public, our notice muſt be ſhort. A company has been eſtabliſhed for the purpoſe of carrying into execution his invention, and has applied to parliament for powers to act as a corporate body. Thoſe who form this body, propoſe to erect apparatuſes, in convenient ſituations, and convey the gas by pipes along the ſtreets of a town, for the purpoſe of lighting them, as well as the houſes. Experiments were made of this plan by lighting one ſide of Pall Mall, in London, which appeared to anſwer well; and the company's houſe has been conſtantly lighted and heated by gas ſince the firſt eſtabliſhment.

Mr. Winſor, at the opening of the buſineſs, gave lectures and experiments on the gas, though the manner of procuring and purifying it he kept a ſecret: he exhibited the mode of conducting it through the houſe, and a number of elegant devices for chandeliers, &c. by which it was conſumed. Among theſe he propoſed long flexible tubes ſuſpended from the ceiling of the room, and at the end communicating with a burner, which was deſigned with much taſte, being a cupid holding a torch in one hand, and graſping the tube, in the ſame manner, as a rope in the other. This figure was to be ſuſpended by hooks in any convenient part of the room where light was required, and might be carried into any cloſet or other place within the limits of the length of the tube. He ſhewed alſo by experiments, that the flame of the gas was not liable to be extinguiſhed by wind or rain, that it produced no ſmoke, and was not ſo dangerous as the light of lamps or candles, as it could not produce ſparks.

A pamphlet has been recently publiſhed by Mr. Van Voorſt, ſtating the evidence taken before the committee of the houſe of commons appointed upon the bill, for the incorporation of the Gas Light Company. This gentleman ſtates the products of a London chaldron of coals, treated in Mr. Winſor's proceſs, to be, 1ſt, light by the combuſtion of the gas equal to 2,100 pariſh lamps burning 11 hours: 2d, $1\frac{1}{2}$ chaldron of coak by admeaſurement: 3d, 60lbs. of pitch: 4th, three gallons of eſſential oil: and, 5th, 18 gallons of ammoniacal liquor; and he enters into a calculation of the pecuniary profits; but this we forbear to detail, as being entirely dependent upon the local ſituation and value of the coals and their products. This ſtatement is collected chiefly from the evidence of Mr. Accum. The bill was rejected by parliament; but we underſtand, by the above pamphlet, that the company intend to proſecute their undertaking without a charter of incorporation.

Mr. Murdoch made a communication in 1808 to the Royal Society on the ſubject of gas light, and was complimented with count Rumford's medal for the ſame. He gives the reſults of the proceſs as conducted in the cotton mills of Meſſrs. Phillips and Lee, at Mancheſter, who have a very large apparatus conſtructed by Mr. M. at the Soho works. The gas lights are equal to 2500 mould candles of ſix in the pound, each candle conſuming 175 grains of tallow per hour. The number of burners are 271 Argands, and 633 cockſpurs, ſo called from having three jets diverging from each other. Theſe require an hourly ſupply of 1250 cubic feet of gas to produce, which requires ſeven cwt. of cannel coal in the retort, and about one third of that quantity of good common coal to heat the retort. The cannel coal in the retort produces nearly $4\frac{1}{2}$ cwt. of good coak, and $4\frac{1}{4}$ ale gallons of tar. The ammoniacal liquor was not regarded, as it has not yet been applied to any manufacture, ſo as to be demanded in large quantities; though a paper by Mr. Wm. Cox will be found in Mr. Van Voorſt's pamphlet, ſhewing the advantages of the ammonia as applied for manure, and ſome other experiments on its uſe in dyeing. See FLAME.

GASBORN, in *Geography*, a town of Sweden, in the province of Warmeland; 43 miles N. of Carliſtadt.

GASCOIGN, or *Bezoardic Powder*, in *Medicine*, is formed of the compound powder of crab's claws one pound, of oriental bezoar prepared one ounce: this powder is made up into balls, called Gaſcoign balls, from the name of their inventor. This is omitted in the modern Pharmacopœias, as having no advantage over the prepared oyſter-ſhells.

GASCOIGNE, *Sir* WILLIAM, in *Biography*, who flouriſhed in the reign of Henry IV., was nobly deſcended of an ancient family in Yorkſhire. He was born at Gawthorp, near Leeds, about the year 1350; was a ſtudent in the law in the Inner Temple, and became a member of that ſociety. About the year 1398 he had attained to ſuch eminence in his profeſſion, that he was made one of the king's ſerjeants. From this period he was diſtinguiſhed for his ſound legal knowledge, and fidelity, in the tranſaction of the moſt intricate and important affairs, as well relating to his own rights as thoſe of the kingdom at large. How much he was employed on all great queſtions appears from the parliament rolls and other ancient records. From the firſt year of Henry IV., who began his reign in September 1399, to the latter end of it, we meet with the abſtracts of Gaſcoigne's opinions, arguments, diſtinctions, and deciſions, as well before he was chief juſtice as after, very frequently recited, among thoſe of other ſages of the law, in our old books of Reports, many of which are diſtinguiſhed and recommended, by the remarks of the editor, as worthy of obſervation, and may give good lights in our old law caſes. It appears,

pears that he was made lord chief juſtice of the king's bench ſo early as the year 1401. And in 1405 he was appointed with others, by the king, to treat with thoſe who had acted in rebellion againſt the exiſting government; and ſoon after, when archbiſhop Scrope and others were taken with arms in their hands againſt the king, his majeſty would have had his chief juſtice pronounce upon them ſentence of death without waiting the forms of trial, but Gaſcoigne maintained the law with ſo much integrity, that he refuſed to conform himſelf to the king's wiſhes, though by this refuſal he incurred his ſovereign's diſpleaſure. The anger of the king was but of ſhort duration, for we find that he preſented his judge with the honour of knighthood that ſame year. It was towards the latter end of this reign that the judge teſtified his regard to the law of the land, which ſhould bow to none, however high in rank, and in the prince and heir to the crown, Gaſcoigne gave an example which has been applauded by all writers from that time to the preſent. A riotous companion of the prince's had been indicted before the chief juſtice for ſome diſorders which had been committed, probably, either in the company of the prince or at his inſtigation. The young man appeared at the bar with the criminal, to give him countenance and protection, or to avert the due courſe of law. Finding that his preſence had not overawed the ſtern magiſtrate, he proceeded to inſult him in the diſcharge of his duty, but Gaſcoigne, regardleſs of every conſideration except that which the law of the land required, and recollecting that he was placed in that high ſtation to adminiſter juſtice, committed the prince himſelf to cuſtody, for his rude behaviour, there to wait his father's pleaſure; "but in ſuch venerable, ſuch coercive expreſſions; wherein the paternal authority of the king was ſo enforced by the awful gravity of the judge, that the prince's calm ſubmiſſion to the puniſhment was no leſs ſudden and ſurpriſing, than the outrageous offence had been which drew it upon him." An attempt was made by ſome of the courtiers to alienate the king's affections from the judge on account of his inflexible behaviour towards the heir apparent; but the monarch exclaimed, that he thanked his Maker, who had given him both a judge who could miniſter, and a ſon who could obey juſtice. The judge perſevered to the end of his life in the honeſt diſcharge of his official duties. He died in the year 1413, and a funeral was granted him proportionable to his eminent dignity and high fame. Upon his monument were his effigies at length. He is repreſented in his judge's robes, with his hood on, a large purſe faſtened to his girdle on his left ſide, and a long dagger on the right. Biog. Brit. Hume's Hiſt.

GASCONADE, a boaſt or vaunt of ſomething very improbable.

The term has its riſe from the Gaſcons, or people of Gaſcony, in France, who, it ſeems, have been diſtinguiſhed for bragging and rhodomontado.

Gasconade *River*, in *Geography*, a river of Louiſiana, which runs into the Miſſouri. N. lat. 38° 30'. W. long. 92° 20'.

GASCONY, Vasconia, in *Geography*, a province of France before the revolution, comprehending the ſouth diviſion of the government of Guienne, was bounded on the north by Guienne, on the eaſt by Languedoc, on the ſouth by the Pyrenées, and on the weſt by the ocean, and lay between 42° 35' and 44° 30' N. lat., and between 1° 40' W. long. and 1° 20' E. long., being 50 leagues from weſt to eaſt, and from 20 to 30 in breadth. This province derives its name from the Gaſcons, or Vaſcones, a tribe in Spain that deſcended from the Pyrenean mountains towards the concluſion of the ſixth century, and took poſſeſſion of Novempopulani. After their reduction by Theodebert, in 602, they revolted ſeveral times, but were finally ſubjected by Charlemagne. Theſe Gaſcons poſſeſſed a conſiderable degree of ſpirit; but they were ſo apt to exaggerate in deſcribing their exploits, as to render the term "Gaſconade" proverbial. Gaſcony is compoſed of the following diſtricts, *viz.* Armagnac in the centre; Bigorre, Soulz, and Labour on the ſouth; Chaloſſe and Landes on the weſt; Coudomois and Lomagne on the north; and on the ſouth Comminges and Couſerans. The principal rivers are the Adour, the Save, Gimone, Arrats, Gers, Baize, Loſſe, Neſte, and Gave.

GASCUENA, a town of Spain, in the province of New Caſtile; 30 miles N.W. of Cuença.

GASH, or Gaw, in *Mining*, is one of the numerous appellations for a fault or break of the ſtrata. See Fault.

GASHOLMA, in *Geography*, a ſmall iſland on the W. ſide of the gulf of Bothnia. N. lat. 61° 1'. E. long. 17° 5'.

Gasholma, *Oſter*, a ſmall iſland on the W. ſide of the gulf of Bothnia. N. lat. 61° 57'. E. long. 17° 20'.

Gasholma, *Weſter*, a ſmall iſland on the W. ſide of the gulf of Bothnia. N. lat. 61° 57'. E. long. 17° 17'.

GASIMA, a town of Japan, near the eaſt coaſt of Niphon; 45 miles N.E. of Jeddo.

GASKETS, on *Ship-board*, the ſmall cord uſed to faſten the ſails to the yards when furled up.

GASMAN, Floriano, in *Biography*, a German muſical compoſer of the Vienna ſchool, born in Bohemia, 1729. He diſtinguiſhed himſelf, not only in his own country, but in Italy, where he compoſed four ſerious operas and three comic, which had conſiderable ſucceſs; but no one ſo much as the comic opera, "L'Amore Artigiano," compoſed for Vienna, which, in 1770, when the Baglioni family from Bologna, conſiſting of ſix ſiſters, all ſingers, and Garibalde, were at Milan, had a very extraordinary run in that city, and afterwards was in very high favour all over Italy and throughout Europe, wherever there was an Italian lyric theatre.

In 1772 Gaſman was at Vienna, and had been appointed not only maeſtro di cappella to the emperor Joſeph II., but inſpector of the Imperial muſical library; honours to which his worth, genius, and talents well entitled him. This ingenious compoſer was ſometimes accuſed of want of fire in his theatrical compoſitions; but the gravity of his ſtyle is eaſily accounted for, by the time and pains he muſt have beſtowed on church muſic. To aim at equal perfection in both, is trying to ſerve God and Mammon; and thoſe excellent compoſers for the church, whoſe works have ſurvived them, ſuch as Paleſtrina, Tallis, Birde, Allegri, Benevoli, Colonna, Caldara, Marcello, Lotti, Perti, and Fux, have chiefly confined themſelves to the church ſtyle. Aleſſandro Scarlatti, Handel, Pergoleſi, and Jomelli, are exceptions. But, in general, thoſe ſucceed beſt in writing for the church, ſtage, or chamber, who accuſtom themſelves to that particular ſpecies of compoſition only.

We do not call every modern oratorio, maſs, or motet, church muſic; as the ſame compoſitions to different words would do equally well, indeed often better, for the ſtage. But by muſica di chieſa, properly ſo called, we mean grave and ſcientific compoſitions for voices only, of which the excellence conſiſts more in good harmony, learned modulation, and fugues upon ingenious and ſober ſubjects, than in light airs and turbulent accompaniments.

This author's works were very voluminous for a compoſer to whom longevity was not granted; for he died at Vienna in 1775, at only 45 years of age, after compoſing for the ſerious opera, in Italy, Merope, Iſſipile, Catone in Utica, Ezio, twice, and

Achille in Sciro: at Vienna, Olimpiade, Amore di Pſiche, and Il Trionfo d'Amore. For the comic opera, at Venice, l'Uccilatore, twice: il Filoſofo inamorato, un Pazzo ne fa Cento, and il Mondo nella Luna. At Vienna, i Viaggiatori ridicoli, l'Amore Artigiano, la Notte Critica, l'opera Seria, la Conteſſina, il Filoſofo inamorato a ſecond time, la Peſcatrice, and i Rovinati; beſides a great number of curious quartets, for various inſtruments, which we believe were never printed; but, having been favoured with MS. copies of them by the author himſelf, it is but juſtice to ſay, that, upon trial, we found them excellent: there are pleaſing melodies, free from caprice and affectation; ſound harmony, ingenious contrivances, and imitations, without the leaſt confuſion. The ſtyle is ſober and ſedate, without dulneſs, and maſterly without pedantry.

Theſe quartets, having been compoſed more than 30 years ago, are not ſo highly ſeaſoned as thoſe of Haydn and Mozart; but for thoſe who have not kept pace with the times, and are fond of plain food, they would perhaps be the more palatable.

GASMARK, in *Geography*, a town of Sweden, in the province of Warmeland; 30 miles E. of Philipſtal.

GASNITZ, a town of Bohemia, in the circle of Saatz; ſix miles E. of Eger.

GASPAR, in *Biography*, is the name of one of the moſt ancient contrapuntiſts of whoſe works any remains can be found. He is frequently mentioned by Franchinus among the moſt delightful compoſers of his time. He was contemporary with Juſquin; and among the maſſes and motets that were found printed under a patent granted by Leo X., preſerved in the Britiſh Muſeum, there is a maſs by Gaſpar, probably a native of France or Flanders. The compoſition of this maſs, which is upon the ſubject of an old ſong, *N'as tu Pas*, is excellent with reſpect to harmony; and the points of imitation are ſuch as would not diſgrace Paleſtrina, or even a much more modern author, as to melody, though printed in 1508, and probably compoſed in the preceding century. Though the names of Orpheus, Amphion, and Linus, have long ſurvived their works, we ſhall only record the names of muſicians, of whoſe abilities ſome ſpecimens are ſtill to be found.

GASPAR *Iſland*, or *Glaſſa*, in *Geography*, a ſmall iſland in the Eaſtern ſea, which gives name to a channel between the iſlands of Banca and Billiton, called "Gaſpar Straits." S. lat. 1° 55'. E. long. 107° 5'.

GASPARINI, FRANCESCO, in *Biography*, a native of Lucca, director of the Conſervatorio of La Pieta at Venice, Filarmonico at Bologna, and one of the greateſt maſters of his time.

His firſt publication was a book of twelve chamber cantatas, for a ſingle voice, ſmall 4to. Lucca, 1697. They are graceful, elegant, natural, and often pathetic; leſs learned and uncommon than thoſe of Aleſ. Scarlatti; but, for that reaſon, more generally pleaſing and open to the imitation and pillage of compoſers gifted with little invention.

In 1703, his uſeful little work, intitled "L'Armonico Pratico al Cembalo," firſt appeared at Venice, conſiſting of only 86 pages 4to. But by regular ſtudy and long experience, he knew what young muſical ſtudents chiefly wanted, and has ſupplied it in the ſhorteſt and cleareſt manner poſſible, in ſo ſmall a compaſs. He confines himſelf to accompaniment on keyed-inſtruments, a ſubject which had not been excluſively treated before in Italy, nor do we know of any elementary work that has appeared there ſince, of equal utility. It is divided into the following twelve chapters:

I. Names and poſition of the keys.
II. Method of forming harmony by concords.
III. Accidental characters.
IV. Method of accompanying the hexachord, in a gradual aſcent, and by leaps.
V. Method of accompanying the hexachord in a gradual deſcent, and in wider intervals.
VI. The harmony of all kinds of cadences.
VII. Of diſcords, their preparation and reſolution, and of binding notes and ſyncopation.
VIII. Method of acquiring the art of accompaniment in all keys, and modulating out of one key into another.
IX. Of licences in the harmony of recitatives. See ACCIACATURA.
X. Of breaking chords into groups, and of ornamenting and embelliſhing the harmony.
XI. Of dividing and flouriſhing the chords.
XII. Method of tranſpoſition, into every key, by means of imaginary clefs.

This little work, in 1764, had gone through five editions. But on the 4th edit. in 1754, M. Laborde (Eſſais ſur la Muſ. tom. iii. p. 544.) obſerves, that "it proves harmony to have made a very ſlow progreſs in Italy, &c. Gaſparini not being arrived at the règle de l'octave." But did the French themſelves, or any other people, follow that rule, or the fundamental baſe, when Gaſparini's book was publiſhed? And does the counterpoint of Durante, Jomelli, Galuppi, Piccini, or Sacchini, manifeſt a want of rules or knowledge of harmony?

In 1702, this elegant compoſer ſet the opera of "Tiberio" for Venice; and between that period, and 1723, he produced 25 operas for that city only, beſides a great number for Rome and other places.

He ſeems to have been the firſt opera compoſer who aimed at grace in his melodies, and who ſteered between the extremes of ſimplicity and pedantry.

When Quantz went to Rome in 1724, he found Gaſparini ſtill living, took leſſons of him in counterpoint, and his good nature and probity ſeem to have made as deep an impreſſion upon Quantz, as his muſical abilities.

He was at this time 72 years of age; and ſeems to have continued writing till he was near fourſcore: the laſt opera in Quadrio's liſt of his muſical dramas bearing date 1730.

He was the maſter of Domenico Scarlatti, and of Benedetto Marcello. A letter of his writing is printed in Marcello's Pſalms, in anſwer to one from his noble and illuſtrious pupil; and in the works of Metaſtaſio, there is a ſonnet by that exquiſite lyric poet on Gaſparini. When his "Merope" was performed at Rome in 1721, there was in it a ſcene of recitative which has been ſaid to draw tears from the whole audience.

During the reſidence of Aleſſandro Scarlatti at Naples, he had ſo high an opinion of Franceſco Gaſparini, then a compoſer and a harpſichord maſter of great eminence at Rome, that he placed his ſon Domenico, while a youth, to ſtudy under him in that city. This teſtimony of confidence in his probity and abilities gave birth to a ſingular correſpondence between theſe two great muſicians. Gaſparini compoſed a cantata in a curious and artful ſtyle, worthy the notice of ſuch a maſter, and ſent it as a preſent to Scarlatti: "Cantata inviata dal Signor Franceſco Gaſparini al Signor Aleſ. Scarlatti."

To this muſical epiſtle Scarlatti not only added an air, by way of poſtſcript, but replied by another cantata of a ſtill more ſubtile and artificial kind, making uſe of the ſame words: "Cantata in reſpoſta al Signor Gaſparini, del Sig. Aleſ. Scarlatti, Eumana." This reply produced a rejoinder from Gaſparini,

Gaſparini, who ſent Scarlatti another cantata, in which the modulation of the recitative is very learned and abſtruſe.

Scarlatti, ſeemingly determined to have the laſt word in this cantata correſpondence, ſent him a ſecond compoſition to the ſame words, in which the modulation is the moſt extraneous, and the notation the moſt equivocal and perplexing, perhaps that were ever committed to paper. This is entitled "Seconda Cantata del Signor Aleſ. Scarlatti in Idea Eumana, ma in regolo Cromatico, ed è per ogni profeſſore."

Franceſco Gaſparini's twelve cantatas, of which the ſecond edition was printed at Lucca 1697, were the firſt productions that he publiſhed. There is a movement in his ſecond cantata which would remind all who are acquainted with Dr. Pepuſch's celebrated cantata "Alexis," of the air "Charming ſounds that ſweetly languiſh."

GASPARINI, MICHAEL-ANGELO, a native likewiſe of Lucca, ſtudied under Lotti, was an eminent theatrical ſinger with a counter-tenor voice, and afterwards an excellent compoſer. His ſtyle of ſinging and good taſte acquired him great reputation.

He had many ſcholars as a ſinging-maſter, who became illuſtrious; among the reſt the celebrated Fauſtina. Having for a long time ſung the muſic of others, he, in turn, made others ſing his muſic, and compoſed many operas which pleaſed.

GASPARINO, BARZIZA, an Italian poet, was born, towards the cloſe of the 14th century, at Barziza, a place in the Bergamaſque, whence he derived his ſurname. He acquired, at an early period, a taſte for the good authors of antiquity, and taught others what he had learnt himſelf. He became a profeſſor of belles lettres at the univerſity of Pavia about the beginning of the 15th century, from whence he paſſed to Venice, and undertook the profeſſorſhip of moral philoſophy at Padua. About this period, by the death of his elder brother, in very ſtraightened circumſtances, he took upon himſelf the heavy charge of maintaining his eight children, which reduced him to ſuch a ſtate of indigence, that he was compelled to ſell his books. In 1418, he opened a public ſchool at Milan, by the order, and under the patronage of the duke, and his leiſure hours he employed in giving private inſtructions to young perſons, and in copying and correcting the MSS. of ancient authors. He died about the year 1431, leaving behind him ſeveral ſhort treatiſes on grammar and rhetoric; orations compoſed upon various occaſions; letters to his friends, which paſſed through ſeveral editions; and other epiſtles written by way of exerciſe as models to his pupils. His death was univerſally lamented by the city of Milan, and his merits and great learning were highly extolled by contemporary writers. Moreri.

GASPE BAY, in *Geography*, a bay on the eaſt coaſt of Lower Canada, and weſt ſide of the gulf of St. Lawrence.

GASPE, *Cape*, a cape on the coaſt of Canada, in the gulf of St. Lawrence, a little S. of Gaſpe bay; near which is an Indian ſettlement.

GASPEE, a diſtrict and county of Lower Canada, comprehending the point of land, bounded by the river and gulf of St. Lawrence on the north and eaſt, and the bay of Chaleur S. and S.W.

GASPEE, or *Namquil Point*, a point ſeven miles S. of Providence, Rhode iſland, projecting from the weſtern ſhore of Providence river; ſo called from the name of the Britiſh ſchooner Gaſpee, which was burnt June 10, 1772, by about 60 men from Providence, painted like Narraganſet Indians.

GASPESIA, a tract of country on the S. ſide of the mouth of St. Lawrence river, and on the N. ſide of Chaleur bay, in Lower Canada. Its eaſtern extremity is cape Roſiers. It is inhabited by Indians, called Gaſpeſians.

GASSAGO, a town of Italy, in the department of the Mela; 3 miles N.W. of Breſcia.

GASSEN, a town of Lower Luſatia; 15 miles S.E. of Guben.

GASSENDI, PETER, in *Biography*, a French philoſopher of diſtinguiſhed eminence, was born in 1592 at Chanterſier, near Digne, in Provence. At the early age of four years he manifeſted that pious diſpoſition and thoſe extraordinary talents, by the cultivation and exerciſe of which he acquired future celebrity. It was in this period of his infancy that he began to direct his attention to the heavens, and to avail himſelf by retirement of every favourable opportunity that occurred for contemplating them with ſatisfaction and advantage. His parents obſerved theſe dawnings of genius with delight, and though their circumſtances were moderate, they determined to give him the beſt education in their power. With this view, he was firſt placed under the inſtruction of an excellent maſter at Digne, where, by his proficiency in the Latin language, and in rhetorical exerciſes, he laid the foundation of the high degree of reputation to which he attained in early life. From Digne he was removed to Aix, where, for two years, he devoted himſelf to the ſtudy of philoſophy under an eminent profeſſor. At the age of 16 years he was appointed teacher of rhetoric at Digne; and at 19, profeſſor of philoſophy in the univerſity of Aix. Whilſt he neglected no opportunity that occurred of proſecuting his ſtudies in the learned languages, and alſo in mathematics and aſtronomy, he diligently examined the ancient ſyſtems of philoſophy, and adopted that of Epicurus, which he preferred to every other, and of which he approved himſelf afterwards a very ingenious and zealous advocate. Although the authority of Ariſtotle was acknowledged in all public ſchools, Gaſſendi, during the exerciſe of his profeſſorſhip at Aix, ventured publicly to expoſe the defects of his ſyſtem. The lectures which contained his cenſures of the Ariſtotelian philoſophy, delivered in the indirect form of paradoxical problems, were publiſhed under the title of "Exercitationes paradoxicæ adverſus Ariſtotelem." This work, which gave great offence to the partizans of Ariſtotle, was held in high eſtimation by ſeveral learned men, particularly by Nicolas Peireſc, the preſident of the univerſity of Aix; and induced him to uſe his intereſt for admitting the author to the degree of doctor of divinity, and to a canonry in the church of Digne. Having obtained theſe preferments, he reſigned his profeſſorſhip in Aix, and in his retirement at Digne purſued his philoſophical and aſtronomical reſearches. A ſecond volume was afterwards publiſhed, the object of which was to expoſe the futility of the Ariſtotelian logic. The author was diſcouraged from proſecuting the plan he had propoſed, and induced to deſiſt from all direct attacks upon the philoſophy of Ariſtotle, by the oppoſition of his bigotted and intolerant advocates; nevertheleſs he avowed his attachment to the ſyſtem of Epicurus, and then defended it with great ability and learning. Accordingly he undertook to frame from Lucretius, Laertius, and other ancient writers, a conſiſtent ſcheme of Epicurean doctrine, in which the phenomena of nature are immediately derived from primary atoms. But, aware of the fundamental defect of this ſyſtem, he added to it the doctrine of a ſuperintending deity, who firſt moved and ſubſequently arranged thoſe atoms, and whom he regarded as the wiſe governor of the world. The atomic doctrine was ſtrenuouſly maintained by Gaſſendi, in oppoſition to the fictions of the Carteſian philoſophy, which were then gaining ground; and he

he particularly aſſerted and vindicated the doctrine of a vacuum. On the ſubject of morals, Gaſſendi explained the permanent pleaſure or indolence of Epicurus, in a manner perfectly conſiſtent with the pureſt precepts of virtue.

In order to extend his acquaintance with learned perſons, Gaſſendi, in the year 1628, viſited Holland, where his philoſophical and literary merit was acknowledged and reſpected by many admirers and friends. During his abode in this country, he formed an intimacy with the learned Merſennus, and wrote an elegant and judicious apology for him in reply to the cenſures of Robert Fludd, on the ſubject of the Moſaic philoſophy. Upon his return to France, he renewed his application to aſtronomy, and proſecuted a ſeries of celeſtial obſervations, with a view of completing his ſyſtem of the heavens. At Paris he recommended himſelf, by his agreeable manners, as well as by his acknowledged reputation for literature and ſcience, to perſons moſt diſtinguiſhed for learning, and alſo for high rank, in that capital. By the intereſt of the cardinal of Lyons, the brother of cardinal Richelieu, he was appointed, in the year 1645, regius profeſſor of mathematics at Paris; an office, the primary duties of which he diſcharged by reading lectures on aſtronomy, which were attended by crowded auditories, and which, fully anſwering the high expectations that had been previouſly entertained, contributed to eſtabliſh and maintain his popularity. The fatigues of his public labours, added to his intenſe application in the proſecution of his private ſtudies, exhauſted the ſtrength of his conſtitution; and having caught a cold, which occaſioned an inflammation of his lungs, he was obliged, in the year 1647, to leave Paris, and to return to Digne, for the benefit of his native air. Having obtained ſome temporary relief by an intermiſſion of his ſtudies, he returned to Paris in the year 1653. Here he publiſhed the lives of Tycho Brahe, Copernicus, Purbach, and Regiomontanus; but reſuming his aſtronomical labours with his accuſtomed ardour, his diſorder returned, and he ſunk under it, in the year 1655, in the 63d year of his age. Juſt before he expired, he laid his hand upon his heart, and remarking the feeble ſtate of its pulſation, he ſaid to his attendant, "See, how frail is the life of man!"

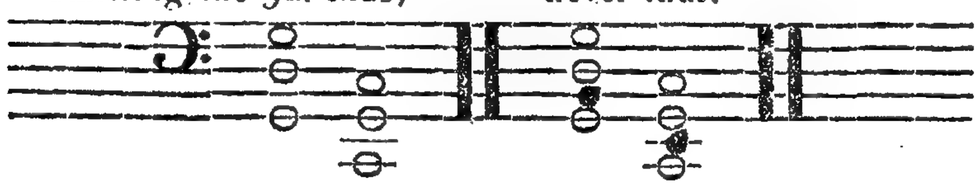
Gaſſendi was eminently diſtinguiſhed among his contemporaries by the ſoundneſs of his judgment, the extent of his reading, the capaciouſneſs of his memory, and the intenſeneſs of his application; and thus diſtinguiſhed, he attained to pre-eminence among the philoſophers of the period in which he lived. Our learned Barrow ranks him among the moſt eminent mathematicians of the age, and mentions him in connection with Galileo, Gilbert, and Des Cartes. His commentary upon the 10th book of Diogenes Laertius exhibits him to ſingular advantage, with regard to profound erudition and ſkill in the languages. By his oppoſition to the philoſophy of Des Cartes, already noticed, he formed a reſpectable party among the philoſophers of his time, denominated Gaſſendiſts, in contradiſtinction to the other prevalent party, known by the appellation of Carteſians. The latter were much more numerous than the former; for Gaſſendi had few diſciples in his own country; but among the Engliſh, who in his time were remarkable for their application to ſtudies of a phyſical and mathematical kind, a conſiderable number adopted his philoſophical ſyſtem. It is remarkable, that even thoſe eminent philoſophers and divines, ſuch as Whichot, Gale, Cudworth, and More, who entered the liſts with Hobbes, (whoſe doctrine came nearer to the principles of Gaſſendi than to the ſyſtem of Des Cartes), and revived ancient Platoniſm, in order to cruſh under its weight the philoſopher of Malmſbury, placed Gaſſendi and Plato in the ſame claſs, and explained the ſentiments of the latter in ſuch a manner, as to appear quite agreeable to the principles of the former. To this period many trace the origin of the two philoſophical ſects, called the *mathematical* and *metaphyſical*, which ſee. The controverſy between Gaſſendi and Des Cartes led to ſeveral mutual cenſures and reproaches on the part of their reſpective advocates. Whilſt Des Cartes and his metaphyſical followers were accuſed of ſtriking at the foundations of all religion, Gaſſendi is charged by Arnauld with overturning the doctrine of the ſoul's immortality in his controverſy with Des Cartes, and by Leibnitz with heſitating and wavering too much concerning the nature of the ſoul, and the principles of natural religion. The literary conteſt between theſe two philoſophers had betrayed them both into the uſe of ſome irritating expreſſions, which had produced a miſunderſtanding and coolneſs, that were much lamented by their friends; and attempts were made for effecting a reconciliation between them. The abbé d'Eſtrees, afterwards cardinal, took the lead in this laudable undertaking, and convened them, and ſeveral of their friends, among whom were father Merſenne, Roberval, the abbé de Marolles, and others, to a public dinner; Gaſſendi was prevented by illneſs from attending; but ſo intent was the abbé d'Eſtrees upon accompliſhing his purpoſe of reconciliation, that he took his gueſts with him to Gaſſendi's apartments; where they had the pleaſure of hearing theſe two philoſophers making mutual apologies for improper irritability, and declaring to each other, that whatever difference of opinion might after this interview ſubſiſt between them, it ſhould produce no interruption of their friendſhip. The firſt tranſit of mercury over the ſun, which had been predicted by Kepler to take place on the 7th of November, 1631, was obſerved by Gaſſendi. From his letters it appears, that he was on terms of intimacy with Kepler, Longomontanus, Snellius, Hevelius, Galileo, Kircher, Bullialdus, and other celebrated aſtronomers of that age, and that he was often conſulted by them; and his labours entitle him to a high rank among the founders of the reformed philoſophy. His large and valuable library, together with his aſtronomical and philoſophical apparatus, was purchaſed by the emperor Ferdinand III., and afterwards depoſited, with other choice collections, in the Imperial library at Vienna. The MSS. which he left behind him, and the treatiſes publiſhed by himſelf, were collected after his death, and, accompanied with the author's life, publiſhed by Sorbiere, in ſix volumes folio, in 1658. They conſiſt of the philoſophy and life of Epicurus; the author's own philoſophy; his aſtronomical works; the lives of Peireſc, Copernicus, Tycho Brahe, Purbach, Regiomontanus, John Muller, &c.; a refutation of the Meditations of Des Cartes; Epiſtles; and other treatiſes. Bernier, a celebrated French phyſician, has given an accurate view of the philoſophy of Gaſſendi in his abridgment of it, publiſhed in French at Lyons, in the year 1684, in eight volumes 12mo. This abridgment will give the reader a clearer account of this philoſophy than even the works of Gaſſendi himſelf, in which his meaning is often expreſſed in an ambiguous manner, and which are alſo loaded with ſuperfluous erudition. The life of Gaſſendi, accurately written by Bougerelle, a prieſt of the oratory, was publiſhed at Paris in 1737. Nouv. Dict. Hiſt. Brucker's Hiſt. of Philoſ. by Enfield, vol. ii. p. 464, &c. Moſheim Eccl. Hiſt. vol. v.

In the 5th vol. of his works, printed at Lyons in 1658, we find a tract on the theory of muſic: "Manuductio ad Theoriam Muſices." But this is confined merely to harmonics. He there demonſtrates, with Des Cartes and Père Merſenne, why the 4th, as a perfect concord, is more pleaſing in the acute than the grave. All theſe philoſophers, with

with the ancients, allow the 4th to be a concord, though, in counterpoint, the leaſt pleaſing of all. Des Cartes, the moſt ſevere of the ſcientific triumvirate, ſays, (Compend. Muſi. pag. 19. de Quarta) "Hæc infæliciſſima eſt conſonantiarum omnium, nec unquam in cantilenis attribuetur, niſi per accidens, et cum alterius adjumento, nec quidem quod magis imperfecta ſit quam tertia minor, aut ſexta, ſed quia tam vicina eſt quintæ, ut coram hujus ſuavitate tota illius gratia evaneſcat."

Organiſts have long obſerved that cloſe intervals in the baſe, though conſonant, are diſagreeable, and never, in full playing, give the 3d in a common chord with the left hand in the baſe.

omitting the 3d. thus, never thus.



GASSION, John de, a marſhal of France, was born in 1609 at Pau, where his father was preſident of the parliament. Being intended for the army, he, at the age of 16, entered into the gendarmes of the prince of Piedmont; and in 1627 he ſerved under the duke de Rohan in the civil wars with the Calviniſt party, to whom he was always attached. He next joined himſelf to Guſtavus, and was made captain of his body guard, and ſhortly after raiſed to the rank of a field officer in the cavalry, in which poſt he performed eſſential ſervices in ſeveral actions, eſpecially at the battle of Leipſic. Guſtavus was ſo highly pleaſed with his valour in the field and his fidelity in council, that he determined to diſtinguiſh him by ſome ſignal recompence; but the death of that great man at Lutzen prevented the execution of his well meant intention. (See Gustavus.) Gaſſion now returned to France with his regiment, and entered under the marſhal de la Force in Lorrain, where he performed many remarkable exploits, and where he became a terror of the enemy. At the ſiege of Thionville he received a dangerous wound, for which he was recompenſed in 1643 with a marſhal's ſtaff, and in the following year he was appointed lieutenant-general of the army in Flanders. He now performed the moſt brilliant actions, and was entruſted with highly important poſts, but when he had apparently attained to the height of his reputation, he received a mortal wound at the ſiege of Lens in 1647, and was buried in the pariſh church at Charenton. His hiſtory has been publiſhed by the abbè de Pure, in four volumes 12mo. He has been characteriſed as a military man by a daring courage and ſpirit of enterpriſe, which ſet at defiance all common obſtacles. "Theory," he ſaid, "was good in the cloſet, but boldneſs and action are the requiſites in the field." At another time he exclaimed, "I have that in my head and at my ſide which will overcome pretended impoſſibilities." Cardinal Richelieu had ſo full a confidence in him, that when urged by uncommon difficulties he uſed to ſay, "They will be readily removed by Gaſſion." Moreri.

GASSO, in *Geography*, a town of France, in the department of the Po; five miles S. of Chivaſſo.

GAST Hound. See *Gaze* Hound.

GASTALDUS, or Castaldus, an officer anciently entertained in the courts of divers princes.

The word is alſo written *gaſtaldius*, *gaſtaldio*, *gaſtaldatus*, *guaſtaldus*, &c. Macri derives it from the Arabic *chaſendar*, purveyor of a houſe; others from the German *gaſt*, and *halten*, to retain travellers.

The gaſtaldus was what in Italy and Spain is now called *major domo, viz.* the maſter and ſteward of a houſehold. The gaſtaldus was a comes, or count; which ſhews his office to have been very conſiderable.

In the laws of Italy, we ſometimes alſo meet with gaſtaldus in the ſenſe of a courtier, and ſometimes as an eccleſiaſtical officer; ſo that it is ſomewhere expreſſed to be ſimony to buy the function of gaſtaldus.

GASTALDY, John Baptist, in *Biography*, a doctor of the faculty of medicine at Avignon, and phyſician in ordinary to the king of France, was born at Siſteron, in 1674. He went while very young to Avignon, and finding that this city would afford him ample means of gratifying his taſte for ſtudy, he took up a permanent reſidence. He was an honour to the faculty, and filled the firſt chair of medicine for upwards of forty years; poſſeſſing the rare talent of uniting the uſeful with the agreeable, and, by this charm, attaching the ſtudent to his art. He devoted much of his time to practice, more particularly in the hoſpitals, and his value was acknowledged by the citizens of Avignon during the plague, which ravaged that place in the year 1720. Gaſtaldy died at Avignon in 1747. His principal work is the following; "Inſtitutiones Medicinæ Phyſico-Anatomicæ," 1713. Several Queſtions in Phyſic were publiſhed by him at different times reſpecting intereſting topics in phyſiology and medicine. Eloy. Dict. Hiſt.

GASTAUD, Francis, who flouriſhed in the beginning of the eighteenth century, was deſcended from a family of diſtinction, and born at Aix in Provence. Having received an education adapted to the purpoſe, he was at an early age admitted into orders, and officiated for ſome years as prieſt in the pariſh church of St. Paul. He was greatly admired as a preacher, and publiſhed ſeveral theological pieces, among which was "A Collection of Homilies on the Epiſtles to the Romans," in two volumes, 12mo. To this work is prefixed an excellent delineation of the character of St. Paul. On the death of his elder brother, a celebrated advocate in the parliament of Provence, he determined to embrace the ſame profeſſion. With this deſign he retired into the country, and applied moſt diligently to the ſtudy of the law. He then took his degrees, was admitted an advocate, and practiſed with uncommon ſucceſs. The intereſts of the poor he advocated without hope of reward; and in 1717 he gained a famous cauſe againſt the Jeſuits, of whom he was an active opponent. Not contented with pleading profeſſionally againſt them, he attacked them by means of the preſs, and wrote a bitter piece, entitled "The Jeſuits unmaſked." He publiſhed ſome treatiſes againſt the biſhop of Marſeilles, which occaſioned him to feel the ſevere vengeance of that prelate, at whoſe inſtance he was exiled twice to Viviers, where he died in the year 1731, and on account of his reputed hereſy he was denied the rights of Chriſtian burial. Moreri.

GASTE, St., in *Geography*, a town of the county of Tyrol; 20 miles S.W. of Bolzano.

GASTEIN, a town of the archbiſhopric of Salzburg, celebrated for its warm baths and mines of lead, iron, and gold; 36 miles S. of Salzburg.

GASTEL, a river of Wales, which runs into the Conway, in the county of Carnarvon.

GASTER, in *Anatomy*, (from the Greek γαστηρ), the *ſtomach*. In the ancient writers on medicine, the word is ſometimes applied to the abdomen in general, or to the uterus.

Gaster, in *Geography*, a bailiwick of Switzerland, belonging to the canton of Schweitz and Glaris, to which it was ſold by the houſe of Auſtria in 1438.

GASTE-

GASTEROSTEUS.

GASTEROSTEUS, in *Ichthyology*, a genus of the thoracic order, diſtinguiſhed by the following eſſential character; the head oblong and ſmooth; jaws armed with minute teeth; tongue ſhort and obtuſe; palate ſmooth; eyes moderate, ſlightly prominent, and lateral; gill-membrane with from three to ſeven rays; gill-cover of two pieces, rounded and ſtriated; body carinated each ſide, and covered with bony plates; dorſal fin ſingle, with diſtinct ſpines between it and the head; lateral line ſtraight; ventral fins behind the pectoral, and above the ſternum.

This is the Gmelinian character of the gaſteroſteus genus, and which, according to Lacepede, may be with propriety reduced to the following eſſential particulars; one dorſal fin with an armament of diſtinct dorſal ſpines placed before it; a longitudinal keel on each ſide the tail; one, two, or more rays in each thoracic fin, which are always ſpinous. The fiſhes of this genus are in general of a diminutive ſize, and, with the exception of four ſpecies, are peculiar to the ſeas and rivers of extra-European climates.

Species.

ACULEATUS. Three ſpines on the back. Linn. *Stickling*, *Stachelfiſch*, Wulff. *Three-ſpined ſtickleback*, Donov. Brit. Fiſhes.

The length of this ſpecies rarely exceeds three inches; the head is rather compreſſed, and the eyes remarkably prominent; the ſides covered with a ſeries of hard bony plates as in the other ſpecies of the ſame genus; near the tail the body is ſquare, and beneath the vent is a ſhort ſpine. The colour of the back green; ſides, and beneath ſilvery; and the chin, with the breaſt, and fore part of the abdomen of the female, of a fine red colour when in full roe. It inhabits freſh waters in dykes, ditches, and little rivulets, and occurs in ſuch vaſt abundance in many parts of Europe, that, notwithſtanding the diminutiveneſs of the ſize, it is employed very often as an article of manure. Gmelin relates that the ſtickleback is frequently uſed to fatten ducks and pigs; and it is well known that in the neighbourhood of Dantzic a kind of oil is expreſſed from it, which is in frequent uſe for burning in lamps and other ſimilar purpoſes.

DUCTOR. Dorſal ſpines four; gill-membrane with ſeven rays. Gmel.

Inhabits the ocean, and always preceedes, or appears in company, with the ſhark. The dorſal fin contains twenty-ſeven rays; pectoral eighteen; ventral ſix; anal ſixteen; and tail nineteen.

JAPONICUS. Dorſal ſpines four; gill-membrane with five rays. Gmel.

Length five inches, and of a yellow colour; the head obtuſe; jaws rough, without teeth; gill-covers not ſcaly, toothed behind; dorſal ſpines moveable, thick, ſtrong, unequal, and placed in a cavity; ventral fins connected by a thick rigid ſpine, an inch and a half in length; and the body covered with large rhombic ſcales, ending in ſpines turned backwards; the anterior part ciliated with ſpines, and the edge brown. Inhabits Japan.

In the dorſal fin are ten rays; pectoral twelve; anal nine, and tail twenty-two.

LYFAN. Dorſal ſpines ſeven; anal two; gill-membrane eight-rayed. Gmel.

An Arabian ſpecies; the body above blueiſh-brown, beneath white, and of an oblong lanceolate form. The lateral line undulated on the anterior part. The dorſal fin includes one ſpinous, and twenty-one ſoft rays; pectoral, ſeventeen rays; ventral, one ſpinous and ſix ſoft rays, and the anal, one ſpinous and nineteen ſoft rays.

OCCIDENTALIS. Dorſal ſpines ſeven; and two before the anal fin. Gmel.

Native of America; colour ſilvery; tail longitudinally ſtriated.

OVATUS. Dorſal ſpines ſeven, the firſt recumbent; anal two. Gmel.

A ſpecies of ambiguous character, allied in ſhape, according to Gmelin, to the genus Chætodon, and in other reſpects not ſufficiently diſtinguiſhed from the Labrus or the Scomber, with the firſt of which it accords, in being deſtitute of the thoracic plate, and with the other in its recumbent dorſal ſpine. The jaws and lips are rough; the dorſal ſpines directed alternately to the ſides, the firſt very ſmall, the next rather longer. This fiſh inhabits Aſia.

CAROLINUS. Dorſal ſpines eight; anal three. Gmel.

Native of the ſeas of Carolina, and greatly allied to the genus Scomber; the body is of an oval form, inclining to oblong; lateral line ſub-carinated at the tail; dorſal and anal fins falcated; and tail nearly bilobate.

CANADUS. Dorſal ſpines eight; anal none; gill-membrane ſeven-rayed. Gmel.

Body oblong; poſterior and anal fin falcate; tail nearly bilobate. Inhabits Carolina.

SALTATRIX. Dorſal ſpines eight, connected by a membrane; gill-membrane with ſeven rays. Gmel.

Native of the ſeas of Carolina, where, from its ſkipping frequently out of the water, it is known by the name of Skip-jack. The lower jaw has a ſingle row of teeth, the upper two; the dorſal ſpines are weak, and placed in a cavity; the tail forked.

PUNGITIUS. Dorſal ſpines about ten; and the ſides deſtitute of plates. *Spinis dorſalibus ſub-decem, lateribus abſque ſcutis*, Donov. *Gaſteroſteus pungitius; ſpinis dorſalibus decem*, Linn. *Centriſcus ſpinis decem, &c.* Klein. *Spinarella puſillus*, Bell. *La petite épinoche de mer*, Bloch. *Leſſer ſtickleback*, Will. *Ten-ſpined ſtickleback*, Penn.

The leſſer or ten-ſpined ſtickleback is the moſt diminutive of the fiſh tribe known, very rarely exceeding, when full grown, an inch and a half in length, and is even ſeldom found of that ſize.

This ſpecies is of a rather more ſlender ſhape than the common kind, and the jaws a little longer in proportion; the colour on the back olive; ſides yellowiſh, and parts beneath ſilvery. The number of the dorſal ſpines, which Linnæus and Gmelin admit as the principal diſtinction of the ſeveral ſpecies in this genus, we may venture to aſſert, ſo far as relates to the preſent ſpecies, at leaſt is not always conſtant. We have ſeen it with ten dorſal ſpines, as thoſe authors deſcribe; we have alſo ſeen it with only nine, and one example with no more than eight. Theſe circumſtances ſeem ſufficient to juſtify the ſlight amendment in the ſpecific character above propoſed, to which may be added, that the abſence of the lateral plates is very characteriſtic, and at once removes this from the other Britiſh ſpecies. The pectoral fin uſually contains about ten rays; the anal fin nine; and the tail twelve.

SPINACHIA. Dorſal ſpines fifteen. Linn. *Gaſteroſteus pentagonus*, Klein. *Aculeatus vel pungitius marinus longus*, Ray. *Grand épinoche*, Bloch. *Fifteen-ſpined ſtickleback*, Donov. Brit. Fiſhes.

Length from ſix to eight inches. The head of a remarkable tubular form; the body ſlender; back armed with fifteen ſharp ſpines, and the lateral line compoſed of ſmall, ſomewhat prominent, and pointed ſcales. General colour above olive, variable, and tinged with gold, beneath white. The dorſal fin contains about ſeven rays; pectoral fin ten rays; ventral an acute bony proceſs; in the anal fin are eight rays,

rays, the firſt of which is ſhort and ſpinous; and the tail contains twelve rays.

Inhabits the ſeas of Europe, and is rarely, if ever, found in freſh waters. The food of this ſpecies conſiſts of the fry of fiſhes and worms. It is taken in great plenty in ſome parts of Europe, not as an article of food, for it is ſeldom eaten; but, like the common freſh-water ſtickleback, for the purpoſe of manure, and alſo for the ſake of the oil, which it yields in abundance.

SPINARELLA. Spines on the poſterior part of the head four, ſomewhat ſerrated; the lateral ones as long as the belly. Gmel.

A native of India.

ACANTHIAS. Four ſmall rays before the dorſal fin; gill-membrane three-rayed. Gmel.

Inhabits the ſeas of Denmark.

GASTOLDI, ſometimes called *Gaſtaldi*, in *Biography*, a voluminous muſical Italian compoſer, born at Caravaggio, was author of thirty different works; the titles and dates of which may be ſeen in Draudius and Walther. Of theſe we have only ſeen his ballads, printed at Antwerp, 1596, under the following title: "Balletti a 5. co i verſi per cantare, ſonare, e ballare; con una Maſcherata de Cacciatori à 6. e un Concerto de' Paſtori, à 8." This puts the derivation of our word ballad out of all doubt, which originally meant a ſong that was ſung and danced at the ſame time. The tunes of Gaſtoldi are all very lively, and more graceful than any we have ſeen before the cultivation of melody for the ſtage. The firſt edition of theſe ballads was publiſhed at Venice, 1591; many of them are called *Fa las*, under which title our Morley, four years after, publiſhed ſhort airs, in five parts: ſo that it ſeems as if the name of *Fa la*, ſilly as it is, was not originally Engliſh.

GASTON DE FOIX, duke of Nemours, and nephew of Lewis XII. king of France, was born in 1488. The monarch took delight in the education of the youth, and at a proper period beſtowed upon him the government of Milan, and made him general of his army in Italy. The youthful hero was equally deſirous of ſhewing proofs of his valour, and ſignalized himſelf in various actions, the laſt of which was the battle of Ravenna, fought on Eaſter Sunday, 1512. Not contented with a ſignal victory he reſolved to follow the retreating army, and making a furious charge he was thrown from his horſe, and killed by an enemy's pike. His death, which happened in his 24th year, more than overbalanced the joy ariſing from the ſucceſs. Moreri.

GASTONIA, in *Botany*, ſo named by Commerſon and Juſſieu, in honour of Gaſton duke of Orleans, the ſecond ſon of Henry IV. of France. He was the patron of Moriſon, and founded the botanic garden at Blois, known to botaniſts by the name of *hortus bleſenſis*, of which Moriſon publiſhed a catalogue. This prince formed a plan for a general collection of drawings of plants, which was regularly continued after his death by the kings of France up to the revolution, and is ſtill we believe in a progreſſive ſtate, conſtituting one great ornament of the national library.—Juſſ. 217. Lamarck. Dict. v. 2. 610. Claſs and order, *Dodecandria Dodecagynia*. Nat. Ord. *Hederaceæ*, Linn. *Araliæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, ſhort, entire, ſlightly waved. *Cor.* Petals ſix, rarely but five, broad at the baſe, ſeſſile, ſomewhat triangular, keeled, acute, ſpreading, recurved at the point. *Stam.* Filaments twelve, rarely but ten, ſhort, awl-ſhaped; anthers ſhorter than the corolla, oblong, furrowed, of two lobes. *Piſt.* Germen ovate, furrowed; ſtyles ten or twelve, ſmall and ſhort; ſtigmas ſimple. *Peric.* Capſule? or berry? ovate, with ten or twelve furrows and as many cells, crowned with the permanent calyx. *Seeds* ſolitary.

Eſſ. Ch. Calyx of one leaf, ſuperior, entire. Petals ſix, broad at the baſe. Fruit of twelve cells. Seeds ſolitary.

This genus is akin to *Aralia*, as well as to Forſter's *Polyſcias*, Nov. Gen. t. 32, but differs widely from both in its calyx, as well as with reſpect to number in the parts of fructification. It was found by Commerſon on a large umbelliferous tree of the iſle de Bourbon, called in that country *bois d'eponge*, from its ſpongy bark, and hence Lamarck gives it the awkward ſpecific name of *cutiſpongia*. The *leaves* are pinnate, with a terminal leaflet often wanting; leaflets two or three inches long, ovate, wavy, entire, coriaceous, ſmooth. *Umbels* of about eight flowers, very numerous, in branched or umbellate cluſters, all naked. *Flowers* greeniſh, with yellow anthers, larger than in moſt umbelliferous plants, all equal and regular. Juſſieu ſays that on old trees they have five petals and fifteen ſtamens; on younger ones ten petals and ten ſtamens. We are indebted to him for a ſpecimen. Lamarck ſeems to have omitted this genus in his plates. This writer conſiders the *Nalugu*, Rheede Hort. Mal. v. 2. 43. t. 26, as another ſpecies, which Linnæus quotes for his *Aralia chinenſis*, and Juſſieu is diſpoſed to refer to *Aquilicia*, that is, *Leea*.

GASTORF, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 8 miles S.E. of Leitmeritz.

GASTOUNI, a town of European Turkey, in the Morea; 12 miles E. of Chiarenza.

GASTREL, FRANCIS, in *Biography*, was born at Slapton, in Northamptonſhire, about the year 1662. He was educated at Weſtminſter under the celebrated Dr. Buſby, where he was admitted a king's ſcholar, and afterwards elected ſtudent of Chriſt-church college, Oxford. This was in the year 1680; in 1684 and 1687 he took his degrees of B.A. and M.A., and in a ſhort time he was admitted to orders, and became diſtinguiſhed as a preacher. In 1694 he was appointed preacher to the honourable ſociety of Lincoln's Inn, London, and in 1697 he was appointed to preach the lecture founded by the Hon. Robert Boyle. The diſcourſes delivered on this occaſion he publiſhed in a continued treatiſe, entitled "The certainty and neceſſity of Religion, or the firſt Grounds and Principles of human Duty eſtabliſhed." In the year 1699 he publiſhed another diſcourſe as a ſecond part of the ſame important ſubject, entitled "The chriſtian Revelation, and the neceſſity of believing it eſtabliſhed, in oppoſition to all cavils and inſinuations of ſuch as pretend to allow natural religion and reject the Goſpel." In 1700 Mr. Gaſtrel took his degree of doctor in divinity, and was appointed chaplain to the houſe of commons. Two years afterwards he was preſented by the queen to a canonry of Chriſt-church in Oxford. About this time he engaged in the controverſy on the Trinity, and publiſhed "Some conſiderations concerning the Trinity, and the way of managing that controverſy," which was ſo well received that it quickly paſſed through two editions, and in the third he ſubjoined a vindication of it in reply to ſome animadverſions of Mr. Anthony Collins in his "Eſſay concerning the uſe of Reaſon." In 1707 he publiſhed "The Chriſtian Inſtitutes, &c. collected out of the writings of the Old and New Teſtament." In the year 1711 Dr. Gaſtrel was choſen proctor in convocation, for the chapter of Oxford, and was appointed one of the queen's chaplains. In 1714 he publiſhed his "Remarks upon Dr. Clarke's Scripture Doctrine of the Trinity," and in the ſame year he was promoted to the biſhopric of Cheſter, which occaſioned the reſignation of his office as preacher at Lincoln's Inn, though he was ſtill permitted to hold the canonry of Chriſt-church in commen-

dam. In politics Dr. Gaſtrel ſided with the Tories, which led to his promotion in the reign of queen Anne, but rendered him in ſome degree obnoxious to the adminiſtration in the following reign, whoſe meaſures he oppoſed in the houſe of lords. He ſhewed his zeal for the univerſity of Oxford in 1717, when it was attacked in the houſe of lords, upon account of a riot, or pretended riot, on the prince of Wales's birth-day. When the bill was depending againſt his old friend the biſhop of Rocheſter, he ſpoke with animation in his behalf, and with indignation againſt the adminiſtration. And in the year 1723, when the bill for inflicting pains and penalties on the biſhop had paſſed the commons, and was brought into the houſe of lords, Dr. Gaſtrel oppoſed it in every ſtage, becauſe he was convinced that there was not ſufficient evidence to juſtify the violence of the proceedings inſtituted againſt Dr. Atterbury. Dr. Gaſtrel fell a victim to the gout in the year 1725, when he was about ſixty-three years of age. He died at his apartments in Chriſt-church, and was buried in the cathedral there, without any monument. "But," ſays the writer of his life in the Biographia Britannica, "he left a ſufficient monument of himſelf in his excellent writings." Beſides his other employments, he was one of the commiſſioners for building fifty new churches in London: and a member of the Society for propagating the Goſpel in foreign Parts. Biog. Brit.

GASTRIC, in *Anatomy*, an adjective derived from γαστηρ, the ſtomach, and applied to the arteries, nerves, or other parts belonging to that organ.

GASTRICUS Succus, or *Gaſtric juice*, in *Phyſiology*, an animal fluid, ſecreted in the ſtomach, mixed with the food, which it has the power of diſſolving, and conſtituting thereby the chief agent in the proceſs of digeſtion. See Digestion.

GASTRILOQUUS, or Gastriloquous, a perſon who ſpeaks inwardly, or within his ſtomach, and whoſe voice ſeems to come from afar off; more uſually called *ventriloquus*, which ſee.

The term is formed of the Greek, γαστηρ, *belly, ſtomach*, and the Latin, *loqui, to ſpeak*.

GASTRITIS, in *Medicine*, from the Greek, γαστηρ, the *ſtomach*, with the termination *itis*, ſignifies inflammation of the ſtomach.

From the variety of ſubſtances which paſs through the ſtomach, and which may be injurious either by their quality or quantity, and from its great ſympathy with the reſt of the body, it might be expected that this organ would be particularly liable to be affected with inflammation. Such an affection, however, at leaſt in the acute form, generally underſtood by the appellation of gaſtritis, is a rare occurrence. But it has been obſerved by Dr. Cullen, that a leſs active degree, or rather a peculiar modification of the diſeaſe, which he has termed the *erythematic* inflammation of the ſtomach, occurs more frequently; although the ſymptoms, by which its preſence is indicated, are not always ſo unequivocal as thoſe of the acute or phlegmonous inflammation. The two forms of the diſeaſe have their ſeat, he conceived, in different parts of the ſtructure; the acute gaſtritis affecting the nervous coat of the ſtomach, or the peritoneum inveſting it; while the erythematous inflammation is always ſeated in the villous coat and cellular texture immediately ſubjacent.

The phlegmonic inflammation of the ſtomach, or gaſtritis properly ſo called, is characterized by an acute burning pain in the region of the ſtomach, which is ſuddenly increaſed, and vomiting at the ſame time excited by any thing whatever that is ſwallowed; it is alſo aggravated by external preſſure. Theſe ſymptoms are accompanied by a great degree of general fever or pyrexia; the pulſe is extremely quick and ſmall, and commonly hard. There is alſo extreme anxiety, and a greater depreſſion of ſtrength and loſs of power in all the functions of the body, than in the caſe of almoſt any other inflammation. In many inſtances there is a remarkable tendency to ſyncope; and there is frequent reaching, and often hiccup, independently of any thing ſwallowed. In ſome inſtances, other ſymptoms are ſuperadded to theſe. Thus very early in the diſeaſe, a high delirium has ſometimes come on, with great giddineſs and loſs of ſight, from the ſympathetic affection of the brain; conſiderable difficulty of breathing has alſo occurred, probably from the impoſſibility of depreſſing the diaphragm without compreſſing the ſtomach; convulſions of the muſcles, and in ſome caſes, although intenſe thirſt was preſent, an actual hydrophobia, or horror of taking liquids, has alſo taken place. By this term is to be underſtood, however, only a dread of drinking, and not the *rabies canina*, improperly called hydrophobia, from *one* of its ſymptoms. In a remarkable caſe of inflammation of the ſtomach, (deſcribed in the Edinburgh Medical Eſſays, vol. i. art. 29.) which was moſt violent, but ultimately cured by repeated blood-letting, this dread of liquids obviouſly aroſe from experience of the acute pain excited in the gullet and throat. "After this laſt blooding," ſays the writer, "the patient, finding himſelf more than ever relieved, called haſtily for a little warm milk and water, which he greedily glutted in a mouthful, and that very moment, with great force, ſpouted it at a great diſtance, and after it an incredible quantity of ſaliva in the ſame manner, telling, that notwithſtanding all his burning thirſt, to ſwallow it was impoſſible; nor could he, without a kind of horror, hear of any drink." Hence, it has been ſuppoſed, that the dread of water, connected with canine madneſs, originates from an inflammation of the gullet and ſtomach, more particularly as diſſection has often diſcovered a ſmall degree of ſuch inflammation in that diſeaſe. See Hydrophobia.

From the great ſenſibility of the ſtomach, and its ſympathetic connection with the other important organs of life, it muſt be obvious that inflammation of this viſcus, by whatever cauſes produced, muſt occaſion a great and often fatal derangement of the ſyſtem. In particular, by the great debility which ſuch an inflammation ſuddenly induces, it may quickly prove fatal, without running the common courſe of inflammations. Such indeed is the connection of the ſtomach with life, that ſome of the cauſes of gaſtritis produce death almoſt inſtantaneouſly, before any inflammation can be excited. Thus ſome of the narcotic poiſons, ſuch as laurel-water, a ſtrong infuſion of tobacco, or even ſpirituous liquors in ſufficient quantity, have produced immediate death; a large draught of cold water, after the body has been violently heated and exhauſted by great exertions and copious ſweating, has likewiſe had the ſame effect. (See Cold.) And a blow on the region of the ſtomach will occaſion inſtant death without producing either inflammation or rupture of veſſels; as in the caſe of a man taken to the Royal Infirmary at Edinburgh, and mentioned by Dr. Gregory in his lectures.

If the diſeaſe laſts long enough to follow the ordinary courſe of other inflammations, it may terminate like them by reſolution, gangrene, or ſuppuration. Some writers have mentioned ſcirrhus and cancer of the ſtomach as among the ſequelæ of gaſtritis; but Dr. Cullen has correctly ſtated that the ſcirrhoſities, which are often diſcovered affecting the ſtomach, are ſeldom known to be the conſequences of inflammation. The *prognoſis*, as to the tendency of the diſeaſe to one or other of theſe terminations, may be deduced from the following appearances and conſiderations. The diſpoſition of the inflammation to ceaſe, or to terminate by *reſolution*, as it is called, may be known by its having ariſen from

no violent cauſe, which may have injured the texture or ſubſtance of the ſtomach; by the mild or moderate ſtate of the ſymptoms; and by a gradual remiſſion of them, in conſequence of the action of the remedies employed in the courſe of the firſt few days of the diſeaſe. For in violent caſes, where the remedies have not been applied ſufficiently early or with ſufficient vigour, gangrene comes on very rapidly. The tendency to *gangrene* may be ſuſpected from the unyielding obſtinacy of the ſymptoms, when active remedies have been early employed, and eſpecially when the inflammation has been induced by corroſive poiſons, or draſtic emetics, taken into the ſtomach. And that a gangrene has already begun, may be known from the ſudden remiſſion or ceſſation of the pain, while the pulſe continues frequent, and at the ſame time becomes weaker; while other marks of the ſinking of the powers of life in the whole ſyſtem come on; ſuch as frequent fainting, ſtarting of the tendons, hiccup, a cadaverous appearance of the countenance, &c. *Suppuration* is a leſs frequent termination of gaſtritis, but occaſionally occurs, and may be expected to take place, when the ſymptoms have continued, in a moderate degree, for more than one or two weeks; and eſpecially when there is a conſiderable remiſſion of the pain, while a ſenſe of weight and anxiety ſtill remain. When an abſceſs is formed, the frequency of the pulſe is at firſt abated; but it ſoon again increaſes, and frequent cold ſhiverings, and marked exacerbations of heat and feveriſhneſs in the afternoon and evening, followed by night-ſweats, come on; in other words, a hectic fever enſues. At length the diſeaſe commonly proves fatal, unleſs the abſceſs open into the cavity of the ſtomach, the pus be diſcharged by vomiting, and the ulcer ſoon heal. There are, indeed, ſome rare inſtances on record, in which the impoſthume has burſt externally, and not only the pus, but the alimentary matters ſwallowed, have paſſed out at the opening during the remainder of life. In ſuch caſes, a previous adheſion of the ſtomach with the peritoneum had taken place by means of the inflammatory proceſs. Van Swieten mentions a woman of 60 years of age, whom he viſited, and who had ſuſtained ſuch a fiſtulous opening for 12 years, without any great injury to her health; "and I obſerved," he adds, "that the contents of the ſtomach came out in part through the opening of this fiſtula." (Comment. ad Aph. 955, Boerhaav.) He refers to a ſtill more extraordinary caſe, related in the Journal des Savans, for 1737, which occurred in a girl, in whom a ſuitable compreſs and bandage were required to cloſe the large opening of the fiſtula, otherwiſe all the nouriſhment that was taken in immediately flowed out through it. Nevertheleſs, the opening of this ulcer gradually contracted itſelf, and ſhe lived in ſuch good ſtrength as to undergo the labours in a country farm; in which manner ſhe ſupported her malady for the ſpace of 23 years.

Cauſes of Gaſtritis.—We are not acquainted with any particular *prediſpoſition* to gaſtritis in the firſt inſtance; but when the diſeaſe has once occurred, like moſt other inflammations, it leaves a tendency in the part affected to be more eaſily excited to inflammation again; and therefore, for a long time ſubſequent to recovery, the utmoſt caution, in regard to the uſe of irritating food and drink, is required. The *exciting* cauſes are ſuch matters applied to the ſtomach, as from their ſenſible, chemical, or mechanical properties, occaſion violent irritation to the ſtomach, or injure its texture: or the inflammation is produced by the extenſion of the diſeaſe from the neighbouring organs, or from diſtant parts by what has been termed *metaſtaſis*. Among the firſt of theſe, are, large draughts of cold liquids, taken while the body is greatly heated, the perſpiration is profuſe, and the exertions which occaſioned the heat have been remitted;—over-diſtenſion of the ſtomach with highly ſtimulant or indigeſtible food;—chemical acrids, whether poiſons, properly ſo called, or draſtic antimonial, mercurial, or cupreous emetics, taken into the ſtomach;—mechanical matters, which by their weight, roughneſs, &c. mechanically injure the coats of the ſtomach;—and in ſome caſes of peculiar debility of the ſtomach, even fermented liquors, or ordinary food. Among the laſt-mentioned cauſes are the inflammation of other viſcera, as of the liver, bowels, &c.;—the transference of gouty, rheumatic, or eryſipelatous inflammation, from the extremities;—and the checking of certain chronic eruptions on the ſkin. The ſtomach is alſo liable to be inflamed under an attack of general fever, like other organs of the body, by particular determinations of the circulation to the part. See FEVER.

Appearances on Diſſection.—When inflammation of the ſtomach induces death, independently of ſuppuration or gangrene (which are not the moſt frequent terminations of the diſeaſe), ſometimes the inflammation is found, upon diſſection, to have ſpread over a conſiderable part, or perhaps the whole, of the inner membrane; but moſt commonly it occupies a ſmaller portion. The ſtomach upon the outſide, at the inflamed part, ſhews a greater number of ſmall veſſels than uſual, but is commonly not much crowded with them. On opening the ſtomach, it is found to be a little thicker at the inflamed part, the inner membrane is very red from the number of ſmall florid veſſels, and there are frequently ſpots of extravaſated blood. When the exciting cauſe has been a corroſive poiſon, ſuch as arſenic, for inſtance, the inflammation is moſt intenſe. The ſubſtance of the ſtomach is then found thickened, and on opening into its cavity there is a very great degree of redneſs in the inner membrane, ariſing partly from the very great number of minute veſſels, and partly from extravaſated blood. Portions of the inner membrane are ſometimes deſtroyed, from the violent action that has taken place in conſequence of the immediate application of the poiſon: and ſometimes a thin layer of coagulable lymph is found thrown out upon a portion of the inner ſurface of the ſtomach. (See Baillie, Morbid Anat. p. 138.) It muſt be added, however, that from the diſſection of dead bodies it is known that the ſtomach has been often affected with inflammation when the characteriſtic ſymptoms, before mentioned, had not appeared: of this we ſhall have occaſion to ſpeak preſently.

Cure of Gaſtritis.—The treatment of inflammation of the ſtomach will neceſſarily vary according to the nature of the exciting cauſe, and to the degree and duration of the diſeaſe, and to the circumſtance of its being ſimple or complicated. The leading indication, however, and the general plan muſt be the ſame as in all phlegmonic inflammations, in their commencement, namely, to attempt the reſolution of the diſeaſe by depletion, together with the ſtrict obſervance of the antiphlogiſtic regimen. Large bleedings muſt be ſpeedily employed, and repeated, if the urgency of the ſymptoms continue to require it, notwithſtanding the ſmallneſs of the pulſe, the general debility, and even diſpoſition to fainting. For, after bleeding, it is obſerved that the pulſe commonly becomes fuller, and the tendency to ſyncope is diminiſhed. In the inſtance, recorded in the Edinburgh Medical Eſſays, to which we have already alluded, the patient was bled five times within ſeven hours, and was each time ſuddenly relieved from the acute pain; the pulſe, before irregular, became regular; and the cold extremities became warm. In delicate conſtitutions, when the violence of the inflammation has been reduced, but not altogether removed, by bleeding, the application of leeches, or of cupping-glaſſes, after ſcarifi-

cation, to the region of the ſtomach, may be occaſionally reſorted to with advantage. A large bliſter, applied to the pit of the ſtomach, after veneſection, is likewiſe advantageous. In caſes where a conſiderable irritability of the ſtomach, with little or no actual inflammation, exiſts, and gives riſe to naufea and vomiting, the external agency of a bliſter is often the moſt effectual remedy. The reſolution of the inflammation is alſo aſſiſted by fomentations to the whole of the abdomen, or by frequent emollient and laxative glyſters, which will contribute alſo to the purpoſe of dilution, and, from the vicinity of the colon to the ſtomach, may act as a ſort of internal fomentation.

It is fortunate that theſe meaſures, particularly the blood-letting and bliſtering, conſtitute the moſt effective means that we poſſeſs of reducing inflammatory action; for as, in this inflammation, every thing applied to the internal ſurface of the ſtomach itſelf is immediately rejected, and adds to the morbid irritation; no medicine can be adminiſtered by the mouth for its cure; and it is perhaps adviſable to abſtain altogether from taking any thing whatever into the ſtomach, whether by way of medicine or aliment, until the violence of the inflammation be ſomewhat ſubdued, however contrary ſuch abſtinence may be to the prejudices of Engliſhmen. An exception to this, however, lies in the caſe of gaſtritis, occaſioned by acrid or poiſonous ſubſtances; for here diluent liquids muſt be given, and the vomiting produced, by removing the irritating cauſe, may be ſerviceable; although it muſt be recollected that theſe acrid matters commonly produce a ſufficient degree of vomiting themſelves. In other caſes, where any thing can be borne by the ſtomach, liquids of the very mildeſt kind, ſuch as milk and water, thin gruel, &c. muſt be given, and in very ſmall quantities at a time.

For the acrid mineral poiſons, which act *chemically* on the living fibre, the uſe of antidotes or *correctors* naturally ſuggeſts itſelf. Thus the undiluted and corroſive acids and alkalies may be reciprocally neutralized by each other; the ſulphurets have been ſuppoſed to correct the acrid qualities of arſenical ſalts, &c. (See ARSENIC.) But it muſt be obſerved, with reſpect to the undiluted acids, and the pure or cauſtic alkalies, that their injurious operation on the texture of the parts with which they come in contact is inſtantaneous, and before any remedies can be applied, the whole miſchief is accompliſhed.

Opiates, in whatever manner exhibited, are very hurtful during the firſt days of inflammation of the ſtomach; but when its violence has greatly abated, or the pain and ſickneſs recur at intervals only, opiates may be cautiouſly adminiſtered in glyſters, and have ſometimes been thus employed with advantage.

The antiphlogiſtic regimen muſt be in a conſiderable degree adhered to, even after the diſeaſe is ſubdued: a low mild diet muſt be continued for ſome weeks; the food being ſparing alſo in quantity, conſiſting of milk and vegetables chiefly, and every thing hard, viſcid, inſoluble, or ſtimulant, together with all fermented liquors, being carefully avoided. We formerly mentioned, and the obſervation was ſupported by the authority of Dr. George Fordyce, that one of the moſt common cauſes of relapſe in fevers was the too ſpeedy recurrence to the ordinary full diet. (See FEVER.) This obſervation is ſtill more applicable to the *phlegmaſiæ*, or acute inflammations, and above all to inflammation of the ſtomach; becauſe inſoluble or ſtimulating ſubſtances not only operate by their influence on the general ſyſtem, but by their immediate contact with the organ, which is debilitated, and prediſpoſed to diſeaſe by the previous ſuffering.

When *ſuppuration* has actually begun, as Dr. Cullen juſtly remarks, it muſt be left to nature; our medicines are of no avail in influencing its progreſs, and the buſineſs of the phyſician is only to *avoid* all irritation. We can only confine the patient to quietneſs, and a mild diet. The caſe is then almoſt hopeleſs.

With reſpect to the *erythematic* inflammation of the ſtomach, it was conſidered by Dr. Cullen as a more frequent occurrence than that of the *phlegmonic* kind. We have already ſtated that diſſection has ſometimes detected the preſence of an inflamed condition of the ſtomach, when neither pain nor pyrexia had before given any notice of it. Such inflammation Dr. Cullen apprehends to have been chiefly of the erythematic kind. This ſpecies of inflammation, he thinks, would more frequently occur, from acrid matter of any kind taken into the ſtomach, were not the interior ſurface of this organ commonly defended by mucus, exuding in large quantity from the numerous follicles placed immediately under the villous coat. Upon many occaſions, however, the exudation of mucus is prevented, or the liquid poured out is of a leſs viſcid kind, ſo as to be leſs fitted to defend the ſubjacent nerves; and, in ſuch caſes, matters even of moderate acrimony may produce an erythematic affection of the ſtomach.

But although it ſometimes occurs where neither pyrexia, pain, nor vomiting indicate its preſence, there are caſes in which it may be diſcovered. The affection of the ſtomach ſometimes ſpreads into the œſophagus, and appears in the pharynx, as well as on the whole internal ſurface of the mouth. When, therefore, an erythematic inflammation affects the mouth and fauces, and when at the ſame time there ſhall be in the ſtomach an unuſual ſenſibility to all acrids, with a frequent vomiting, there can be little doubt of the ſtomach being affected with the ſame inflammation that has appeared in the fauces. Even when no inflammation appears in the throat, yet if ſome degree of pain be felt in the ſtomach, if there be a want of appetite, an anxiety, frequent vomiting, an unuſual ſenſibility with reſpect to acrids, ſome thirſt, and frequency of pulſe, there will then be room to ſuſpect an erythematic inflammation of the ſtomach; and Dr. Cullen affirms that he has known ſuch ſymptoms, after ſome time, diſcover their cauſe more clearly by the appearance of the inflammation in the fauces or mouth. Erythematic inflammation is often diſpoſed to ſpread from one place to another on the ſame ſurface; and, in doing ſo, to leave the place it had at firſt occupied. Thus, ſuch an inflammation has been known to ſpread ſucceſſively along the whole courſe of the alimentary canal, occaſioning in the inteſtines diarrhœa, and in the ſtomach vomitings; the diarrhœa ceaſing when the vomitings came on, or the vomitings upon the appearance of the diarrhœa.

When an erythematic inflammation of the ſtomach is diſcovered, it is to be treated differently according to the difference of its cauſes and ſymptoms. When it is owing to acrid matters taken in by the mouth, and when theſe may be ſuppoſed to be ſtill preſent in the ſtomach, they ſhould be waſhed out by throwing in a large quantity of warm and mild liquids, and exciting vomiting. At the ſame time, if the nature of the acrimony and its proper corrector be known, this ſhould be thrown in; or if a ſpecific corrector be not known, ſome general demulcents ſhould be employed, in order to inviſcate the acrid matter, or to defend the ſurface of the ſtomach from its irritation. Theſe meaſures, however, are more ſuitable to prevent the inflammation than to cure it after it has taken place. When it has occurred, and is attended with a ſenſe of heat, with pain and fever, the modes of depletion, bliſtering, and fomentations, mentioned when

ſpeaking

ſpeaking of the phlegmonic gaſtritis, muſt be more or leſs employed according to the degree of thoſe ſymptoms. When an erythematic inflammation of the ſtomach has ariſen from internal cauſes, if pain and pyrexia accompany the diſeaſe, ſome bleeding, in perſons not otherwiſe weakened, may be employed; but as the affection often ariſes in what are called putrid diſeaſes, and in convaleſcents from fever; ſo in theſe caſes bleeding is inadmiſſible: all that can be done being to avoid irritation, and to throw into the ſtomach what quantity of acids, and of aceſcent aliments, it ſhall be found to bear. In ſome conditions of the body, in which this diſeaſe ariſes, the Peruvian bark and bitters may ſeem to be indicated; but an erythematic ſtate of the ſtomach does not commonly allow of them. See Cullen, Firſt Lines, chap. viii. Van Swieten Comment. Sauvages.

GASTROBRANCHUS Cœcus, in *Ichthyology*, is a curious fiſh, that has been erroneouſly ranked by Linnæus among the *Vermes*, under the name of Myxine *glutinoſa*. Its uſual length is from four to ſix or ſeven inches, and its general appearance is that of a ſmall eel; the mouth is ſituated beneath, as in the lamprey, and is of an oblong form, bearded on each ſide, and furniſhed with a ſeries of teeth, diſpoſed on each ſide into a double row, in form of a pectinated bone. This animal is deſtitute of eyes. The accurate examination of its ſtructure by Dr. Bloch has proved it to belong to the tribe of cartilaginous fiſhes: the ſkin is ſmooth, and deſtitute of ſcales, and the animal is of an uncommonly glutinous nature. It is not unfrequently found about the Britiſh coaſts, and is ſaid to deſtroy other fiſhes by piercing their ſkin, and ſucking their juices, and even devouring all the internal parts.

GASTROCELE, (derived from γαστηρ, *the ſtomach*, and κηλη, *a tumor*,) a hernia, or rupture containing the ſtomach. See Hernia.

GASTROCNEMIUS, in *Anatomy*, from γαστηρ, the *belly*, and κνημη, the *leg*, is a muſcle of the leg, occupying the ſurface of the calf. The three muſcles compoſing the calf are ſo connected to each other, that they ought to be deſcribed together; moreover, their office is the ſame. We ſhall include them under this article. The gaſtrocnemius, which ariſes from the femur, and the ſoleus, originating from the tibia and fibula, are both connected to a common tendon, which projects at the lower and back part of the leg, and is inſerted into the back of the heel. This is called tendo Achillis, as being the part by which Thetis is ſaid to have held her ſon, when ſhe dipped him in the Styx.

The *gaſtrocnemius*, (called alſo gemellus, gaſtroc. externus, and bi-femoro-calcanien,) forms with the ſoleus the extenſor tarſi ſuralis or magnus of Douglas. It conſiſts of two portions, very much reſembling each other, ſeparate above, and uniting below in a common aponeuroſis, placed at the back of the leg, and extending from the femoral condyles to the poſterior ſurface of the os calcis. The internal head of the muſcle is larger than the external, flattened, and broader below than above. Its poſterior ſurface is covered above by the ſemi-membranoſus, and in the reſt of its extent by the faſcia of the leg. The anterior ſurface covers the knee joint, the attachment of the ſemi-membranoſus, the popliteal artery, the popliteus muſcle, the plantaris, and the ſoleus. Its inner edge is unattached: the outer is ſeparated from the external head at its upper half, and united with it by the lower. The upper extremity, which is thick and ſomewhat rounded, is attached juſt above the back part of the internal condyle. From this point it deſcends and paſſes with a ſlight obliquity from within outwards, ſoon joining the external head. Its breadth increaſes gradually to about the middle of the calf, and then diminiſhes again, ending in a broad aponeuroſis. The internal head is covered behind by the aponeuroſis of the leg: it covers in front the capſule of the knee, the popliteus and ſoleus. The outer margin is unattached, while the inner is ſeparated from the oppoſite above, and confuſed with it below. Its upper extremity is attached juſt above the back of the external condyle. It deſcends at firſt rather obliquely from without inwards, grows broader firſt, then again narrower, and ends in the ſame apeneuroſis as the former head. Both theſe portions of muſcle terminate below the middle of the leg in a broad and flat tendon, which grows narrower as it deſcends. This is attached to the poſterior ſurface of the ſoleus ſooner on the outer than on the inner ſide, and is very intimately connected to that muſcle.

The two heads above deſcribed are tendinous and muſcular. The internal is fixed to the former by a broad and thick tendon, intimately connected in front to the capſule of the knee, deſcending firſt on the inner edge, and then expanding into a broad ſheet, which covers more than the upper half of the poſterior ſurface. The tendon of the outer head is not ſo thick as that of the preceding. After deſcending for two inches on the outer edge, it expands on the back of the muſcle, like the former. The common aponeuroſis, in which the two heads terminate, increaſes very much in breadth as it aſcends, and covers the anterior ſurface almoſt as high as the upper extremities. The fleſhy fibres of the inner head ariſe from the outer edge and anterior ſurface of its upper tendon, and terminate on the back of the common aponeuroſis. Thoſe of the outer paſs, in like manner, from the inner edge and front of the upper tendon to the back of the common expanſion, but are not mixed with thoſe of the oppoſite head.

The *plantaris*, extenſor tarſi minor of Douglas, jambier grêle, petit femoro-calcanien, is a very long but ſlender muſcle, placed between the gaſtrocnemius and ſoleus, and not exiſting in all ſubjects. It extends from the back of the outer femoral condyle, to the poſterior and inner part of the os calcis. Its poſterior ſurface is covered by the gaſtrocnemius; it covers in front the capſule of the knee, the popliteus, the popliteal artery, and the ſoleus. Its upper extremity is fixed to the upper and back part of the external condyle of the femur, to the capſule of the knee, and to the tendon of the outer head of the gaſtrocnemius. It deſcends obliquely from without inwards, and, after a courſe of three inches and a half, forms a very narrow flat tendon, which continues between the gaſtrocnemius and ſoleus, until the lower fourth part of the leg, when it eſcapes. It is then connected to the inner edge of the tendo Achillis, and deſcends with that tendon, being ſtill more intimately united to it below, where it is implanted in the upper, inner, and back part of the os calcis.

The ſoleus, gaſtrocnemius internus, le ſoleaire, tibio-peronei-calcanien, is placed at the back of the leg, and extends from the upper extremity of the fibula to the poſterior portion of the os calcis. It is broad and thick, and nearly oval, and preſents to our conſideration an anterior and poſterior ſurface, an inner and outer edge, an upper and lower extremity. The poſterior ſurface is covered by the gaſtrocnemius and plantaris, and below the former by the faſcia of the leg: the front ſurface covers the peroneus longus, the upper third part of the back of the fibula, to which it is attached, the popliteus, flexor longus digitorum pedis, flexor longus pollicis pedis, and tibialis poſticus, the popliteal, poſterior tibial, and peroneal arteries, and the poſterior tibial nerve. The inner margin is ſeparated above from the popliteus by an interval, in which the popliteal artery and accompanying nerve paſs: it is then fixed to the oblique line at the upper and back part of the tibia, and to the inner

margin of the bone, half way down the leg. In the reſt of its extent it is unattached. The external margin is unconnected throughout, and offers nothing worthy of remark. The upper extremity of the muſcle is thin and narrow, and fixed to the upper and back part of the fibula. From this point it deſcends along the back of the leg, growing broader to the middle of the limb, and then contracting again to the inferior extremity, which is fixed to the lower and back part of the os calcis.

The ſtructure of the ſoleus is tendinous, aponeurotic, and fleſhy. Its attachment to the os calcis is by means of a very powerful tendon, named tendo Achillis, which is fixed to the lower half of the poſterior ſurface of the bone. The anterior ſurface of the tendon is in contact with the upper half of the back ſurface of the bone, which is covered by a layer of cartilage. A thin ſynovial membrane expanded over the oppoſed ſurfaces renders them ſmooth, and confines the ſynovia, by which they are lubricated. As the tendon aſcends from the heel, it is at firſt contracted ſlightly in its breadth, ſo as to aſſume nearly a cylindrical figure: it then grows broader, and divides into two aponeuroſes, a ſmaller belonging, as we have already deſcribed, to the gaſtrocnemius, a much more conſiderable one to the ſoleus. The latter grows broader as it aſcends, and expands ſo as to cover the whole poſterior ſurface of the muſcle, excepting the upper extremity.

From its anterior ſurface, near the outer margin, there ariſes an aponeurotic ſeptum, which aſcends among the muſcular fibres, and approaches gradually to the middle of the muſcle. Two other aponeuroſes, an internal and an external one, may be obſerved towards the upper part of the front of the ſoleus. The firſt ariſes from the oblique line at the back of the tibia, and from its inner edge, and deſcends on the inner ſide of the front of the muſcle below its middle. The latter proceeds from the upper extremity and outer margin of the fibula, and deſcends low on the outer part of the muſcle. From its upper and inner edge a portion is detached, to form an aponeurotic inverted arch, covering the paſſage of the popliteal veſſels and nerve behind, and continues on the oppoſite ſide with the internal aponeuroſis. From the two aponeuroſes juſt deſcribed the muſcular fibres ariſe, and paſs obliquely to the anterior ſurface of that which covers the back of the muſcles, and to the ſides of the aponeurotic ſeptum, which exiſts in the ſubſtance of the muſcle. They deſcend along the interior ſurface of the tendo Achillis, to within three inches of its attachment to the os calcis.

Action of theſe Muſcles.—The muſcles of the calf are particularly employed in progreſſion; and their bulk and power, with thoſe of the gluteal muſcles, prove that the human ſubject was deſigned to walk erect. Hence man is particularly characterized by the largeneſs of his calf, and no animal equals him in this reſpect. In the attitude of ſtanding, when the foot reſts firmly on the ground, the ſoleus, having its fixed point in the heel, keeps the leg backwards, and prevents it from obeying the tendency, which the weight of the body gives it, to bend forwards on the foot. When the leg has been carried forward on the foot, the latter part being fixed to the ground, this muſcle will reſtore it to its erect poſition, by moving it backwards on the foot. The gaſtrocnemius fixes the thigh behind, as the ſoleus does the leg; and oppoſes the cruralis and vaſti which hold the bone in front. When their action is carried beyond the degree now deſcribed, the gaſtrocnemius may bend the thigh backwards, or the ſoleus the leg.

By lifting the heels, when the body is erect, the muſcles of the calves elevate the whole body, which is ſupported on the two aſtragali; the weight is there maintained by the anterior part of the feet, and the individual is ſaid to ſtand on tiptoes. If the foot of one ſide be lifted from the ground, and the oppoſite heel be raiſed by the calf of its own ſide, the whole body is then elevated by the muſcles of one calf. When a perſon ſtands on tiptoe with a burden on the ſhoulders, or any other part of the trunk, the weight of this, as well as of the body, muſt be elevated and ſupported by the muſcles of the calf.

In progreſſion, the ſoleus and gaſtrocnemius, by lifting the heel, make the foot deſcribe a ſemicircle, the point reſting on the ground, and the heel being elevated. This motion increaſes the length of the lower extremity by the whole length of the foot, and gives an impulſe to the trunk, which propels it forwards. See the article EXTREMITIES for a further account of the mechaniſm of this motion. Running puts theſe muſcles in powerful action: the front of the foot only reſts on the ground at each ſtep, the back portion being kept conſtantly elevated. Their action is equally obſerved in leaping, at the inſtant when the heel quits the ground. We may obſerve here that theſe muſcles of the lower limbs, which, by their ſudden contraction, ſtrengthen the previouſly bent articulations, are by far the moſt powerful. This may be ſeen in the ſoleus, with reſpect to the ankle, in the vaſti and cruralis, to the knee, and in the gluteus maximus, to the hip. The height to which the hip is ſometimes elevated in leaping is aſtoniſhing. The fact is explained by the power of theſe muſcles, diſpoſed firſt behind, then in front, and then behind again, to accord with the alternate directions in which the joints are bent. The vaſt force exerted by the muſcles of the calf, in raiſing the body in jumping or dancing, accounts alſo for the rupture of the tendo Achillis. The unfavourable manner in which the muſcles act in elevating the body, when we aſcend an eminence, explains the weight and fatigue experienced at thoſe times in the calf of the leg. The gaſtrocnemius may aſſiſt the flexors of the knee in bending the leg on the thigh.

The plantaris, from its diminutive ſize, can have but little ſhare in the movements juſt deſcribed: it muſt produce juſt the ſame effect as the gaſtrocnemius. As it is frequently abſent, its office cannot be very important.

GASTROCOLICA VENA, (from γαστηρ, the *ſtomach*, and κολον, the *colon*,) a vein, which pours its blood into the vena portarum. See VEIN.

GASTRO-COLICUM OMENTUM, is the ſame as the great omentum. See EPIPLOON.

GASTRODIA, in *Botany*, (γαστροειδης, having a ſwelling, or ventricoſe, form; in alluſion to the ſhape of the flower, which in this family is ſingular.)—Brown Prod. Nov. Holl. v. i. 330.—Claſs and order, *Gynandria Monandria*. Nat. Ord. *Orchideæ*.

Gen. Ch. *Cal.* Perianth ſuperior, coloured, of one leaf, tubular; the orifice in five ſhort, oblique, rather unequal lobes, all directed toward one ſide. *Cor.* Petals none. Nectary encloſed in the calyx, lying on the organs of impregnation, ſupported by a claw, unconnected. *Stam.* Anther terminal, moveable, deciduous, its cells cloſe together; maſſes of pollen of large angular particles, cohering elaſtically. *Piſt.* Germen inferior, pear-ſhaped, nearly globular, ribbed; ſtyle columnar, elongated, but ſhorter than the calyx, excavated at the top, thickened at the baſe in the fore-part, where the ſtigma is ſituated. *Peric.* Capſule nearly globular. *Seeds* numerous?

Eſſ. Ch. Calyx of one leaf, tubular, five-cleft. Lip ſtalked, unconnected. Anther vertical.

1. G. *ſeſamoides*. Native of Port Jackſon, where, according to Mr. R. Brown, it is very rare, he having never ſeen more than ſix or ſeven ſpecimens. We received one from

from Dr. White many years ago, whoſe flowers we cannot afford for diſſection, and therefore have borrowed the above account of their internal parts from our accurate friend Mr. Brown. The *roo* is paraſitical on thoſe of other plants, fleſhy, branched, and jointed. *Stalk* ſimple, erect, a foot high, ſmooth, leafleſs, bearing two diſtant, ſhort, abrupt, entire, membranous ſheaths. *Cluſter* terminal, ſimple, of ſix or ſeven drooping, pale bluſh-coloured flowers, reſembling thoſe of *Seſamum orientale*, but ſmaller, and highly remarkable in their natural order for having a tubular calyx of one leaf, which in fact combines what we have taken for calyx and corolla in other *Orchideæ*. See CYMBIDIUM, DENDROBIUM, EPIDENDRUM, EPIPACTIS, &c. Linnæus would have termed it a petal, Swartz a calyx. This plant has moſt affinity with *Satyrium Epipogium* of Linnæus, referred by Swartz to *Limodorum*. See EPIPOGUM. S.

GASTRODYNIA, in *Medicine*, from γαστὴρ, the *ſtomach*, and ὀδύνη, *pain*, is a term applied by the noſologiſts to thoſe varieties of pain in the ſtomach, which ariſe independently of inflammation in that organ. See GASTRITIS.

Hoffmann, and ſome other writers, expreſs the ſame idea by the word *Cardialgia*; while Sauvages and Cullen employ both the terms, making an arbitrary diſtinction in their acceptation of them. Sauvages diſtinguiſhes cardialgia from gaſtrodynia, by applying the former to pain or uneaſy ſenſation about the region of the ſtomach, which is accompanied by a tendency to ſyncope, or fainting; and uſing the latter to denote a more acute pain of that region, without any ſuch concomitant diſpoſition. But the diſtinction of Dr. Cullen, who reſtricted the term cardialgia to what is popularly underſtood by the word *heart-burn*, is more generally adopted. "For thoſe pains that are either acute or pungent, or accompanied with a ſenſe of diſtention, or of conſtriction, if they are at the ſame time not attended with any ſenſe of acrimony or heat, I employ the appellation of *gaſtrodynia*. To expreſs thoſe painful or uneaſy ſenſations which ſeem to ariſe from a ſenſe of acrimony irritating the part, or from ſuch a ſenſe of heat as the application of acrids, whether externally or internally applied, often gives, I employ the term of *cardialgia*; and by this I particularly mean to denote thoſe feelings which are expreſſed by the term *heart-burn* in the Engliſh language." (See Cullen, Firſt Lines, § 1427. Sauvages, Noſol. Meth. Claſs vii. Gen. 20 & 21. Hoffmann, Medicina Rat. tom. ii. § ii. cap. 2.) The Engliſh terms cramp in the ſtomach, ſtomach-colic, &c. are ſynonymous with gaſtrodynia, which alſo includes thoſe more obtuſe and chronic pains, which accompany the organic derangements of the apertures of that viſcus, or of its coats. The word *colic*, however, which ſtrictly denotes a painful affection of the *colon*, or great inteſtine, has been improperly transferred to pain, connected with the other abdominal organs.

Pain in the ſtomach is occaſioned by a variety of matters taken into it, and by various morbid conditions of its coats; ſo that Dr. Cullen, conſidering it as a mere ſymptom, has not allowed gaſtrodynia a place in his noſological arrangement. It is more eſpecially mentioned by him as one of the numerous ſymptoms which indicate a debilitated condition of the digeſtive power of the ſtomach, or *dyſpepſia*; in which caſe it is accompanied by other indications of the ſame debility, as by a diſcharge of wind, a ſenſe of weight and fullneſs after meals, belching, nauſea, foul tongue, &c. (See INDIGESTION.) The pain, under ſuch circumſtances, is excited ſometimes by over-diſtention of the fibres of the ſtomach by flatulence, (Gaſtrodynia *flatulenta* of Sauvages,) or by irregular ſpaſmodic contraction of ſome portion of the organ, (G. *ſpaſmodica*,) as occurs in the bowels in colic; or by the preſence of an overload of undigeſted aliment, (G. *ſaburralis*); or of worms; or of bile, or other acrimonious ſecretion, (G. *verminoſa* and *bilioſa* of the ſame author.)

It has been well obſerved by Dr. Pemberton, in his "Practical Treatiſe on various Diſeaſes of the abdominal Viſcera," that the pain in the ſtomach, connected with this dyſpeptic ſtate of it, is moſt felt, in ſome caſes, when the ſtomach is empty; and in others, when the ſtomach is full. This conſideration, that the pain is mitigated or removed by the application of food in the one inſtance, and by the withholding it in the other, leads us to infer a difference in the proximate cauſe of the pain, and in the nature of the remedies neceſſary to cure it, in the two caſes. "That pain," Dr. Pemberton remarks, "which is moſt felt when the ſtomach is empty, ſeems to ariſe from an altered and increaſed ſecretion of the glands of the mucous membrane of that organ. This fluid, by its acrimony (if I may be allowed the expreſſion) irritates the nerves of the ſtomach, and thus cauſes pain. When it is ſecreted in ſmall quantities, it may be ſo enveloped by any food that is taken, as to render it inert; or when it is ſecreted in larger quantities, it may be thrown up, after cauſing violent pain, by vomiting: and in this ſtate it conſtitutes what is called *pyroſis*, or *water braſh*." (Loc. cit. p. 101.)

"The pain of the ſtomach, which is moſt felt when it is full, would appear to ariſe from irritability of the muſcular coat of that organ, and not to be at all connected with the glandular ſecretions of it; for unleſs the pain be called forth by food being received, it will reſt perfectly at eaſe. The food will remain down perhaps half an hour (or more) before any uneaſy ſenſations are created. Theſe then will go on increaſing till the food is returned again, very little changed from the operation of digeſtion. This diſeaſe is attended with ſympathetic head-ache; it ſeems particularly to attack chlorotic women, and hypochondriacal men; I am therefore inclined to believe that it owes its origin to the muſcular fibres of the ſtomach, partaking of the general irritability of all other muſcular parts in an irritable habit; and I think that the advantage derived from the method of treatment hereafter mentioned, will add conſiderable ſtrength to this opinion." (P. 115.)

The following *diagnoſtic* ſymptoms, by which this form of gaſtrodynia may be diſcriminated from the pain ariſing from organic diſeaſes of the ſtomach, are ſtated by the author juſt quoted. It may be diſtinguiſhed from that pain which is produced in a ſtricture of the *cardia*, or upper orifice of the ſtomach, by the pain not being perceived *the inſtant* the food is ſwallowed, by the ſeat of the pain not being confined to one ſpot, and by there having exiſted conſtitutional derangement *previous* to the ſtomach affection; whereas, in ſtricture of the cardia, the conſtitution is *ſubſequently* affected. It may be diſtinguiſhed from *ſcirrhus* or *cancer* of the ſtomach, by the pain not being produced, except after taking food; whereas, in either of the former caſes, there is more or leſs of conſtant pain; and in cancer, what is brought up from the ſtomach is uſually very offenſive, and is alſo more or leſs of a dark brown hue.

Among the exciting cauſes of pain in the ſtomach, the ſwallowing of poiſonous and indigeſtible ſubſtances, which, by their chemical or mechanical properties, injure the texture, and irritate the nerves of the ſtomach, muſt not be omitted. Theſe occaſion the gaſtrodynia *à veneno*, and G. *à peregrinis* of Sauvages. Not only the more active and corroſive ſubſtances, denominated poiſons, ſuch as arſenic, mercurial, antimonial, and other metallic ſalts, the undiluted mineral acids, &c. operate in this way; but even the draſtic drugs given for the purpoſe of exciting an emetic or cathar-

tic

tic action, ſometimes produce a conſiderable degree of gaſtrodynia, when imprudently adminiſtered in an over-doſe. (See Hoffmann, loc. cit.) There are many examples on record of various ſubſtances, altogether foreign to the uſe of man, being ſwallowed with impunity; ſuch as pieces of money, pins, needles, glaſs, ſhells, the ſtones of fruit, &c. but there are alſo numerous inſtances, in which the moſt diſtreſſing gaſtrodynia, ultimately terminating fatally, has been the conſequence. One of the moſt extraordinary inſtances of the original impunity, but ultimate fatality of ſuch a practice, lately occurred in Guy's Hoſpital, in the perſon of an American ſailor; who, between the years 1799 and 1805, had ſwallowed upwards of *thirty claſp-knives*, which cauſed his death in March 1809, after a long ſeries of ſuffering. (See Annual Med. Regiſter for 1808, vol. i. p. 380.)

Pain in the ſtomach is often connected with certain ſtates of the gout, with hyſteria, and with hypochondriaſis, and therefore to be treated by the remedies which are requiſite for the removal of thoſe diſeaſes reſpectively.

The Cure of Gaſtrodynia muſt neceſſarily be as various as the cauſes which give riſe to it; and theſe will require an accurate inveſtigation, by attending to the other ſymptoms of diſorder with which it may be accompanied, before we attempt the adminiſtration of remedies. When the ſigns of impaired digeſtion, already mentioned, concur with the pain, if it is known that any ſubſtance of difficult digeſtibility has been ſwallowed, or that any exceſs of eating has been committed, it may be convenient to rid the ſtomach of part of its over-load, by means of an emetic or a gentle cathartic; a practice, indeed, which is often indicated by the efforts of the conſtitution to relieve itſelf by a ſpontaneous vomiting or diarrhœa: in this caſe theſe efforts only require to be aided by diluent, tepid drinks, or glyſters. Afterwards the ſtrength of the ſtomach may be reſtored by the uſe of the vegetable bitters, or other tonic medicines, together with regular exerciſe, and the plan adapted to the cure of *indigeſtion* (which ſee). When there is much flatulence, the exhibition of thoſe cordial ſtimulants, which have been called carminatives, will afford relief to the pain ariſing from over-diſtention, and aid the general plan. The aromatic vegetable matters, the diſtilled waters from dill, coriander, pepper-mint, and plants of ſimilar property, ſmall doſes of æther, &c. may be employed for this purpoſe. When the pain occurs in violent and ſudden paroxyſms, the ſpaſms may be relieved by any active ſtimulant, ſuch as the æthers, cordial tinctures, wines, preparations of opium, the internal and external application of heat, by means of warm drinks, fomentations, or by a dry heat externally applied to the region of the ſtomach. In caſes where there is a frequent eructation of an acid fluid, or even of the taſteleſs fluid, which conſtitutes the water-braſh, alkaline medicines are frequently of conſiderable benefit. Sometimes alſo the generation of acid in the ſtomach is prevented by an oppoſite method of treatment, namely, by the uſe of the mineral acids, which put a ſtop to the acetous fermentation out of the body. With theſe means of obtaining temporary relief, thoſe remedies which ſtrengthen the digeſtive powers, as above mentioned, muſt be alternated or combined.

For that pain which is moſt felt when the ſtomach is empty, and which Dr. Pemberton conſiders as ariſing from an altered ſtate of the glandular ſecretions of its internal coat, he conſiders the combination of opium with aſtringents as the moſt effectual remedy; and he prefers the form of pill as affording the moſt permanent application of the medicine. In the incipient ſtages he employs pills of opium and kino, or of opium and alum. When the ſecretion of the fluid appears to be moderated, the tone of the ſtomach may be reſtored by a chalybeate water, or by ſteel in ſome other form. The diet, Dr. Pemberton adds, ſhould be plain-dreſſed animal food, with a ſmall proportion of vegetables. The patient ſhould be particularly cautious not to take a large quantity of bread. He ſhould moreover abſtain entirely from fermented liquors, as he ſhould from hot broths, fiſh, and in ſome caſes from eggs.

In that pain of the ſtomach, which ariſes when the ſtomach is full, and which is conſidered as a local diſeaſe, in conſequence of conſtitutional derangement, the method of treatment muſt be, for the moſt part, conſtitutional, regard being paid at the ſame time to the ſtomach itſelf: and Dr. Pemberton conſiders the green draught of myrrh, ſoda, and ſulphate of iron, or Griffith's mixture, as comprehending every ingredient which will meet this intention. Should it happen that the pain in the ſtomach is extremely violent, a ſmall doſe of an opiate may be taken half an hour before dinner, or added to each doſe of the mixture above mentioned. A combination of opium with the carbonate of ammonia, taken in the ſame way, has ſometimes appeared to be very efficacious.

A remedy was ſome time ago recommended by Dr. Odier, of Geneva, for the cure of that form of gaſtrodynia which is ſpaſmodic, and connected with an increaſed irritability of the ſtomach; namely, the white oxyd of biſmuth, or, as it is called in the ſhops, where it is chiefly ſold as a coſmetic, the magiſtery of biſmuth. Dr. Odier employed this remedy "in doſes of ſix grains, four times a day, in all caſes of ſpaſms of the ſtomach, brought on by any kind of aliment, and proceeding only from the irritability of that organ." (See a paper by Dr. Marcet, in the Memoirs of the Med. Soc. of London, vol. vi. p. 155.) We have ſeen a few ſtriking inſtances of the efficacy of the biſmuth in certain forms of gaſtrodynia; but in others, in which no obſervable difference in the circumſtances could be detected, it has appeared to be altogether inert. It may be given in much larger doſes, than thoſe above mentioned; we have ſeen a ſcruple taken three times a day with impunity, or rather without any effect whatever. The common magiſtery, ſold for coſmetic purpoſes, is often an impure oxyd, mixed with nickel, cobalt, or other ſubſtances.

When gaſtrodynia is occaſioned by the preſence of poiſons or other extraneous matter in the ſtomach, we muſt endeavour by evacuant medicines to diſcharge them, or by means of diluents or chemical agents, to weaken the operation of the poiſonous ſubſtances, or farther to defend the ſtomach in ſome degree againſt the irritation of both, by means of mucilaginous and oleaginous medicines. See Poison.

GASTRO-EPIPLOIC, in *Anatomy*, (from γαστηρ, the *ſtomach*, and επιπλοον, the *omentum*,) a name given to certain arteries and veins, which are diſtributed to both theſe organs. See Artery and Vein.

GASTRO-HEPATICUM Omentum. See Epiploon.

GASTROLATER, of γαστηρ, and λαλγευω, *a glutton*, or *belly-god; cujus deus venter eſt.*

GASTROMANCY, or Gastromantia, a kind of divination, practiſed among the ancients, by means of words coming, or ſeeming to come, out of the belly.

The word is Greek, γαστρομαντεια, compoſed of γαστηρ, *belly*, and μαντεια, *divination*.

There is another kind of divination, called by the ſame name gaſtromancy, which is performed by means of glaſſes, or other round, tranſparent veſſels, within which certain figures

figures appear by magic art. It is thus called, becauſe the figures appear as in the belly of the veſſels.

GASTROPODA, in *Zoology*, a ſub-order in the claſs of *Molluſca*. See CLASSIFICATION of *Animals*.

GASTRORA'PHE, or GASTRORA'PHIA, a term, in *Surgery*, derived from γαστηρ, the *belly*, and ῥαφη, a *ſuture*, or *ſeam*. It means the ſewing up of a wound of the abdomen, or inteſtines; a proceeding, which is hardly ever deemed neceſſary, or proper, by the moſt eminent modern ſurgeons.

With reſpect to ſewing up a wound of the parietes of the abdomen, ſurgical writers inform us, that either the common interrupted ſuture may be uſed, (ſee SUTURE,) or the quilled one, which is generally repreſented as that to which a preference ought to be given. The quilled ſuture is practiſed on the abdomen, as follows; a ligature, capable of ſplitting into two, is to have a needle faſtened to each end of it. The operator is to put the index finger of his left hand into the wound, under the lip, which is furtheſt from him. This finger is placed in contact with the peritoneum, in order that it may, with the aſſiſtance of the thumb, pinch up and raiſe the whole thickneſs of the parietes. With the right hand, one of the needles is to be introduced into the abdomen, its point being guided on the index finger, ſo as to be kept from wounding the omentum and inteſtines. We are directed to pierce the lip of the wound, from within outward, about an inch from its edge. The other needle is to be paſſed in the ſame way through the oppoſite lip. Then the two needles are to be cut off. As many ſuch ſutures muſt be made as the extent of the wound may require. The ſides of the wound are next to be brought together, and we are to prepare to tie the ligatures, not in a bow, in the way of the interrupted ſuture, becauſe, it is ſaid, the continual action of the abdominal muſcles might make the ligatures cut their way through the parts. Hence we are directed to ſplit each end of the ligatures into two portions, and to tie theſe over a piece of bougie, laid along the line, at which the ligatures emerge from the fleſh. This is to be done to all the ligatures on one ſide firſt. Then, the wound being cloſed, another piece of bougie is to be placed, in a ſimilar manner, along the other lip of the wound; and the oppoſite ends of the ligatures are to be tied over it, with ſufficient tightneſs to keep the ſides of the wound in contact.

Although we cannot allow, that this ſuture is proper in ordinary wounds of the abdomen, we believe that it is preferable to the interrupted one, becauſe a great deal of its preſſure is made on the two pieces of bougie, and, of courſe, the ligatures muſt be leſs likely to cut their way out. Its operation is to be aſſiſted with the uniting bandage, or ſtrips of adheſive plaſter, and with compreſſes laid over each ſide of the wound, under the bandage. Every thing ſhould be avoided which tends to put the abdominal muſcles into action, by which means the ſuture would be dragged, the wound irritated, and a riſk created of the threads cutting their way through the fleſh. In order to prevent, as much as poſſible, all exertion of the abdominal muſcles, the bowels ſhould be kept open with glyſters; and no medicine is ſo good as opium for putting a ſtop to the vomiting, which is ſometimes attendant on wounds of the abdomen, and apt to produce a very hurtful diſturbance of the wound.

The quilled ſuture receives its name from the circumſtance of a quill having been formerly uſed inſtead of a piece of bougie. The ligatures may generally be withdrawn in about a week, and ſticking-plaſter uſed with only common dreſſings.

Gaſtroráphe, in the ſenſe of ſewing up a wound of the external parts of the abdomen, muſt generally be regarded as a highly unneceſſary proceeding, unproductive of any good, and likely to occaſion a great deal of avoidable irritation and pain. It has now been proved, by repeated and manifold experience, that all ordinary wounds of the belly may be united by means of common dreſſings, a proper poſture, and ſome kind of bandage. There is an excellent paper ſhewing the ill effects of ſutures, by M. Pibrac, in the Mémoires de l'Academie de Chirurgie, tom. 3. This gentleman has adduced many intereſting caſes, where extenſive wounds of the belly were cured in the moſt favourable manner, without the aid of ſutures. The large wound, made in the Cæſarean operation, has alſo been often healed, as well as poſſible, without ſewing the parts together. We feel it unneceſſary, however, to ſay more at preſent on the general impropriety of ſutures, as we ſhall have occaſion to reſume the conſideration of it hereafter. See SUTURE.

We can juſt conceive a caſe in which it might be found abſolutely neceſſary to uſe a ſuture. For inſtance, were an extenſive tranſverſe wound to be made through the parietes of the abdomen, this plan might be the only means capable of preventing an actual protruſion of ſome of the viſcera. Yet, even in this circumſtance, the ſtitches ſhould be as few as the ſtate of things will allow. With reſpect to longitudinal wounds, the uniting bandage, with ſtrips of adheſive plaſter, is fully ſufficient to keep their lips in contact.

Gaſtroráphe, in the ſenſe of ſewing up ſome breach in the inteſtinal canal, is now never practiſed by the moſt eminent ſurgeons. We mean the reader to underſtand, that a ſuture is never employed with a view of holding the edges of an inteſtinal wound together, though it may be deemed expedient, in certain caſes, to faſten a thread to a wounded inteſtine, by which means the injured bowel may be retained near the external wound, ſo as to enable any extravaſated matter to find its way out. See WOUNDS.

The old writers, who ſaid a great deal about gaſtroráphe, ſeem rather to have done ſo from cuſtom than reaſon. What they meant by the term could hardly ever be practiſed; becauſe the ſymptoms laid down for diſtinguiſhing when an inteſtine is wounded do not, with any certainty, determine in what particular part it is wounded, which want of information makes it abſurd to open the abdomen to get at the injured part. Hence, in former times, when ſewing together living parts was leſs horrid, the operation of ſtitching the bowels could hardly have been done, by the moſt raſh practitioner, except when they were both wounded and protruded. At preſent, even in this uncommon caſe, a good ſurgeon would not proceed to ſew up the breach, as an old woman mends a hole in a glove. At moſt, he would only faſten a thread to the wounded part before returning it into the belly. Gaſtroráphe, in ſhort, was always more talked of than executed; and Du Verney, who was for many years the moſt eminent ſurgeon in the French army, during ſeveral campaigns, and who, moreover, lived at a period when the faſhion of fighting with ſwords commonly prevailed, acknowledged, that he had never met with a caſe which required the performance of gaſtroráphe, that is, the operation of ſtitching the bowels. It has alſo been propoſed to ſew the ends of the inteſtinal canal together, in inſtances of mortified herniæ. However, there are ſtrong objections to ſuch practice, as will be hereafter explained. See HERNIA.

GASTROTOMIA. A term, ſignifying the operation of cutting into the abdomen. The word is derived from γαστηρ, the *belly*, and τεμνω, to *cut*. It often denotes the Cæſarean operation, or that of cutting into the uterus in order to extract the fœtus.

GASULON, in the *Materia Medica*, a word uſed by Avicenna and Serapion, to expreſs ſometimes the plant hyſſop, and ſometimes nitre. Theſe are two very different things to be known under the ſame name; but the proper interpretation of the word being the *cleaning of clothes*, it was uſed probably at ſome time to ſignify every thing of an abſterſive quality; but among the many things of this kind once called by it, the two above mentioned are all that we find recorded, which may be eaſily diſtinguiſhed by the context.

GATA, in *Geography*, a town of Spain, in the province of Eſtramadura, on a river of the ſame name, which riſes near the town, and runs into the Alagon, 15 miles S.W. of Coria. The town is 15 miles N.N.W. of Coria.

GATA, *Cape*, or *Cape de Gat*, a promontory of Spain, on the coaſt of Grenada, conſiſting of an enormous rock of a ſingular nature and appearance, 24 miles in circuit, and 13 broad. In the centre of this promontory are four hills, near each other, called the Sacriſtan, the Two Friars, the Captain, and the White Mountain. The other ſide of the promontory, beyond theſe four hills, is called "El Puerto de la Plata," where the Mooriſh corſairs lie lurking for Spaniſh veſſels. N. lat. 36° 43'. W. long. 2° 22'.

GATAKER, THOMAS, in *Biography*, was born in London in 1574. Having attained a good ſtock of grammar learning, he was, at the age of 16, ſent to St. John's college, Cambridge, where he greatly diſtinguiſhed himſelf, as well for his indefatigable diligence, as for the modeſty of his manners and the excellence of his diſpoſition. He had the misfortune to loſe his father in a ſhort time after he had been at college, and was by this circumſtance left without the means neceſſary to continue him at the univerſity. Some benevolent and zealous friends contributed to his ſupport, and he was thus enabled to complete his ſtudies. In due time he took his degrees, and was, on account of the general eſtimation in which he was held, appointed one of the fellows of Sidney college, even before the inſtitution was erected; but in the year 1599, when the college was finiſhed, he entered upon his duties as tutor with great reputation and ſucceſs. While he was engaged in this employment he formed a plan, with others, of preaching at the neighbouring villages. After a reſidence of ſome months, Mr. Gataker quitted the univerſity with a determination to ſettle in London. He firſt engaged as chaplain to ſir William Cooke, a ſituation which proved the means of his introduction to many perſons of eminence and learning, particularly in the profeſſion of the law; this led to the honourable poſt of preacher to the ſociety of Lincoln's-inn, the duties of which he diſcharged with great reputation for ten years. By the acceptance of this office Mr. Gataker did not diſſolve his connection with ſir William Cooke's family, though in termtime he thought it his duty to reſide in Lincoln's-inn. In 1603 he took his degree of bachelor of divinity at Cambridge, and might have proceeded to that of doctor, but declined it for economical reaſons. The reputation which he acquired by his diſcourſes at Lincoln's-inn chapel occaſioned ſeveral inſtances of valuable preferments to be offered to him, which he might have held without relinquiſhing his ſituation of preacher to that ſociety. But he felt it was not right for any man to hold offices, the duties of which he could not perform, and therefore he ſet his face againſt all pluralities. It was his wiſh alſo to continue as he was, becauſe his preſent ſituation, though the income of it was ſmall, afforded him leiſure to purſue his learned ſtudies. To theſe he devoted much of his time, particularly to the ſtudy of the Scriptures in their original languages. In 1611 Mr. Gataker entered the matrimonial ſtate, and accepted the rectory of Rotherhithe. He now applied himſelf with all diligence to the duties of the paſtoral office. In 1616 Mr. Gataker maintained a correſpondence with archbiſhop Uſher on ſome literary ſubjects. Several of the letters which paſſed between them are preſerved in the collection ſubjoined to the life of the archbiſhop, which afford abundant evidence of the great knowledge and critical acumen of Gataker, and of the high eſteem in which he was held by that learned prelate. While Mr. Gataker was preacher at Lincoln's-inn, he had devoted ſeveral ſermons to the conſideration of the nature, uſe, and abuſe of lots, intended to ſhew the lawfulneſs of innocent and entertaining games of chance, and the unlawfulneſs of the divinatory lots. What he delivered on this ſubject had been much miſrepreſented, and he was accuſed of having pleaded in behalf of gamblers, and encouraged the abuſe and miſemployment of time. In juſtification of his own conduct he publiſhed the ſubſtance of his ſermons, under the title "Of the Nature and Uſe of Lots, a Treatiſe hiſtorical and theological." This work occaſioned ſome controverſy, but it was received with conſiderable applauſe by the learned. In the year 1620 Mr. Gataker ſet out on a tour through the Netherlands; at Middleburgh he preached to the Engliſh church, and diſtinguiſhed himſelf by the ſpirit and ability with which he diſputed againſt the Catholic prieſts, who reſided in thoſe parts, together with the fugitives of their perſuaſion who had been obliged to quit England, for being concerned in the plots againſt the government during the reigns of Elizabeth and her ſucceſſor. Upon his return to England, he found that his Treatiſe on Lots had been attacked by Mr. John Balmford, whoſe work was prohibited on account of its virulence and illiberality. He firſt employed his intereſt in getting the prohibition removed, and then took up his pen to anſwer his antagoniſt. Some years afterwards he found himſelf called on again in defence of the ſame work, and publiſhed a juſtification of his arguments in the Latin language. In 1624 he entered the liſts in defence of the Proteſtant religion, againſt the Catholics. His firſt piece was entitled "Tranſubſtantiation declared by the Confeſſion of popiſh Writers to have no neceſſary Foundation in God's Word, and demonſtrated to be againſt Scripture, Nature, Senſe, and Reaſon." In 1642 he was appointed to ſit in the aſſembly of divines at Weſtminſter, and he attended in his place from a pure deſire of promoting truth and peace, and of rendering what ſervice he could to the religious intereſts of his country. In ſome caſes he differed from the majority, and, for the ſake of peace, impoſed on himſelf ſilence. In others he felt it a duty incumbent on him to cleave to his own ſentiments, and, by ſtedfaſtly adhering to his opinions, he was enabled, upon the introduction of the covenant into the aſſembly, with the aid of others, whoſe ſentiments were ſimilar to his own, to obtain conſiderable qualifications before they agreed to ſubſcribe. Mr. Gataker next engaged, with other members, in writing the "Annotations on the Bible," which were publiſhed in the name of the aſſembly. Mr. Gataker was the author of the notes upon Iſaiah, Jeremiah, and the Lamentations, which are generally admitted to have much merit. While he was thus employed he was offered the maſterſhip of Trinity college, which he thought proper to decline, in order that he might have more leiſure to attend to literary labours. He compoſed two works, in which his learning and critical talents were very advantageouſly diſplayed. The firſt was a treatiſe on the name by which God made himſelf known to Moſes and the people of Iſrael, entitled "De Nomine Tetragrammato Diſſertatio, quâ Vocis Jehovah apud noſtros receptæ uſus defenditur, &c." This has been frequently reprinted, and is to be found among the author's "Opera Critica,"

printed at Utrecht in 1698. The ſecond was entitled "De Diphthongis ſive Bivocalibus Diſſertatio philologica, in qua Literarum quarundarum ſonus germanus Natura genuina Figura nova et Scriptura vetus veraque inveſtigatur." In this the learned author endeavours to prove that in reality there are no diphthongs, and that it is impoſſible that two vowels ſhould be united in ſuch a manner as to form one ſyllable. During the compoſition of theſe learned works, Mr. Gataker had been almoſt laid aſide from his paſtoral duties by ill health; but when he was able he gladly returned to the duties of his profeſſion, till, by the rupture of a blood-veſſel, he was obliged to decline the ſervice of the pulpit altogether. He now ſpent his time almoſt entirely in ſtudy, and in 1648 he preſented to the world a work on the ſtyle of the New Teſtament, which gained him the character of being one of the ableſt philologiſts of the age. This was the precurſor to a much larger work of a ſimilar nature, and of great uſe in illuſtrating the ſenſe of difficult paſſages in the Old and New Teſtament, the primitive fathers, modern critics, and alſo in profane authors both Greek and Latin. At firſt only two of the ſix books, into which it was divided, were publiſhed, and the remainder were given to the world by his ſon after the author's death. Without attempting to particularize all Mr. Gataker's works, we may obſerve, that in 1652 he publiſhed his edition of Antoninus's meditations, with a very valuable preliminary diſcourſe on the philoſophy of the ſtoics. In 1648 he, with the other London miniſters, to the number of 47, remonſtrated againſt the meaſures taken by parliament againſt the king and the eſtabliſhed government. He ſeverely condemned, in public and in private, the execution of the monarch, and the changes which were introduced into the conſtitution. His ſentiments on this occaſion rendered him an object of ſuſpicion and jealouſy to the ruling powers, of which circumſtance his pariſhioners took advantage, and refuſed to pay him his dues. Toward the cloſe of a long life he was attacked by the famous aſtrologer William Lilly, becauſe in his annotations on Jeremiah he had expoſed the vanity and abſurdity of the judicial aſtrology. To the ſtrictures of the aſtrologer, Gataker replied with energy, and expoſed the ignorance and folly of the impoſtor. A ſecond attack from Lilly produced a rejoinder from the divine, which was the laſt of his publications, for almoſt as ſoon as it was finiſhed he was ſeized with a fever, which proved fatal to him in the 80th year of his age. By his contemporaries Gataker was highly eſteemed: he is called by Echard "the moſt celebrated among the aſſembly of divines;" "and it is hard to ſay," adds the hiſtorian, "which is the moſt remarkable, his exemplary piety and charity, his polite literature, or his humility and modeſty in refuſing preferments." He is equally praiſed by Morhoff, Bayle, Colonius, and others. Beſides the articles already enumerated, he was author of many other, the titles of which are given in the Biog. Britannica, to which our readers are referred for information reſpecting this worthy man and excellent divine.

GATE, in *Architecture*, a large door, giving entrance into a city, town, caſtle, palace, or other conſiderable building; or an aperture of paſſage for men, horſes, coaches, or waggons. The proportion of gates is from ſeven to twelve feet in width, and the height $1\frac{1}{2}$ the breadth. Where loaded carts of hay and ſtraw are to paſs, the height may even be twice the breadth.

The gates of London were many of them converted into gaols or priſons, as Ludgate, Newgate, &c. but they are now removed. The leſſer or *by-gates*, are called *poſterns*. Gates through which coaches, &c. are to paſs, ſhould not be leſs than ſeven feet broad, nor more than twelve; the height to be $1\frac{1}{2}$ the breadth.

GATE, in *Rural Economy*, a frame of wood conſtructed with a number of bars, and fixed in ſuch a manner as to ſwing upon hinges, for the purpoſe of affording convenient paſſage into and out of incloſed grounds, or other places.

In the conſtructing of gates, of whatever kind or form they may be, the materials ſhould conſtantly be well prepared by proper ſeaſoning before they are put together; as where this is not the caſe, they ſoon become much injured by their conſtant expoſure to the effects of the ſun and wind. They alſo require that the different parts be put together with conſiderable accuracy and correctneſs. In reſpect to durability, there can be no doubt but that oak is by much the beſt ſort of wood to be employed; but ſome of the more light kinds of wood, ſuch as thoſe of the deal, willow, and alder ſorts, anſwer the purpoſe extremely well, and are very durable, as, on account of their lightneſs, they do not deſtroy themſelves ſo much in ſhutting. It is found by experience that the lighter gates can be made in their foreparts, ſo that they be ſufficiently ſtrong for the intended purpoſe, the better they anſwer. For this reaſon, in ſome caſes, as where horſes are chiefly to be confined, the top bars, by being left of more ſtrength, may admit of the others having leſs ſubſtance; but if this be not done, they are apt to be broken by the horſes rubbing their necks upon them, unleſs where they are made of great height.

The width of gates for general purpoſes is moſtly from eight and a half to nine feet, and the height from five to ſix feet; the bars being five or ſix in number, and each four or five inches in breadth. Hence they are frequently denominated five or ſix-barred gates. In caſes where fowls or other ſmall animals are to be guarded againſt, it is ſometimes the cuſtom to run a ſmaller bar between the two lowermoſt ones, as by this means their paſſage is prevented.

In different ſituations and diſtricts gates are formed in very different manners, but thoſe chiefly employed are of four kinds; namely, the ſwing gate, the folding gate, the ſlip-bar gate, and the wicket or turn-about gate. Each of theſe ſorts of gates have likewiſe great variety in their forms, as may be ſeen in the annexed plate by the different figures.

The moſt ſimple form of gate is that of the ſlip-bar, which merely conſiſts in running three or four bars into the fixed poſts on each ſide. Theſe are moveable at pleaſure, ſo as to make way for any thing to paſs. The poſts may be either of wood or ſtone, being firmly fixed into the ground, and having proper holes formed in them for the reception of the bars.

A gate of this ſort is ſeen at *fig.* 1. in *Plate (Agriculture) Gates.*

It has been obſerved that this is perhaps the moſt durable of any ſort of gate, particularly where the gate-poſts are of ſtone. The only objection that can be made to it is that of the trouble of opening and ſhutting it, which, when perſons paſs through it in a hurry, renders it liable to be left open. Its cheapneſs and laſting property render it in every other reſpect preferable to any other deſcription of gate. The only inſtances in which it does not perfectly anſwer, are thoſe near the verge of a farm, or on the ſide of a highway or other public road, as it does not admit of being locked or ſecured as other gates are. In the whole of the interior of farms or eſtates, it is, however, generally found the moſt cheap, convenient, and uſeful gate that can be employed by the farmer.

The ſwing gate is that which is next in the ſimplicity of its conſtruction. This varies very greatly in its forms and

dimenſions, as may be ſeen by referring to *figures* 2, 3, 4, 5, 6, 7, and 8, in the plate. The gate which is repreſented at *fig.* 2. is formed upon an improved principle; and highly eſteemed in many diſtricts of the kingdom. There is a projection on the fore-part of the har-tree as ſhewn at *a*, which riſes nine inches; and on which the lower end of the diagonal bar, that paſſes upwards, reſts; *bb* is the diagonal bar, through which the three middle horizontal bars paſs; *cc* is a perpendicular bar fixed into the uppermoſt bar, ſix inches from the inſertion of the diagonal one at *d*, and into the lowermoſt one at *e*; *f* is the ſpring on the fore-tree, by means of which the gate faſtens.

Another gate of larger dimenſions, but of the ſame kind, is ſhewn at *fig.* 3. in the ſame plate. In this there are, however, three upright bars, as ſeen at *aaa*, and *b* is the diagonal bar which acts as a brace to the whole.

A further improvement on this ſort of gate is repreſented at *fig.* 4. in which there are two diagonal bars meeting in the middle from the bottom extremities of the har-tree and fore-tree, with an upright middle bar, and two braces paſſing from the top till they meet the diagonal pieces. Theſe different parts are ſeen at *aa*, *bb*, and *c*.

Theſe are all highly uſeful forms of gates for farm purpoſes.

A common form of ſwing gate is likewiſe ſeen at *fig.* 5. in which there is ſimply one diagonal brace, which renders it capable of being conſtructed at but little expence.

An improved ſwing gate, recommended by Mr. Parker, in his "Eſſay on hanging and faſtening Gates," is repreſented at *fig.* 6. And he remarks that the gate that is in moſt general uſe in Shropſhire weighs about 130 pounds without the iron-work, and that its dimenſions are theſe:

	Inches by Inches.
Heel - - - - -	5 .. $2\frac{1}{4}$
Head - - - - -	$2\frac{1}{4}$ .. $2\frac{1}{4}$
Rail near heel - - - -	$3\frac{1}{4}$ .. 3
——— head - - -	3 .. $2\frac{1}{2}$
Bars near heel - - -	$3\frac{1}{4}$ .. 1
——— head - - -	$2\frac{1}{4}$ .. $0\frac{1}{4}$
One diagonal and two perpendicular bars, or lacings, each	$3\frac{1}{4}$ .. 1

It is added that the diagonal bar, riſing from the lower part of the heel of the gate, meets the middle of the rail, and the two upright bars are placed at proper diſtances, between the middle and the head of the gate: theſe croſs bars, it is ſuppoſed, muſt aſſiſt greatly in keeping the gate together, but that what is moſt to be guarded againſt is, the ſinking at the head; and to prevent which, the gate ſhewn in the above figure is not indifferently contrived.

It may be further noticed that the rail and the horizontal bars of this gate are much the ſame as thoſe juſt deſcribed, but that the diagonal bar *c* is let into the lower part of the heel *a*, with a firm reſt or butment, its upper end coming exactly into the angle formed by the rail *f*, and the head *b*; and it is alſo ſupported in its place by the upright bars *d* and *e*. From this arrangement it would ſeem that the bar *c* might be likely to puſh the head *b* out of its place, were it not counteracted by the upper thimble being attached to, or forming one end of a flat bar of iron, which paſſing through the heel and along the top of the rail, extends to the head of the gate, having been hammered into an equal width and thickneſs at the part which goes through the head, and is finiſhed at the end with a ſcrew and nut: the iron bar is fixed to the rail with five or ſix ſtrong nails, that ſecure the whole; and this, the writer ſuppoſes, appears to be much more likely to anſwer the purpoſe wiſhed for, than any other plan he has ever met with.

A gate of this kind, it is obſerved, has juſt been made for him by the direction of an ingenious mechanic; he cannot anſwer for its merits, but is aſſured that it has been tried with great ſucceſs. The weight of the iron ſtrap or bar is twelve pounds, which, at 5*d.* per pound, and 2*d.* for the ſcrew nut, will coſt 5*s.* 2*d.*; but it is queſtioned whether a much lighter bar, even ſo ſmall as half the weight of the above, would not be found to anſwer, if that of twelve pounds weight ſhould be thought too expenſive: the bars *c*, *d*, *e*, are $2\frac{1}{2}$ inches by $1\frac{1}{2}$, or a full inch. A gate of the common upright ſwing-kind is ſhewn at *fig.* 7. which is a good uſeful one where there is a neceſſity for one of the cloſe ſort. It has three rails, to which upright bars are nailed in a pretty cloſe manner.

At *fig.* 8. is ſeen an improved ornamental gate of this deſcription. It conſiſts of three rails, to which are nailed upright bars that reach conſiderably above the top rail, and it has two diagonal braces that meet in an acute angle in the middle of the top of the gate. The har-tree is alſo crooked at the top, in order to afford an ornamental effect. This is a cloſe ſtrong gate, but too expenſive for common uſes.

The great objection to ſwing-gates of all kinds is their liability to be deſtroyed by their great length of frame.

The folding-gate is found more convenient in many caſes than either the ſlip-bar or thoſe of the ſwing kind. An open folding gate, proper for common uſes, is repreſented at *fig.* 9. And one of the more ornamental cloſe kind is ſhewn at *fig.* 10. Experience has ſhewn that this deſcription of gate is much more durable than thoſe of the above kinds; as the bars, from being only half the length, render the joints not nearly ſo liable to be broken, or the hinges to be injured by over-ſtraining; and the difference in the firſt coſt conſiſts ſimply in the expence of a pair of additional hinges.

The wicket or turnabout gate is another ſort that is frequently found uſeful in particular ſituations. A gate of this deſcription, proper for common purpoſes, is ſeen at *fig.* 11, in the plate. And at *fig.* 12. is ſhewn one of the more ornamental ſort, which turns about on the middle or centre-poſt *a*, and is commonly formed of light iron work. It has a very neat appearance.

All ſorts of gates ſhould be carefully attended to in keeping them well painted, and free from dragging upon the ground in the fore-parts, as by ſuch care they will laſt much longer than where the contrary is the caſe.

GATE *Poſts*, the pillars or upright ſtrong pieces of timber, or other materials to which gates are hung and faſtened. Poſts for this uſe are formed of very different ſubſtances, but principally of ſtone or timber. It has been obſerved that where it can be done, they ſhould always be of ſtone, and ſuch as is hewn if poſſible, as theſe, when properly conſtructed, will laſt for ages: where wood is employed, oak well ſeaſoned is undoubtedly the beſt, and ſhould always be of conſiderable ſubſtance. In ſome places it is the practice to plant quick growing trees for this purpoſe, and when they have attained a ſuitable growth, to cut them over about ten feet from the ſurface: theſe, where the trees grow well, form very durable gate-poſts; but they ſometimes ſhrink, and occaſion much trouble in remedying the inconvenience. They are alſo liable to ſhake and get looſe by the wind. Where dead timber is made uſe of for this purpoſe, the

poſts

poſts ſhould be very ſtrong, and the wood conſtantly well-ſeaſoned; that part which is let into the ground being well defended by ſoaking it in coarſe oil, charring, or giving it a coat of coal-varniſh, and all that is above expoſed to the action of the weather ſhould be well covered with two or three good coats of ſome ſort of oil paint. The expence incurred in this way is but little, while the advantage gained is very conſiderable.

It is ſuppoſed by Mr. Parker, in the eſſay mentioned above, that for timber gate-poſts the ſubſtance ſhould not be leſs than from eight to ten inches in the ſquare, and that for very heavy gates a foot in the ſquare is by no means too much. And even if formed of ſtill larger ſize it is better. The ſteadineſs of a gate-poſt in a great meaſure depends upon the depth to which it is ſet in the ground, which ought in ſome caſes to be nearly equal to the height of it. But in general, five or ſix feet are fully ſufficient for the purpoſe. A ſtrong frame of wood placed under the ground, ſo as to connect with both poſts, may in ſome inſtances be uſeful in keeping the poſts ſteady without the labour of putting them in ſo very deep.

Since a well-conſtructed gate cannot be uſed to advantage without ſuitable poſts, it is ſuppoſed neceſſary to ſay a few words about them. And, as much trouble and expence may be ſaved by a proper underſtanding in what regards their length and ſubſtance, the calculations given below are ſubmitted to the reader's attention. It is ſuggeſted that an oak poſt ten inches ſquare, and eight feet long, is ſufficiently ſtrong for ſuſpending the gate ſhewn at *fig.* 6. in the plate; and it will contain five and an half feet of timber, or exactly 5 feet 6 inches and 6-10ths, the value of which muſt depend on its quality; but for common purpoſes the lower part of a tree of the dimenſions ſhewn at *fig.* 13, will conſtitute four excellent poſts for uſe, though their form may not be thought ornamental, and will contain by cuſtomary meaſure nineteen and an half feet, or exactly nineteen feet ſix inches and three-tenths, but the true meaſure of the part of a tree, ſuch as ſeen at the above figure, is twenty-three feet, or exactly twenty-three feet one inch and three-tenths; this leaves to the purchaſer of round timber, taking in the ſap, an advantage, it is contended, in the proportion of from 50 to 39, or upwards of from five to four. A part of an oak-tree without the bark, fit for this intention, is ſeen at *fig.* 13. in the plate. The money eſtimate of theſe gate-poſts is ſhewn below.

	£.	s.	d.
To 4 poſts containing 19½ feet cuſtomary meaſure, of moderately good oak, ſeveral inches of which, in the length towards the root, are of little or no value, taken together at 2*s.* a foot - - - - -	1	19	0
32 feet of ſawing at - - - -		1	0
	2	0	0

If this be divided by four, it will give 10*s.* per poſt; which value, though ſeemingly high, will, it is aſſerted, be ſoon compenſated, in the avoiding the continual charges of altering and propping inſufficient poſts. Beſides, theſe dimenſions exceed the ſize of ten inches ſquare, even after allowing for the early decay of the ſap on the round ſide of each poſt; inſomuch that a part of a tree of ſmaller dimenſions might ſerve for the purpoſe; ſuppoſe the circumference of a part of a tree without the bark, intended for four poſts, were only 5 feet 8 inches, inſtead of 6 feet 3 inches and 4-10ths, which is the circumference anſwering to the diameter of 2 feet, it would contain 16 feet 9 inches and 6-10ths by cuſtomary meaſure, including the ſap, which would be nearly equal, in ſtrength, to 4 poſts of 10 inches ſquare; for each of ſuch poſts will meaſure, in the true way, more than five feet; and the four poſts, as ſhewn at *fig.* 13, would be reduced 7*s.* in price, or 1*s.* 9*d.* each, leaving their value about 8*s.* 3*d.* a piece. Mr. Parker conſiders it as frivolous to add illuſtrations upon queſtions, to which ſimilar caſes are detailed, in every common book on menſuration of ſolids; but he feels it highly neceſſary to take notice of the outline of thoſe facts, which, like other parts of the ſubject, are not generally practiſed upon: and further, ſhould a gate of his recommendation be found to lodge its head upon the ground, he begs to be conſidered as *accountable* only for the *gate*, and not for the poſt on which it hangs, unleſs his advice in that reſpect may alſo have been duly attended to. And it muſt be underſtood that he is eſtimating the value of an oak gate-poſt of a certain ſtrength, and not cavilling about the difference as to the cuſtomary and true meaſure of round timber, for the market price of timber is conſidered as applying to a particular meaſure, and taking into the account the waſte in converting round timber to uſe.

It is a good method to prevent gate poſts from falling forward, and the gate, of courſe, ſtriking upon the ground, in the fore-part to have ſtumps placed againſt the front parts of them, at the time they are firſt fixed into the earth, in ſuch a manner as that, while they act powerfully againſt the poſts, they may not appear above the ſurface of the land, and prove inconvenient. Theſe ſhould always be ſtrongly nailed to the poſts, and be formed of well-ſeaſoned pieces of oak, being firmly rammed up at the ſame time with the poſts.

GATES, *Hanging and Faſtening of.* The modes of fixing or attaching them to the poſts, by hinges, or other means, in order that the gate may open and ſhut with eaſe and convenience; likewiſe the methods of ſecuring them ſo as to keep them ſhut.

The hanging of gates is a buſineſs that requires ſome ſerious conſideration to effect it in a proper manner. It is obvious that they ſhould have a certain degree of velocity, without having too much, in ſhutting themſelves; but this is not attained without ſome degree of difficulty. The author of the Rural Economy of the Midland Counties remarks, that though he had paid much attention to the hanging of gates in Yorkſhire, both with pivots and hinges, and had acquired an adequate idea of the leading principles, yet not having committed it to writing, the real nature of it had eſcaped his recollection, and a falſe notion of it ſupplied the place; which was, that the only thing neceſſary was to throw the gate out of the upright, ſo as to lean towards the poſt; it being no matter whether this inclination of it was attained by the hooks or the thimbles. And that, led by this falſe notion, he had conceived that the ſimpleſt, and conſequently the beſt way, to hang a gate, would be to put the hooks in exactly perpendicular to each other, and to give the fall by the thimbles alone. He conſequently prepared a bottom thimble, with a claſp to take the har-tree, and with an eye at each corner, in order that the gate might be occaſionally hung on one ſide or other of the fence, as the occupation of the incloſure might require, and with this thimble hung a gate.

The centres of the pins of the hooks being placed exactly perpendicular to each other by a plumb line, the gate was hung on; but inſtead of falling this way or that, it ſtood ſtationarily wherever it was ſet. Finding himſelf thus at a ſtand without inclination to remain long in ſuch a diſgraceful predica-

predicament, he ſet the workmen to other buſineſs, and himſelf to the inveſtigation of the principles of gate-hanging. After muſing for ſome time, with the gate in his hand, and ſketching his ideas afterwards on paper, he ſaw clearly, and to demonſtration, that the fall depended entirely upon the hooks; the axis of motion is given by the ſituation of the hooks with reſpect to each other; and, whichever way the axis of motion inclines, that way the gate will fall.

The theory of this principle is eaſily demonſtrable; but it requires diagrams to explain it, and is merely elementary. It is ſuggeſted that a gate ſhould have two, what are termed falls; one at the poſt, to make it catch; and another at a right angle to the gateway, to prevent its ſtanding open. The quantity of fall muſt vary with the uſes and length of the gate, and the judgment or fancy of the hanger. If a gate has too much fall at the poſt, it is liable to beat itſelf to pieces; if too little, it does not catch with ſufficient certainty, and is liable to be blown open by the wind, and thus become a deception, rather than a ſafe-guard. On ſufficient trial, it has been found, that for field gates, one inch and a half at the poſt, and an inch at the right angle, give what appears to the writer a proper fall to them.

In regard to the thimbles, the only uſe of their being made in this or that form, is, to counteract the croſs winding or obliquity of the hooks; ſo that the gate, when ſhut, ſhall hang plumb and level; or every way in a perfectly upright poſition. The way to aſcertain the true poſition of the hooks, is that of taking a plumb line, or any ſtring with a ſtone tied in it, and looking along the line of the fence or gateway, to drive the hooks, or move the poſt, until the centre of the pin of the upper hook appears, by the line hanging perpendicularly before the eye, an inch and a half nearer the middle of the fence, than that of the under one; and then looking along the line of the road, or perpendicularly to the gateway, ſee that the centre of the pin of the upper hook ſtands one inch nearer the middle of the road than that of the under hook; obſerving likewiſe that the pins of the hooks ſtand, not exactly upright, but in a line with each other, forming one direct axis of motion.

It is ſuggeſted, that as gates are liable to ſag, or ſink down by hanging, they ſhould conſtantly be hung ſomewhat above the level, rather than below it. The top thimble being uſually put into the middle of the har-tree, with the eye as near to it as the ſhoulder of the hook will admit, the counteraction of courſe depends on the bottom thimble. If this thimble be made with two ſtrong ſtraps, to claſp the lower part of the har-tree, as it always ought, with an eye on one ſide, or with two eyes, one on each ſide, and their centres three inches apart, with projecting necks, when fixed, one inch farther from the har-tree than that of the upper thimble, or, more accurately ſpeaking, with the centre of the eye or eyes of the lower thimble ſtanding an inch further behind the har-tree, than the centre of the eye of the upper one, the gate acquires, on a certainty, the requiſite fall, yet hangs level and upright when ſhut.

Other directions for effecting the buſineſs of hanging gates are ſtated in the corrected Report of the County of Northumberland. Having ſet the poſt perpendicular, let a plumb line *a b*, *figure* 2. in the plate, be drawn upon it; on this line at a proper height put in the hook C, ſo that it may project three inches and a half from the face of the poſt, and at a convenient diſtance below this, put in the lower hook D, an inch and a half to one ſide of the perpendicular line, and projecting two inches from the face of the poſt; then put the top loop or eye two inches from the face of the har-tree, and the bottom loop three inches and a half from it; and when thus hung, the gate will, it is contended, have a tendency to ſhut, in every poſition in which it may be placed.

For if the weight of the gate be repreſented by the line *c d* in the diagram accompanying *figure* 2, this, by the reſolution of forces, is reſolvable into other two, namely, *c e* and *d e*, as ſeen in the ſame diagram, the former repreſenting that part of the weight which preſſes in a perpendicular direction, and the latter, that part of it which preſſes horizontally, and gives the gate a tendency to ſhut. It is remarked that this is a principle that has been long known and practiſed in the hanging of gates that open in both directions.

This ſubject has been ſtill farther inveſtigated and explained in a late eſſay, by the ingenuity and exertion of Mr. Parker, who obſerves that "a gate, when ſuſpended by hinges, is a lever of the ſecond kind, in which the weight is placed between the power and the fulcrum; for it is evident, that the hand applied to the head of the gate is the acting power, that the gate itſelf is the weight to be raiſed or moved, and that the hinges are the fulcrum or centre of motion." And that "when the hooks or pivots upon which a gate is hung are preciſely in the ſame perpendicular line with each other, the gate will be at reſt wherever it may be placed; and the ſame power which is required to move a gate thus ſuſpended through any given arc of the circle, will be exactly ſufficient to bring the gate back to its former poſition; in proof of which he would inſtance a common door to a room with plain hinges. But the ſmalleſt variation of the hooks from their perpendicular line, will attach to a gate, ſo ſuſpended, one determinate line of reſt, and no other; and from any part of the circle which the gate may be made to deſcribe, it muſt have a conſtant tendency to fall to that line of reſt." That "the line of reſt for a gate will always be where the head of the gate approaches neareſt to the ground, and from thence being moved half a circle to the right or left, it will there attain its greateſt height, and ſupport itſelf, or with a very ſlight aſſiſtance may be ſupported in equilibrio."

But that "when a gate is in its line of reſt, or in its oppoſite line of equilibrium, the two hooks by which it is ſuſpended, and the centre of the gate's gravitation will be found to be in one and the ſame vertical plane: which will be eaſily underſtood by obſerving a common gate, whoſe hinges may be put on in any manner, however awkward or perverſe. And when the hooks are in a perpendicular line with each other, it can admit of no doubt, that they muſt always be in the ſame vertical plane with the centre of the gate's gravitation, becauſe they will be ſo with any third given point whatſoever.

"Theſe general principles are alſo applicable to any common ſwing-gate, which has two or more pivots or hooks at the lower hinge, when the poſition of either one of the lower pivots is conſidered with regard to the upper hook." And, in further explanation of theſe principles, a figure is given in the Eſſay, which is ſuppoſed "the outline of a gate 9 feet 2 inches long, from the fore-part of its head to its upper point of ſuſpenſion, repreſented in the line of reſt, as well as in the oppoſite line of equilibrium, ſhewing the velocity with which the gate is made to fall, from an elevation of 6 inches gained at the head, in attaining its line of equilibrium; eſtimated from the line of reſt, by means of the poſition of the two hooks, and the proportionate extra length of the lower thimble." It is added, that "the line of faſtening ſhould be 22 deg. 30 min. or 1-16th part of a circle

circle ſhort of, or within the line of reſt; and conſequently the correſponding line of equilibrium will alſo be 22 deg. 30 min. ſhort of the greateſt extent of the gate's opening." But, however, in order "to prevent the gate being left unſhut, it is adviſed that a ſhort poſt ſhould be placed at about half the diſtance between the road to be paſſed, and the fence adjoining the hanging-poſt, that is, 22 deg. 30 min. within the line of equilibrium; ſo that the gate ſhould not open from its line of faſtening more than about 135 deg. which will anſwer every purpoſe; and the hinges muſt be ſo adjuſted, that the gate ſhall be perfectly upright at its line of faſtening." It is conceived, that "a gate ſuſpended in this manner cannot be left open, excepting in high winds, but will ſhut of itſelf, though not with an uniformly accelerated motion, as might be ſuppoſed; its velocity being rather increaſed, as it paſſes the middle part of its ſemi-circular courſe, and retarded again as it approaches its line of reſt, coinciding with the proportionate riſe of the head; allowing only for ſuch acceleration as muſt be acquired while the gate, in falling with a continued motion, recedes more and more from the line of equilibrium: as the verſed ſine of the angle, formed by the gate with its line of reſt, is to the length of 110 inches, which is the made radius; ſo will be the correſponding riſe of the head of the gate to 3 7-16ths inches, or half the whole riſe of the gate's head, at any given angle within the quadrant, and the riſe in the head afterwards will be as the coſine of any given angle, formed by the gate with its line of equilibrium, in deſcribing the complement of that angle, is to the length of the gate, or radius; ſo will be the correſponding riſe of the head of the gate, to the remaining 3 7-16ths inches; which coſine of the angle formed by the gate, with the line of equilibrium, is equal to the ſine of the complementary angle, or angle of the gate's progreſs, from a radius at right angles to, or equidiſtant from, the lines of reſt and equilibrium, in performing its ſupplementary courſe. Thus it is evident, that though the riſe of the gate at the head in the firſt 90 deg. or half of its ſemicircular courſe, be 3 7-10ths inches, yet in the firſt and laſt 22 deg. 30 min. of its courſe, it will riſe only $\frac{1}{4}$ of an inch, or exactly 6-24ths and 69-116ths or a 24th in each reſpectively: and reſpecting the quarter fractions, the riſe of the gate's head, and correſponding velocity of the gate's fall, in equal eighth parts of its ſemicircular courſe, is nearly in proportion to the numbers 6, 16, 26, 32, and then inverſely, 32, 26, 16, and 6. And in order to illuſtrate the matter ſtill more clearly, he adds a repreſentation of the horizontal ſection of two hooks for a right-handed gate, opening one way, brought into one place of obſervation, the upper hook, the lower hook, the line of faſtening, the line of reſt, and the line of equilibrium. The diameter of the hooks 13-10ths of an inch, which is the proper ſize for a common gate. The horizontal diſtance of the lines falling from the two hooks, being 15-12ths or 2-4ths of an inch, is the meaſure adapted to hinges which are 40 inches aſunder. In adjuſting the hinges, it is neceſſary that the upper thimble ſhould incline $\frac{1}{4}$ of an inch from its centre, towards the hanging-poſt, and that the lower thimble ſhould be ſcrewed into the heel of the gate $\frac{1}{4}$ of an inch out of the ſtraight line, inclining in the oppoſite direction, that is from, inſtead of towards, the hanging-poſt, both the thimbles together making a variation of the 6-12ths of an inch, and to correſpond with this variation, the upper hook ſhould meaſure, from the centre of the pin to the ſhouldering, about half the thickneſs of the heel of the gate, as the 1-6th inch inclination of the upper thimble will allow ſufficiently for the gate hanging clear of the poſt. The longer hook muſt be 6-12ths inch longer than the upper hook, and muſt be driven into the gate-poſt 1 1-6th inch out of the perpendicular line of the perforated part of the gate-poſt, in which the hooks are to be received; as the lower thimble muſt alſo exceed the upper thimble in length 1 2-4ths inch, ſuppoſing the gate to be a right-angled parallelogram; or, at leaſt, the rail and heel to be at right angles with each other, elſe the lower thimbles muſt be extended by a waſher, to make up the deficiency, which, however, will not at all interfere with the velocity of the gate's fall; becauſe the hooks are the centre of motion, upon which all adjuſtment, as to the gate's fall, depends: the places of the thimbles influencing only the upright poſition of the gate when faſtened. The numbers of 8-12ths rather ſurpaſs, it is obſerved, the preciſe meaſure of their reſpective ſides of the triangle, but are nearer to the truth in calculation, than any workman could attain in applying theſe directions; for, in neither caſe, do they exceed their true meaſure ſo much as 1-24th of an inch, and therefore, in the one, the clear ſum of $\frac{1}{2}$ inch is aſſumed for general purpoſes, and ſhould the hinges be leſs than 40 inches aſunder $\frac{1}{2}$ inch will be rather too much; or, were they to be more than 40 inches diſtant from each other, $\frac{1}{2}$ inch, on the contrary, would be rather too little for the juſt proportion."

It is conſidered as certain, "that a ſmall ſpace muſt be loſt in hanging a gate, though the hooks and thimbles be made with the greateſt exactneſs; for the weight of the gate will draw the upper thimble to bear upon the hind part of the upper hook, and will preſs the lower thimble againſt the fore-part of the lower hook: this muſt, however, be trifling where the hinges are well fitted, and no allowance is made for it in the drawings which he has given; becauſe the lower thimble gains as much upon the upper one by their being placed $\frac{1}{2}$ inch, that is $\frac{1}{4}$ inch each, out of the plane of the gate's extenſion, as appears by the difference of the ſides of the triangle numbered 114-12ths, and 15-12ths equal to 1-12th inch, by the meaſure of 15-12ths, which is aſſumed but nearly about 1-14th inch more, as ſtated above; or, on the whole, equal to 1-8th inch, which is a good general equivalent for the loſs in hanging a gate, and will uſually be ſufficient to preſerve the upright poſition of the gate when faſtened, without having recourſe to a waſher at the lower thimble."

He ſtates, that the "velocity, as above given to the gate's fall, will be commonly ſufficient, without any care of oiling the hinges; but the effect of wind cannot be counteracted in gates by any good conſtruction of the hinges; for were a velocity given to a gate's fall, equal to the reſiſtance of ſo powerful an agent, the gate would ſoon want repair, from the conſtant violence of its ſhutting, and be ſo much the heavier in the hands of a horſeman: beſides, when a ſtrong wind blew in the ſame direction as that of the gate's fall, no man on horſeback would be able to withſtand its force; and well-conſtructed gates are moſt liable to be acted upon by wind from their wide extent of ſurface; but if paſſengers are ſo careleſs as to leave gates open under ſuch circumſtances, there will be one ſatisfaction remaining; that is, as ſoon as the wind ceaſes, the hinges muſt reſume their property, and the gates faſten of themſelves."

Different directions are alſo given for aſcertaining the proper poſition of the hooks, in caſes where the hinges of gates are more or leſs than 40 inches aſunder; in proving the truth of which, "ſuppoſe," ſays he, "a gate to be 110 inches long, and that it is intended to riſe at the head 6 7-8ths inches in its ſemicircular courſe, from the line of reſt to the line of equilibrium, then as the length of the gate is to the

diſtance

diſtance between the two hinges, ſo will be 6 7-8ths inches to double the horizontal diſtance of two perpendicular lines, one falling from each of the hooks." Or, "take any other diſtance of the hinges from each other, and the required extra length of the lower thimble may be found by placing the numbers 110, and 6 7-8ths, as the firſt and ſecond term of a rule of three proportions, and the new diſtance of the hinges muſt be the third term, the anſwer, divided by two, will be the ſought-for horizontal diſtance of the two, the perpendicular lines falling from the hooks (adding the loſs in hanging the gate), the anſwer for one is the meaſure for the other."

It is believed that "theſe general rules will find a tolerable accurate meaſure in all caſes; for where a gate, or wicket, is ſhort and light, the friction of the hinges will be leſs in two reſpects, both by the diminiſhed preſſure on the hooks, from the gate's lightneſs, and the reduced diameter of the pivots, which will ſupply what is wanting in the weight or momentum of the gate. On the other hand, when the gate is long and heavy, its increaſed weight, or momentum, and its length as a lever, will be oppoſed to the additional frictions of the hinges." And further, that "in caſes where old hinges are badly made with large hooks or deep thimbles, that difficulty is to be met by taking the proportion for the diſtance, of the two hinges, from each other, at five or ten inches more than it really may be, with reference to the given table, or by adding ſomething to the uſual horizontal diſtance, of the lines falling from the hooks. But when the thimbles are of a long cylindrical form, they are extremely apt to bind upon the hooks, and will ſometimes put a dead ſtop to the gate's motion. With ſuch thimbles, the attempt of adding to the velocity of a gate's fall, may only increaſe the binding or friction, and the remedy of this defect, therefore, is to make the hooks much ſmaller than the thimbles; in new thimbles no form, but that of annular or ring-like, ſhould be admitted. But by the lower thimble being furniſhed with a ſcrew of equal diameter throughout its length, its extra length may be regulated to ſo great a nicety as half a turn of the ſcrew, and may either be let into the heel beyond the ſhouldering, or lengthened out by a waſher, as circumſtances require, in adapting it either for hinges, which are leſs than forty inches aſunder, or the contrary, without the help of a blackſmith, or any freſh forging, which is always troubleſome and expenſive. And if a gate ſinks at the head, without any fault in the hanging-poſts or hooks, the lower thimble may be lengthened out, to bring the gate upright, and the hooks remain unaltered."

Further, that "the gate-poſts being fixed about eight feet nine inches aſunder, will be adapted for a gate nine feet long, or nine feet two inches, including the thimbles; the thimbles being attached to the gate in the manner above directed, let the gate be ſupported where it is to hang and faſten, and then drive in the upper hook, at a convenient diſtance from the edge of the hanging-poſt, ſo that the upper hinge ſhall not be in the way of any carriage paſſing the road, but at the ſame time ſo near to the edge of the poſt, as to loſe no more room from the road than is unavoidable by the head and heel of the gate, extending a little upon the two poſts. It is not neceſſary to the gate, that it ſhould lap againſt the hanging-poſt at all, but ſince the head ought to meet the falling-poſt at leaſt with half its ſubſtance, or from that to two inches, the hanging-poſt ſhould be nearly as much covered by the heel, for the ſake of uniformity.

"When the upper hinge is fitted, the gate ought to be ſupported upright, for aſcertaining the place of the lower hook, and if the thimbles are properly put on, the poſition of the lower hook cannot be miſtaken. Both hinges being fitted, it remains to be found, whether the hooks are in their exact places; for this purpoſe take two plumbed lines, with fine threads, and heavy even-ſided plumbs: if the hooks are well finiſhed, the obſervation reſpecting their centres may be taken, by faſtening the plumbed lines round the hooks, and letting them fall from the outſide of ſimilar parts of the hooks; forty inches being the given diſtance of the hinges, the horizontal diſtance of the two lines falling from the hooks ſhould be $1\frac{1}{4}$ inch, and in a line which forms an angle of 22° 30′ with the gate's line of faſtening: take, therefore, a common two-feet rule, and having opened the legs to the angle 22° 30′, place one ſide of it againſt the plumbed lines, which ought to anſwer to the meaſure of $1\frac{1}{4}$ inch, while the other leg of the rule ſhould be parallel to the gate's line of faſtening; a ſlight blow or two with a hammer, on one or both of the hooks, in the direction neceſſary, will complete the adjuſtment, and the gate will be found to ſhut of itſelf for any time within 135°, from its faſtening, and without violence, whether open to the ſmalleſt, the greateſt, or any intermediate angle preſcribed by the ſhort poſt, which ſhould be placed to meet the middle part of the gate, at the angle of about 135° from the line of faſtening. Further, it might be prudent before the ſhort poſt were put down, to aſcertain at what line the gate will ſtand open, or be poiſed by the friction of its hinges, towards the line of equilibrium, which will diſcover how near the workmen may have adjuſted the line of faſtening to 22° 30′ ſhort of the natural line of reſt; and if the gate is found to fall properly, the ſhort poſt may be put up accordingly, though the method deſcribed may not have been minutely purſued; taking care that the ſhort poſt be ſufficiently within the line of equilibrium, and that the gate ſet off from the ſhort poſt with a velocity equal to overcome any increaſed friction by ruſt of the hinges; for oil ſhould not be uſed at all, as its occaſional aid is not to be depended upon."

It is further ſtated, that "indifferent gate-poſts are liable to get out of their right poſition; the conſtant weight of the gate muſt have a tendency to pull the hanging-poſt inwards; the fall of the gate may make the falling-poſt recede from the direction of the frequent blows it receives, and heavy carriage-wheels paſſing near the poſts, will occaſion them to open outwards, and the natural or artificial ſlopes of the ground adjoining gate-poſts often affect their upright poſition, and decline them from the higher ground, and many other cauſes, produce ſimilar effects; to obviate which, many contrivances have been recommended, ſuch as mortiſing the pair of gate-poſts together by croſs pieces of timber under the road; but the moſt effectual preventive of the evil appears to be that of letting down the poſts very deep into the ground, which will ſuperſede the expence of croſs timbers, and in gaining a firm hold at their baſis, they will be the better ſecured both from natural and accidental diſplacement. Gate-poſts for common gates ſhould be from eight to eight feet and a half in length. See GATE, *Poſt*.

Care is alſo to be taken, in hanging a gate, to chooſe the beſt ſide for it to open; in doing which there are two circumſtances to be conſidered; the principal one is, that there may be plenty of room for a ſervant on horſeback to hold the gate while a carriage paſſes, and the other is to avoid its opening againſt any croſs-road or path, and to which ſome attention is due to the treſpaſs of cattle from a common

common road or otherwiſe; and it is thought more ſecure for a gate to open againſt that ſide from which the treſpaſs may be moſt apprehended. In ſome caſes, it is adviſable to furniſh a hanging-poſt with a pair of hooks, on both ſides of it, ſo that the gate can be ſhifted as occaſion may make it convenient.

"A key-hole and cotter may be put into the lower hook, to ſecure the gate from being taken off its hinges for idle purpoſes; or a ſtud rivetted to one ſide of either of the hooks, with a little notch cut in the ſtrongeſt part of the adjoining thimble, is a ſimple and good contrivance, whereby a gate is prevented from being taken off the hinges when ſhut; but is eaſily taken off, at ſome one part of its courſe, when required, where the ſtud comes oppoſite to the notch, and admits the thimble to paſs over the ſtudded hook. And it is not uncommon to ſee one hook driven into the poſt with its point upwards in the common way, and the point of the other hook in the contrary direction, which is an effectual mode of keeping the gate on its hinges, but it has the inconvenience of not permitting the gate to be removed without drawing one of the hooks.

"The ſame principles are applied in the hanging of gates on the contrary ſides, and likewiſe to thoſe of ſwing-gates," a full explanation of which may be ſeen in the very uſeful Eſſay referred to, as well as the method of ſawing timber for gates and gate-poſts.

The writer has ſuggeſted "that the common field-gates admit of a material diſtinction from road-gates in ſeveral reſpects; for, as to thoſe, which are uſed very ſeldom, or are generally locked, it is of little conſequence, ſo that the fence is made complete, whether they ſhut of themſelves or not: and ſome people think that a light high gate is preferable to a low and heavier one; but he has heard a gate of about 4½ feet high recommended for ſeveral reaſons, and particularly as a fence againſt horſes; becauſe the top rail would meet their wind-pipes inſtead of their cheſts, and being able to put their heads over it, they would be the leſs likely to force it with their rumps." And that "a gate opening out of a field into a public road, ſhould be ſuch as no one could eaſily get over, with upright pales for inſtance, ſharpened at the top, and it might be higher than uſual: there is no objection to ſuch gates opening double, as folding-doors, and he would prefer the hooks for hanging them to be perpendicular to each other, ſo that the gates ſhould remain wherever they might be placed; and no other faſtening ought to be allowed but a lock and key: this ſuppoſes that there is no common road or path through the field." But, "in very heavy lodge-gates, and turnpike-gates, he has ſeen the lower hinge contrived in ſuch a manner as to have a piece of iron let into a ſtone, with the top of the iron rounded and bevelled acutely towards a point, and a ſocket which may be faſtened to the heel of the gate with ſcrew-pins and nuts; and the ſocket is of courſe leſs acute than the bevel to be received, ſo that as little friction as poſſible may be occaſioned in opening the gate by the twiſt of the hinges, which in neither caſe will be perpendicular to each other. The pivot is well protected from rain and dirt in this manner, but he would always prefer the common hooks and thimbles of a proper ſtrength; and if it were thought neceſſary, the gate might be in part ſupported by a ſmall roller or caſter placed under the heel. And he has alſo ſeen the lower hinge of a ſwing-gate formed with four hooks, or pivots, the two middle ones being projected a little further from the hanging-poſts than the others, and the part attached to the gate indented to anſwer the hooks: but the ſame objections apply to this as to thoſe noticed already.

TABLE.

The Proportion in regard to Hooks and Thimbles, ſuppoſing a Gate to be a right-angled Parallelogram, ſet forth in Inches and twelfth Parts of Inches.

Diſtance from Thimble to Thimble.	"Horizontal Diſtance of Two perpendicular Lines, one falling from each of the Hooks."	Extra Length of lower Thimble.	Diſtance from Thimble to Thimble.	"Horizontal Diſtance of Two perpendicular Lines, one falling from each of the Hooks."	Extra Length of lower Thimble.	Diſtance from Thimble to Thimble.	"Horizontal Diſtance of Two perpendicular Lines, one falling from each of the Hooks."	Extra Length of Lower Thimble.
12	4/12	7/12	29	9/12	1	46	1 3/12	1 6/12
13	4/12	7/12	30	10/12	1 1/12	47	1 3/12	1 6/12
14	4/12	7/12	31	10/12	1 1/12	48	1 4/12	1 7/12
15	5/12	8/12	32	10/12	1 1/12	49	1 4/12	1 7/12
16	5/12	8/12	33	11/12	1 2/12	50	1 4/12	1 7/12
17	5/12	8/12	34	11/12	1 2/12	51	1 5/12	1 8/12
18	6/12	9/12	35	11/12	1 2/12	52	1 5/12	1 8/12
19	6/12	9/12	36	1	1 3/12	53	1 5/12	1 8/12
20	6/12	9/12	37	1	1 3/12	54	1 6/12	1 9/12
21	7/12	10/12	38	1	1 3/12	55	1 6/12	1 9/12
22	7/12	10/12	39	1 1/12	1 4/12	56	1 6/12	1 9/12
23	7/12	10/12	40	1 1/12	1 4/12	57	1 7/12	1 10/12
24	8/12	11/12	41	1 1/12	1 4/12	58	1 7/12	1 10/12
25	8/12	11/12	42	1 2/12	1 5/12	59	1 7/12	1 10/12
26	8/12	11/12	43	1 2/12	1 5/12	60	1 8/12	1 11/12
27	9/12	1	44	1 2/12	1 5/12	61	1 8/12	1 11/12
28	9/12	1	45	1 3/12	1 6/12	62	1 8/12	1 11/12

In order to render theſe principles more evident, Mr. Parker has given the following figure and deſcription of the method of hanging gates: At *fig.* 14. is a ſection of two gate-poſts, with the proper poſition of the hinges of a gate, which is deſigned to open one way, diſplaying the line of faſtening, the line of reſt, and the line of equilibrium; which two laſt lines are in the ſame vertical plane, both with the hooks, and with the centre of the gate's gravitation; and at about 1-16th part of a circle within the line of equilibrium, a ſhort poſt is fixed in, to prevent the gate opening too near upon its equilibrium, and thereby becoming liable to be left open. *Fig.* 15. is the upper thimble for a common

gate, which is leſs expenſive, but by no means ſo good as when the ſtrap extends to the whole length of the gate, as deſcribed below; this thimble is twiſted 1-4th of an inch bearing towards the hanging-poſt. *Fig.* 16. is the lower thimble of a gate proportioned to the upper thimble *fig.* 15, as $1\frac{3}{4}$ inch is to 3 inches, in regard to the diſtance between their centres and ſhoulders reſpectively. Theſe thimbles are adapted for a gate whoſe hinges are 40 inches aſunder, and as 40 is to $1\frac{1}{4}$, the difference in this inſtance, ſo ſhould be any other diſtance from hinge to hinge, to the proportionate difference or extra length of the lower thimble; and the greater the extra length might be made, over and above ſuch proportion, the greater muſt become the velocity of the gate's fall, or tendency towards the line of reſt; until its courſe is arreſted by the faſtening-poſt 1-16th part of the circle, or 22° 30′ ſhort of the line of reſt. The lower thimble is let into the gate by a ſcrew of equal ſubſtance throughout its length, or not tapered, in order that the adjuſtment of the thimbles, as to the velocity of the gate's fall, may be regulated to ſo great a nicety as half a turn of the ſcrew: and the thimble may either be let into the heel of the gate, or lengthened out by a waſher, as occaſion ſhall require. The poſition of the thimbles, in reſpect to each other, muſt be favoured alſo by the lower thimble, which being placed 1-4th of an inch out of the middle of the heel of the gate, in the contrary direction of the upper thimble, the whole difference, as to the diſtances of the two thimbles from the hanging-poſt, will be one-half of an inch; and their vertical plane, which is the ſame as that of the lines of reſt and equilibrium, will form an angle with the line of faſtening of 22° 30′, or 1-16th part of a circle; this adjuſtment, in effect, adds 1-12th of an inch to the extra length of the lower thimble, ſo that, by a plumb-line, it will be found (when the gate is hung upright, as it always ought to be) that the actual extra length of the lower thimble, or horizontal diſtance of the two centres from each other, will be $1\frac{1}{4} + \frac{1}{12} = 1\frac{1}{3}$ inch. *Fig.* 17. is the upper hook. *Fig.* 18. is the lower hook, with key-hole and cotter, and is half an inch longer from its centre to the ſhoulder than the upper hook, in order to anſwer the thimbles; the actual poſition of the hooks, with reſpect to each other, or rather the horizontal diſtance of two perpendicular lines, one falling from the centre of each of the hooks, will be about $1\frac{1}{4}$ of an inch only; for if the hooks and thimbles are made to fit properly, each hook will then be more than 1-16th part of an inch ſmaller than its thimble; for as the whole loſs in hanging a gate need not be ſo much as 1-8th of an inch, or not more perhaps than 1-12th (which exactly balances what is gained in the thimbles), the extra length of the lower thimble before it is fixed to the gate, and that of the lower hook before it is driven into the poſt, ought preciſely to accord with the dimenſions expreſſed in the plate, ſuppoſing the diſtance of the two hinges to be 40 inches." And it is added, that "the diameter of the hooks ſhould be about 13-16ths of an inch, and the perforated parts of the thimbles, when made to fit ſuch hooks, will be about 14-16ths, that is, 7-8ths of an inch diameter: for pivots of this ſize, the above calculations are ſuited, as to the velocity of a gate's fall; and the thimbles ſhould be made of rounded iron, that the friction may be reduced by the ſmallneſs of the ſurface to be affected thereby: as is ſhewn by Mr. Vince's experiments "On the Motion of Bodies affected by Friction." Vol. LXXV. Philoſophical Tranſactions of the Royal Society of London. And when old iron-work is made uſe of, wherein a larger ſurface is expoſed to friction, 1-8th, or 1-4th of an inch, as may be ſufficient, added to the common extra length of the lower thimble, will be the readieſt means of counteracting the extra friction." But, "if the heel of a gate be not at right angles with the rail, or the perforated parts of the thimbles be greater than the proportion allowed for, the deficiency, in either or both caſes, muſt be ſupplied by adding to the length of the lower thimble.

"A complete gate for opening one way, and conſtructed in ſuch a manner, that it ſhall not ſink at the head, as ordinary gates are apt to do, is ſhewn at *fig.* 6. The bars are let into the middle parts of the head and heel, and the lacings are tapered for finiſhing upon a level ſurface with the heel, head, and rail; as is evident in the following directions for the ſawing out the timber, which ſhould be of *kind* oak, not too *tough*, and entirely free from ſap." But "the waſte in planing and finiſhing a gate may be allowed for or not, as the gate is deſired to be a little more or leſs ſtrong." But, "when the timber is good, it is reduced ſo little by being planed and finiſhed into a gate, that no allowance need be made for the waſte; or, at all events, if the ſawyer attends to the dimenſions recommended, the gate will be quite ſtrong enough for its ſize."

Parts of Gate.	Length.	Greateſt Thickneſs.	Tapered to.
	Feet. In.	In. by In.	In. by In.
Heel - -	4 4	$4\frac{1}{2}$—$3\frac{1}{2}$	
Head - -	4 4	$2\frac{1}{2}$—$2\frac{1}{2}$	
Rail - -	9 0	$3\frac{1}{2}$—$3\frac{1}{2}$	$2\frac{1}{2}$—$2\frac{1}{2}$
5 Bars - -	9 0	$3\frac{1}{2}$—1	$2\frac{1}{2}$—$\frac{3}{4}$
Diagonal lacing -	9 6	$3\frac{1}{2}$—$1\frac{1}{2}$	$2\frac{1}{2}$—1
Larger upright lacing	2 8	$3\frac{1}{4}$—$1\frac{1}{4}$	
Smaller ditto -	2 8	3 —$1\frac{1}{4}$	

which will be found to form a well proportioned gate, the whole of the eight parts at the head preſenting to the eye $2\frac{1}{2}$ inches, and ſeven out of the eight parts at the heel, that is, all excepting the heel itſelf, preſent $3\frac{1}{2}$ inches." And in it "the diagonal lacing is fitted into the heel by a ſtrong butment, even with the loweſt bar, and its ſmaller end meets the upper angle at the head, and is confined laterally by two upright lacings; this would keep up the rail, provided the head were not puſhed forward, and that is prevented by an iron ſtrap of equal length to the gate, being attached to, or forming a part of the upper thimble in the firſt inſtance, where it holds the heel of the gate by the ſhoulder of the thimble; it is afterwards ſcrewed to the rail at proper diſtances; and laſtly, ſecures the whole work together, by a ſcrew-nut, rounded and let into the front of the gate's head, as ſeen above. The iron ſtrap is about an inch by a quarter of an inch in ſubſtance, for one half of its length, when it is tapered towards the head of the gate. At the end neareſt to the thimble it is made ſtronger for a few inches; and cloſe to the ſhoulder of the thimble, it ſhould be as much as half of an inch thick; the edges are chamfered off, and the whole appears to be gradually tapered from the heel to the head of the gate, widening a little round the hole which is left for the upright part of the latch adjoining to the handle. By this arrangement, the gate is in fact ſuſpended by the iron ſtrap and rail, inſtead of the heel, which aſſiſts greatly in preventing any ſtrain upon the mortiſes by the gate's own weight, or otherwiſe." The writer ſays, he "cannot imagine a gate of a more durable conſtruction, and that it ſeems particularly well calculated for *road-gates*. As in reſpect to a field, through which there is no common road, it is immaterial what ſort of gates may be uſed, ſo that they be made ſecure againſt cattle."

In reſpect to the faſtening it is obſerved by the ſame writer, that moſt blackſmiths have favourite notions of theſe faſtenings, and that from their great variety, it is only neceſſary to conſider ſuch as have been found uſeful on trial. The faſtening, ſhewn at *fig.* 19, "is remarkably eaſy for a horſeman to open, and as difficult, if not impoſſible, to be opened by cattle: the upright wire of the latch is furniſhed with a guard, and the mortiſe of the head of the gate, through which the latch paſſes, is finiſhed with ſheet-iron eſcutcheons, like thoſe ſeen at *fig.* 22, the faſtening being completed with the catch 21, having a button in the place of the ring. *Fig.* 20. is a common peg-latch for the head of a gate, with a guard to render it ſafer for cattle, which might run againſt it when the gate is open; and this forms a very ſecure faſtening, either with or without the guard, when attached to the catch, *fig.* 21; but it is thought very inconvenient for horſemen, and particularly ſo for thoſe who are not accuſtomed to it. *Fig.* 21. is the catch adapted to the latch, *fig.* 22. *Fig.* 22. repreſents two ſheet-iron eſcutcheons, and a pattern for a ſtrong latch, which is executed in caſt-iron 3-4ths of an inch thick. *Fig.* 23. is the catch belonging to *fig.* 19, to be made alſo of caſt-iron, 1 inch thick. *Fig.* 24. is a haſp with a peg, of which the ſtud paſſes through the lower hole, but is too large to paſs the upper hole, and therefore cannot be detached from the haſp: this may be made very uſeful in the fold-yard, &c."

The author ſtates, that "the double drop catch, *fig.* 25, has been uſed for ſome time in parts of Shropſhire and Staffordſhire, and that he took no ſmall pains to improve it: he adapted it for fitting an angle of a poſt, of which *fig.* 26 is an horizontal ſection, and the ſcrew-pin in the centre is made to anſwer two purpoſes: that of attaching the iron work more firmly to the poſt, and alſo of returning the points of the drop catches as often as either of them is driven upwards by the latch, the catch being thus inſtantly repulſed into its former poſition, before the gate has time to recoil beyond it." It is ſuppoſed, that this "ſort of catch is calculated for a ſwing-gate, which, having been opened either way, falls to its line of reſt, but is prevented from paſſing it by the obſtruction of one of the catches; while the other catch giving way for the latch, drops again, and the gate is completely faſtened." And he "afterwards applied the ſame principle to a ſingle catch, for a gate to open only one way, *fig.* 27, in which he conceived that he had been very ſucceſsful.

"It was next to be determined what kind of latch was moſt proper for theſe catches, and he found that the beſt contrivances for baffling cattle were apt to puzzle his viſitors, whoſe convenience was entitled to a ſhare of his attention." He "at firſt tried an iron peg, *fig.* 28, to be driven into the head, oppoſite the top rail, for a road-gate, and when it was to be placed lower for a fold-yard, or common field-gate, to be faſtened with a ſcrew-nut, both of which are repreſented in the figure. He then found it neceſſary to add a handle to the drop, *fig.* 27, but his friends would ſtill inſiſt upon it that it was a two-handed faſtening, and very inconvenient for horſemen; he therefore ſoon diſcontinued the iron peg, in regard to the double catch, though he approves of it for ſome purpoſes." He thinks "it certainly never can be opened by cattle, and it would be eaſy enough for a horſeman to open, when he became acquainted with it; yet ſhould he take faſt hold of the handle of the catch with the fore part of the hand, as might be expected, in raiſing the drop, he will detach that hand from the gate, and he muſt then ſeek the aid of his other; though by placing the thumb or palm of the hand upon the drop-catch, and reſerving the full liberty of his fingers, he may open the gate very well with one hand; but when the catch is upon the contrary ſide of the gate to that of the horſeman, it will not be quite ſo convenient, for the fingers or fore-part of the hand muſt in that caſe be employed upon the catch, while the thumb opens the gate. A great advantage may be gained by having the iron peg guarded, as repreſented at *figs.* 29 and 30, which will remove the objection to its being in any way dangerous; and while it facilitates the opening of the gate with one hand, it throws a freſh difficulty in the way of cattle."

But "the iron-peg latch would not, however, anſwer for the ſwing-gate, and he has ſupplied its place by the jointed latch A, in *fig.* 6, the principle of which is not uncommon; the part O forms a moſt complete guard to the latch, and the handle, being a ſemicircular ring, reſts upon the upper bar of the gate, or upon the ſecond bar, making it extremely improbable that a cow or horſe could ever lift up a latch of this kind." But that "for a ſwing-gate the latch ſhould be placed as nearly as poſſible to the middle part of the head, that the gate may the better reſiſt the jar of its ſhutting; for the ſudden check which the drop-catches give to a ſwing-gate, is greater than what is found in ordinary faſtenings; and if the latch were placed towards the top of the head of the gate, it would be as deſtructive as the common manner of hanging ſingle gates."

After "having finiſhed his drop-catches, a friend aſſured him, that he had ſeen both ſingle and double catches in Suffolk upon the ſame principle, and at his requeſt he procured him a very good ſketch of them, and alſo a ſort of model: as far as he could judge from the drawings of the Suffolk catches, they ſeemed rather to have the advantage of thoſe which he had firſt ſeen in Shropſhire." But, "in the courſe of an extenſive tour he made, he took occaſion to obſerve, that however generally good methods of hanging and faſtening gates might be underſtood, they were very rarely practiſed; and he cannot help particularly noticing the gates acroſs the public roads in Dorſetſhire, which are very numerous, in ſupport of his aſſertion: and ſhould theſe hints ever find their way ſo far, he hopes that public as well as private convenience, in ſuch reſpect, may thereby be promoted. He ſaw a catch, ſimilar to *fig.* 31, in Devonſhire, and the latch uſed with it was a kind of iron peg nailed to the inner ſide of the top rail of the gate; but there is an objection, he thinks, to any catch receiving the latch above the pivot upon which the catch turns: ſuch a faſtening, if the gate ſinks but very little, will gradually become uſeleſs, which gives an undoubted preference to the other drop-catches; as with them a gate muſt ſink two inches (which one that is well hung never ought to do) before the catch will ceaſe to act.

"It is very material, he thinks, that the iron peg ſhould not reſt cloſe againſt the gate-poſt, as that would very much increaſe the difficulty complained of in opening a gate with theſe faſtenings; the middle part of the head of the gate, as to its thickneſs, is the fitteſt to receive the iron peg, whether it is to be placed high or low, and the play of the catch will be the ſame in all inſtances, provided its ſhouldering is adapted accordingly."

The writer ſtates that "the double catch, *fig.* 32, is uſed at this time in ſeveral parts of Shropſhire, with the latch adjoining it made to riſe upon a pivot. The hollow part of the latch is in ſhape and ſize like a table-ſpoon, with a hole drilled through it to prevent rain lodging there; a ſwing-gate with this faſtening is opened either by the hand preſſing down the hollow part of the latch, or on horſeback you may put a ſtick, or the butt end of a whip into it, and with only one exertion the gate may be thrown open; on

the return of the gate, the latch ſtrikes againſt the lower part of one of the catches, either of which will riſe upon its reſpective pivot, till obſtructed by an iron pin or ſtud, placed near the centre of the iron-work. Theſe drop-catches are thinner at their upper parts than they are downwards, which aſſiſts the latch in riſing clear of them; and when the gate is faſtened, the latch is at reſt between the two drop-catches. This is not a very eaſy faſtening to deſcribe, and might be proper to be more particular were it not for the preference due to other contrivances." He ſtates further, that "a guard muſt be adapted for ſuch a latch, or cattle would be likely to open it; but this faſtening is particularly liable to be out of order, either by the ſinking or the contraction of the gate: every objection might be more eaſily removed than the effects of the gate's ſinking, and to this he has made a ſlight improvement, as in the figure; that is, when the latch has ſunk lower than the catches, it will ſtrike againſt an inclined plane, and have a chance of riſing upon its pivot to overcome the obſtacle. But he has lately, he ſays, received a catch for a gate from Leiceſterſhire, which, though it poſſeſſes a great likeneſs to that at *fig.* 27, has one material advantage; that is, that it confines the latch when the gate is at reſt, by a full inch and a half within a narrower compaſs, or allows it ſo much leſs play, which was very deſirable. This pattern of a ſingle catch admitted of a ſmall improvement, and it was eaſily adapted alſo to a double catch: with reſpect to their uſe, what has been ſaid in regard to that at *fig.* 27, and thoſe at *figs.* 25 and 26, will properly apply to theſe catches. The ſingle catch is repreſented at *fig.* 33, and the double catches at *figs.* 34 and 35, which are entitled to a moſt decided preference, compared with any that he has ever met with. Beſides, the handle of the ſingle catch riſes almoſt perpendicularly, and therefere does not interfere with the hand in performing its double office of opening the gate, and holding up the catch at the ſame inſtant: whereas the handle of the catch, *fig.* 27, muſt be brought much forwarder in lifting it up than that of the catch *fig.* 33, and this, added to the difference in the play of the gate, will make altogether about three inches, which is a great deal in the ſpan of a hand." But, he obſerves, that "there is an objection which attaches equally to theſe kinds of catches, as to others, that they may eaſily be broken off a poſt, and carried away; and to obviate this, he confeſſes himſelf incompetent to adviſe any certain mode of ſecuring them; but he ſubmits that where ſuch depredations have been experienced, there will ingenuity moſt likely be found to counteract them." The writer concludes by obſerving, that "there are many inventions of ſpring catches and latches, the common ſorts of which are very liable to be out of repair, by being conſtantly expoſed to the weather, and that thoſe of a ſuperior kind are too expenſive for general purpoſes."

It may be uſeful to inſert, among theſe different ſorts of faſtenings, the repreſentation of a convenient mode of confining horſes to their ſituations in ſtable-yards or other places. This is ſeen at *fig.* 36, in the plate, and conſiſts of a hook and ring, by which they can be held by the halter or bridle, and which, though commonly known and employed in many places, cannot be too ſtrongly recommended: a ſtable-yard ſhould always be well furniſhed with ſuch hooks, to prevent the uſe of common nails, which are extremely dangerous; and one of them may occaſionally become an uſeful appendage to a gate or wicket.

There is alſo a haſp, ſuch as that ſeen at *fig.* 37, with a hook rivetted to it, that may be found uſeful for fold-yard gates, pig-ſties, dog-kennels, and other places of a ſimilar kind.

GATES, *Caſt-iron Hangings and Faſtenings for.*—The introduction of caſt-iron hinges and faſtenings for gates has been attempted, and not without ſucceſs, by Mr. Parker, by which the expence in ſuch caſes is greatly leſſened, and at the ſame time the durability of the articles vaſtly increaſed. It is remarked by him, "that not a ſingle inſtance of failure has come within his knowledge in this ſort of iron-work for gates," though it "has been purpoſely ſubmitted to the moſt ſevere teſts; and he has little doubt but that in reaſonable time the improvement will be generally adopted." It has, indeed, been found that faſtenings of this ſort are capable of reſiſting the ſtrongeſt horſe purpoſely rode againſt the gate; and the ſtouteſt man may throw the gate towards its falling-poſt with all his power, without injury to the caſt hangings. And further, that the ſaving to the public by the adopting of caſt iron, in compariſon with the beſt wrought iron work is, it is ſuppoſed, apparently more than ſixty, but in reality not leſs than fifty *per cent.* It is obſerved that the different patterns have been executed with great correctneſs, in fine mahogany, to the perfect ſatisfaction of the inventor, and that the caſtings are conſequently the ſame. It was therefore only neceſſary for their ſtrength to be fully demonſtrated; and that, this having been done, his deſign is completed. But ſhould the caſt iron-work in any caſe happen to be furniſhed from the foundery without being accurately fitted, it may be adjuſted by filing with the ſame facility that wrought iron work can be altered, or at leaſt with very little more difficulty.

The public have been undertaken to be ſerved with proper ſupplies of theſe caſt-iron hangings and faſtenings, by Meſſrs. Deerman, Francis, & Co. Eagle Foundery, Birmingham; the caſtings being completely finiſhed and fitted at the charge of $3\frac{3}{4}d.$ the pound. The quantity of two tons has been directed to be caſt without delay, and ſeveral hundred weights of caſtings already brought into uſe under the immediate advice of the inventor.

The following hints, or memoranda, are furniſhed with the view of affording a diſtinct method of giving orders for the caſt-iron work to thoſe gentlemen or other perſons who may wiſh to make a trial of it.

For the gate ſhewn at *fig.* 6, to which a head-ſtrap and ſtrap-thimble are adapted, of caſt iron, omitting the intermediate length of the nine-feet iron ſtrap, the directions may be for Mr. Parker's patterns, Nos. 1, 3, 4, 6, 7, 8, and 9, (the caſtings being emboſſed with numbers from 1 to 16), $17\frac{1}{2}lb.$, $5s.$ $7\frac{3}{4}d.$; a pair of ſheet-iron eſcutcheons, $2d.$; No. 9 is the jointed latch formed in three pieces: 12 two-inch wood ſcrews, 4 one and a half inch ditto, and 16 two-penny clout-nails are likewiſe neceſſary to complete the whole.

But for a common ready made gate, having a ſtrong top-rail for the ſtrap-thimble, Nos. 1, 3, 4, 5, 6, and 7, $15lb.$ $4s.$ $8\frac{1}{4}d.$ are only required; with 12 two-inch ſcrews, and two one and a half inch ditto. And for a common gate, not having a ſtrong top-rail for the ſtrap-thimble, Nos. 1, 2, 3, 4, 5, and 6, $13lb.$ $4s.$ $0\frac{3}{4}d.$, are merely requiſite. The coſt of a complete ſet of ſpecimens, being ſixteen in number, which forms ſets for every purpoſe, including ſwing-gates, $41lb.$, is $12s.$ $9\frac{3}{4}d.$

It is ſtated, in addition, that the ſhapes of the ſeveral pieces of caſt-iron work will point out the manner in which they are reſpectively to be attached to the gates in ordinary caſes.

GATE, in *Engineery*, is applied to the cloſe-boarded doors of locks or ſluices on canals or rivers, for penning the water: in a lock theſe are diſtinguiſhed by upper-gates and lower-gates, according as they are placed at the head or tail of the lock. See CANAL.

GATE, or *Gait*, in the *Manege*, called in French *train*, is uſed for the going or pace of a horſe.

GATE, in a *Military Senſe*, is made of ſtrong planks, with iron bars, to oppoſe an enemy. They are generally made in the middle of the curtin, from whence they are ſeen, and defended by the two flanks of the baſtion. They ſhould be covered with a good ravelin, that they may not be ſeen or enfiladed by the enemy. Theſe gates, belonging to a fortified place, are paſſages through the rampart, which may be ſhut or opened by means of doors and a portcullis. They are either private or public.

Private gates are thoſe paſſages by which the troops can go out of the town unſeen by the enemy, when they paſs to and from the relief of the duty in the outworks, or on any other occaſion which is to be concealed from the beſiegers.

Public gates are thoſe paſſages through the middle of ſuch curtins, to which the great roads or public ways lead. The dimenſions of theſe are uſually about thirteen or fourteen feet high, and nine or ten feet wide, continued through the rampart, with proper receſſes for foot paſſengers to ſtand in out of the way of wheel-carriages. The front of the gate-way on the outſide is commonly ornamented with architecture either of the Tuſcan or Doric order: and over the vault, which covers the paſſage, cloſe to the town wall, is erected a building of about eighteen or twenty feet ſquare, in which the portcullis is ſuſpended; and on the inſide of the rampart there is generally another building, of about a hundred feet in front, and thirty deep, and high enough to contain one or two floors of rooms for one of the town officers; the ground floor ſerving for guard-rooms for the troops on duty at the gate. See HARROW, HERSE, ORGAN, and PORTCULLIS.

GATE, in *Mining*, ſignifies a paſſage or gangway underground, uſed by the minors. Drift, audit, gallery, augle, tunnel, brough, ſough, &c. are words of nearly ſimilar import.

GATE, *Poſtern*. See SALLY-*port*.

GATE *of the Sea*, or a *Sea-gate*, is uſed when two ſhips lie aboard one another in a wave or billow, and by that means ſometimes become rib-broken.

GATE, in *Scripture Language*, is uſed to denote the place of public aſſemblies, where juſtice was adminiſtered. (Deut. xvii. 5, 8. xxv. 6, 7. xxi. 18, 19. xxii. 15, &c.) As the Jews moſtly laboured in the fields, aſſemblies were held at the city-gates, and juſtice was adminiſtered there, that labourers, who ought to follow their work, might loſe no time, and that the country people, who required juſtice, might not be obliged to enter the town. Accordingly, the lower courts of juſtice, in the ſeveral cities, were held in their gates: thus we read, "judges and officers ſhalt thou make in all thy gates." (Deut. xvi. 18.) So that the gate among the Hebrews ſeems to have correſponded to the "forum" among the Romans, and to the αγορα among the Greeks; which was the name given to any common place of reſort, whether for the keeping of markets, or the holding courts of judicature. In the former ſenſe, the word, gate, is uſed, when Eliſha foretells at what low rate proviſions would be ſold, on the morrow, in the gate of Samaria. (2 Kings, vii. 1) In the latter ſenſe, Iſrael is exhorted to "execute the judgment of truth and peace in her gates." (Zech. viii. 16.) In either ſenſe, that is, as denoting, in general, a place of public concourſe, the word is uſed, when it is ſaid of the virtuous woman, "Give her of the fruit of her hands, and let her own works praiſe her in the gates." Prov. xxxi. 31.

Hence *gate*, *porta*, ſometimes ſignifies power and dominion: and in a ſimilar ſenſe the Turkiſh emperor's palace is called the *Porte*. Thus, God promiſes Abraham, that his poſterity ſhall poſſeſs the gates of their enemies, their towns and fortreſſes. (Gen. xxii. 17.) Our Saviour ſays to Peter, "Thou art Peter, and upon this rock will I build my church, and the gates of hell, or Ades, ſhall not prevail againſt it." Matt. xvi. 18. See alſo Iſaiah, xxxviii. 10. Pſ. ix. 13. cvii. 18. See ADES.

GATES, *Opening of*, in *Aſtrology*. See OPENING.

GATEHOUSE *of Fleet*, in *Geography*, a town of Scotland, in the county of Kircudbright, ſituated near the mouth of the Fleet, not far from the Iriſh ſea, with a cotton manufacture. Sloops come near the town; 13 miles W. of Kircudbright.

GATEL, a town on the eaſt coaſt of Mindanao. N. lat. 7° 52'. E. long. 126° 18'.

GATERINA, in *Ornithology*, a ſpecies of *Sciæna*; which ſee.

GATES, in *Geography*, a county of America, in Edinton eaſtern diſtrict, North Carolina, bounded north by the ſtate of Virginia, and ſouth by Chowan county. It contains 5881 inhabitants, including 2688 ſlaves; 280 miles from Waſhington. The chief town is Hertford.

GATESHEAD, a borough and pariſh in the ward of Cheſter, and county palatine of Durham, England. The town is built on the ſide of a hill, which ſlopes to the north, where it is bounded by the river Tyne; over which is a ſtone bridge, with an iron gate in the centre, ſeparating the reſpective boundaries and juriſdiction of Gateſhead and Newcaſtle. By a charter granted by biſhop Pudſey in 1164 to "his burgeſſes of Gateſhead," it is provided, that "each ſhall have, in right of his burgage, ſimilar liberties to thoſe enjoyed by the burgeſſes of Newcaſtle, in right of their burgages; and that they ſhall have free paſſage within the liberties of the palatinate with their goods, clear of all dues and exactions." Several ſucceeding prelates had their keepers of the park and caſtle here. In 1557, biſhop Tunſtall granted a charter to the company of Glovers, within the borough of Gateſhead; in 1602, biſhop Matthew incorporated ſundry trades; and in 1661, biſhop Coſin conſtituted them one commonalty. In the reign of Edward VI. this borough was united to Newcaſtle; but in the ſucceeding reign it was reſtored to the ſee of Durham, &c. Previous to the former event, it appears, from "Strype's Annals," that the mayor and burgeſſes of the latter place purchaſed from Thomas Sutton, founder of the Charter-houſe in London, for 12,000*l*. "the manor of Gateſhead, with all the manors, coal-pits, and coal-mines in Gateſhead and Wickham, with the common waſtes, &c." The trade of this place is not very extenſive: it, however, poſſeſſes ſeveral manufactories, particularly of caſt and wrought iron, whiting, &c. The population was ſtated in the late returns at 8597, inhabiting 1101 houſes.

On the eaſt ſide of the chief ſtreet, about half a mile from the bridge, are the ruins of St. Edmund's hoſpital, or monaſtery, ſuppoſed to occupy the ſcite of a monaſtery which appears, from Bede, to have been eſtabliſhed previous to the year 653.

On Gateſhead Fell, a bleak and elevated ridge, extending ſouthward from the village, a victory was obtained, in the year 1068, by William the Conqueror, over the combined forces of Edgar Atheling, and Malcolm, king of Scotland. Brand's Hiſtory of Newcaſtle, 2 vols. 4to.

GATEWAY, in *Rural Economy*, a paſſage, or opening into an incloſure, which is uſually cloſed by a gate. The ſpace for a gateway ſhould be from eight to nine feet, in general; but a greater width is, in ſome caſes, requiſite.

The

The foundations of gateways ſhould always be well laid with ſome ſolid material of the ſtone kind.

GATH, in *Ancient Geography*, a city of the Philiſtines, one of their five ſatrapies, or principalities, (1 Sam. vi. 17.) which were ſituated along the Mediterranean coaſt, between that and the tribes of Simeon, Dan, and part of Benjamin, extending from the ſea-port of Jamnia to the mouth of the river Bezor. Gath, or Geth, was famous as the birth-place of Goliath; it was firſt conquered by David, (1 Sam. xvii. 4.) and continued ſubject to his ſucceſſors till the declenſion of the kingdom of Judah. (2 Sam. viii. 1.) It was rebuilt and fortified by Rehoboam (2 Chron. xi. 8.): and retaken by Uzziah and Hezekiah. It was ſituated about five or ſix miles S. of Jamnia, about 14 S. of Joppa, and 32 W. of Jeruſalem. Gath was the moſt ſouthern city of the Philiſtines, as Ekron, or Accaron, was the moſt northern; ſo that Ekron and Gath are placed as the boundaries of their land. (1 Sam. vii. 1. 4. xvii. 52.) Jerom places Gath on the road from Eleutheropolis to Gaza. It recovered its liberty and luſtre, ſo as to be a place of ſtrength, in the time of the prophets Amos and Micah, independent of the kings of Judah (Amos, vi. 2. Micah, i. 20, &c.); but it was afterwards demoliſhed by Hazael, king of Syria. After that period, it remained of little conſideration till the time of the holy war, when Fulk, king of Jeruſalem, built a caſtle on its ruins.

GATH-*Opher*, or GATH-*Epher*, a town in the diſtrict of Opher, in Galilee, the birth-place of the prophet Jonah (2 Kings, xiv. 25.); placed by Joſhua (xix. 13.) in Zebulun. Jerom, in his preface on Jonah, ſays, that it was two miles from Sephoris, or Diocæſarea.

GATH-*Rimmon*, a city belonging to Dan (Joſh. xix. 45.); placed by Jerom 10 miles from Dioſpolis, towards Eleutheropolis: it was given to the Korathites.—Alſo, a city in the half-tribe of Manaſſeh, on this ſide of Jordan; given to the Korathites. (Joſh. xxi. 25.)—Alſo, a city of Ephraim; given to the Korathites. 1 Chron. vi. 69.

GATHEÆ, a town of the Peloponneſus, in Arcadia, according to Pauſanias.

GATHEATES, a ſmall river of Arcadia, in the ſouthern part, which ran from ſouth to north, and having received the Carnion, diſcharged itſelf into the Alpheus, over-againſt Megalopolis.

GATHER, in the *Sea Language*. A ſhip is ſaid to gather on another, when ſhe gets the wind of her.

GATHERING, in *Rural Economy*, is a term applied to the proceſs of rolling corn-ſwaths into a kind of cocks, or heaps. It alſo ſignifies a particular method of ploughing. See PLOUGHING.

GATINGOLY, in *Geography*, a town on the eaſt coaſt of Celebes. N. lat. 0° 22′. E. long. 123° 46′.

GATINOIS, or GASTINOIS, a province of France before the revolution. In the 11th century it had courts of its own, and was afterwards joined to Anjou. In later times it has partly belonged to the government of Orleans, and partly to the government of the iſle of France, and was diſtinguiſhed by the names of "Gatinois Orleanois," and "Gatinois François." It now forms part of the departments of the Seine and Marne, Seine and Oiſe, and Loiret.

GATO, a ſmall iſland in the Eaſt Indian ſea; 12 miles N. of Sibu. N. lat. 11° 42′. E. long. 123° 36.

GATRON, or KATTRON, a town of Africa, in Fezzan; 40 miles S. of Mourzouk.

GATSCH, a town and caſtle of Hungary; 12 miles E. of Korpona.

GATSEELA, a town of Bengal; 46 miles W. of Midnapour.

GATT, a ſtrait between the Friſch Haff and the German ſea.

GATTAIR, in *Ornithology*, a ſpecies of *Anas*. See DUCK.

GATTAN, in *Geography*, a town of Hindooſtan, in Allahabad; 10 miles north of Jionpour.

GATTAR, or KATTAR, a ſea-port of Arabia, in the province of Lachſa, on the Perſian gulf, oppoſite to Bahhrein; 40 miles S. of El-Catif.

GATTINARO, a town of France, in the department of the Seſia, on the Seſia; 15 miles N. of Vercelli.

GATTO, CAPE, or *Cape Gæta*, a cape on the S. coaſt of the iſland of Cyprus, probably the "promontorium phrurium" of the ancients. The land is low, the north and weſt parts of it being a moraſs, and on the eaſt ſide is a large ſalt lake, which is filled by the rains in winter, and is almoſt dry in ſummer. The ſouth part is a barren rocky ſoil, on which is a ruinous uninhabited convent, called "St. Nicholas." N. lat. 34° 32′. E. long. 33° 8′.

GATTON. See AGATTON.

GATTON, a borough town in the county of Surry, England, has been formerly a place of ſome extent and conſequence; but is reduced to 18 houſes, and 112 inhabitants. A privileged few of theſe, about ſeven, ſend two members to parliament. This place, "like its neighbours Rhiegate and Blechingley," ſays Mr. Gough, "owes its ruin to the *honor* of being repreſented in parliament. It had once a caſtle, ſucceeded by the manor-houſe." This is a modern edifice, ſeated in a fine park, which abounds with plantations, and is ornamented with a lake of about forty acres. The river Mole riſes in this pariſh.

GATTORUGINE, in *Ichthyology*, a ſpecies of *Blennius*, with palmated ſmall fins at the eye-brows and nape; or, as Artedi deſcribes it, with two ſmall fins at the eyes, and the anal fin conſiſting of 23 ſmall bones. It inhabits the Mediterranean and Atlantic ſeas. Pennant deſcribes a fiſh of this ſpecies, which was found on the Angleſea coaſt. Its length was $7\frac{1}{2}$ inches; the body ſmooth and compreſſed on the ſides; the belly a little prominent, and the vent, like that of the creſted blenny, or "galerita," placed under the ends of the pectoral fins. The teeth ſlender, almoſt ſetaceous and very cloſe-ſet; between the eyes was a ſmall hollow, and above each, juſt on the ſummit, was a narrow looſe membrane, trifurcated at the top, which diſtinguiſhes this from all other ſpecies. The pectoral fins broad and rounded, conſiſting of 14 rays; the ventral fins like thoſe of others of the genus; the dorſal fin conſiſting of 14 ſtrong ſpiny rays, and 19 ſoft rays; the anal fin having 21 rays; the tail rounded at the end, and conſiſting of 12 rays, divided towards their extremities. This fiſh in general was of a duſky hue, marked acroſs with wavy lines; the belly of a light aſh-colour; the lower part of the pectoral fins, and the ends of the ventral fins, of an orange colour.

GAU, GAW, *Gou*, or *Gow*, a termination in the German language, ſignifying country, canton, or diſtrict.

GAU *Scherkie*, in *Geography*, a town of Egypt, on the right bank of the Nile, oppoſite to Tahta, ſuppoſed by Norden to be the ancient Dioſpolis. In this town is a temple, 60 paces in length and 40 in breadth, ſeemingly covered by a ſingle ſtone reſting upon columns. The roof is well preſerved; and it is uſed by the Arabs as a lodgment for their cattle.

GAVALI, in the *Materia Medica*, a name given by ſome of the old writers to bdellium, particularly to the Arabian kind, which was the pureſt, and was uſually in form of ſmall tears, and of a pale yelloviſh colour.

GAVALS,

GAVALS, in *Geography*, a town of Ruſſia, in the government of Wiburg; 28 miles S. of it.

GAVAREEA, Cape, a cape on the eaſt coaſt of Kamtſchatka. N. lat. 52° 4′. E. long. 158° 31′.

GAUBIL, Anthony, in *Biography*, was born at Caillac in 1708, and was educated among the Jeſuits, into whoſe order he entered. By them he was ſent a miſſionary to China, where he paſſed thirty-ſix years, during which he obtained a knowledge of the Chineſe hiſtory and literature, which ſurprized the learned natives themſelves. He publiſhed ſeveral hiſtorical works, which were chiefly tranſlations from the Chineſe language. He died in 1759, having done much in ſupporting, by his aſtronomical knowledge, and general ſcience, that reſpectability which the Jeſuits had maintained above all other learned European orders. Nouv. Dict. Hiſt.

GAUBIUS, Jerome David, was a pupil of the learned Boerhaave, and became himſelf a profeſſor of medicine in the univerſity of Leyden, where he took the degree of doctor in 1725. He left ſeveral works of conſiderable value, which would not have diſcredited his maſter.—1. "Diſſertatio Inauguralis de ſolidis humani corporis partibus," Leyden, 1725.—2. "Libellus de methodo concinnandi formulas medicamentorum," ibidem, 1739, 1767. Franckfort, 1750, and in French, Paris, 1749.—3. "De regimine Mentis, quod Medicorum eſt," Leyden, 1747, 1763. In this work he deſcribes the effects reſulting from the empire of the body over the mind.—4. "Inſtitutiones Pathologiæ Medicinalis," ibid. 1758. This work alſo paſſed through ſeveral editions and tranſlations.—5. "Adverſariorum varii argumenti Liber unus," ibid. 1771. Eloy.

GAUDEN, or Gawding, John, in *Biography*, an Engliſh prelate, was born in the year 1605, at Mayland in Eſſex. He received the elementary parts of his education at Bury St. Edmund's, and at the age of ſixteen he was ſent to St. John's college, Cambridge. About 1630 he married a daughter of ſir William Ruſſel, and removing to Oxford became a member of Wadham college, where two of his wife's brothers were put under his care, and afterwards ſome other young perſons of conſiderable rank in life. In 1635 he took his degree of bachelor of divinity, and was afterwards appointed chaplain to the earl of Warwick. His patron's politics being in direct oppoſition to thoſe of the court, his chaplain embraced the ſame ſide, and preached a ſermon before the houſe of commons, in November 1640, which was ſo highly approved by that body, that they voted him a preſent of a large ſilver tankard, with an honorary inſcription upon it. In 1641 he took his degree of D. D. and was preſented by the parliament to the deanery of Bocking in Eſſex, which valuable preferment was confirmed to him by archbiſhop Laud, then a priſoner in the Tower. During the civil wars, and when the Preſbyterian form of church government and worſhip were eſtabliſhed, Dr. Gauden conformed, and preſerved his livings; and in 1643, he was appointed one of the "aſſembly of divines," but his name was afterwards ſtruck off the liſt, as he was ſuſpected of an attachment towards epiſcopacy. In 1648, his principles were more openly declared, for when the army had aſſumed the ſovereign power, and were determined to impeach, and bring to trial the unfortunate and miſguided Charles, Dr. Gauden inſiſted upon the unlawfulneſs of ſuch a meaſure, and publiſhed his proteſtation againſt their meaſures, which, as the title of the work imports, he cauſed to be preſented to the lord Fairfax, and his general council of officers. In the ſame year he wrote, but without venturing to publiſh, "a juſt invective againſt thoſe of the army and their abettors who murdered king Charles I.," with ſome poetic pieces in Latin, referring to thoſe tragical times. During the ſame year likewiſe the celebrated treatiſe entitled "Εικων βασιλικη, or portraiture of his ſacred majeſty in his ſolitude and ſufferings" was firſt printed, and in a few months it had paſſed through ſeventeen editions in England. Dr. Gauden, it is generally admitted, had a principal ſhare in this work, if he were not the ſole author, but fortunately the ſuſpicion of it did not light on him till epiſcopacy was re-eſtabliſhed. He was author of ſome other pieces which muſt have been obnoxious to the ruling party, nevertheleſs he continued unmoleſted till monarchy and epiſcopacy were again reſtored, when his zeal was rewarded by preferment in that church, for which, in the times of its affliction, he had been an advocate. He was appointed preacher at the Temple in the year 1659, and in the following year made chaplain to his majeſty Charles II. He now devoted his talents to vindicate the meaſures of the court, and to juſtify the cauſe of the hierarchy againſt ſectaries; and for his various ſervices, of which, it is ſaid, he frequently reminded the king, he was, in 1660, promoted to the vacant ſee of Exeter, which proved a moſt lucrative ſituation; for, from the fines for the renewal of leaſes, which had not been levied during the abolition of epiſcopacy, in a few months he realized the ſum of twenty thouſand pounds. In 1662, he was tranſlated to the ſee of Worceſter, but he had hoped for the more valuable biſhopric of Wincheſter, which was given to Dr. Morley, the late prelate of Worceſter. This diſappointment of his ambition he could not brook, his pride was mortified, he was taken ill very ſoon after his removal to the new ſee, and died in the fifty-ſeventh year of his age. His character has been variouſly eſtimated. Wood ſpeaks of him as "eſteemed by all who knew him, and as one who was much reſorted to, for his admirable way of preaching." Kennet repreſents him as capable of underwork, as a tool to the court, by the moſt ſordid hopes of greater favour in it; and Charles II. is reported to have ſaid, on hearing of his death, "I doubt not it will be eaſy to find a more worthy perſon to fill his place." By others he is repreſented as inconſtant, ambiguous, luke-warm, vain, ambitious, covetous of preferment, and impatient in the purſuit of it. Biog. Brit.

GAUDENS, St., in *Geography*, a town of France, and, principal place of a diſtrict, in the department of the Upper Garonne, ſeated on the Garonne. The place contains 4,055, and the canton 14,943 inhabitants, on a territory of 190 kiliometres, in 22 communes; 44 miles S.S.W. of Toulouſe. N. lat. 43° 6. E. long. 0° 48′.

GAUDENTIUS, in *Biography*, a ſaint in the Roman calendar, and biſhop of Breſcia, who flouriſhed in the fourth and fifth centuries. He was elected to the ſee of Breſcia in the year 387, which happened during his abſence on a religious viſit to the Eaſt. When he was informed of the choice which had fallen upon him, his diffidence was ſo great that he felt extremely averſe from undertaking ſo weighty a charge, and purpoſely delayed his return to Italy, under the hope that ſome other perſon might be appointed in his ſtead. Deputies were ſent to him to urge his ſpeedy compliance with their wiſhes, and to requeſt of the eaſtern biſhops, that Gaudentius might not be admitted to their communion, if he ſhould refuſe to return to his own dioceſe. Finding them determined upon his acceptance of the new appointment, he returned without farther delay. In 404 he was ſent with a deputation to Conſtantinople, by the emperor Honorius and the weſtern biſhops, to appeaſe the emperor Arcadius's reſentment againſt St. Chryſoſtom, and to intercede for his peaceable re-eſtabliſhment in the ſee. It

is not known how long this biſhop lived; ſome biographers mention his death as having happened in 410, and others in 427. He was author of ſeveral works, and of letters and other pieces, which are inſerted in the fifth volume of the "Bibliotheca Patrum." The moſt complete edition of his works was publiſhed at Breſcia in the year 1738, with thoſe of Philaſter, the life of whom has been attributed to Gaudentius. His ſtyle is plain, but defective in the ſtrength, eloquence, beauty, and correctneſs which diſtinguiſh the writings of many of his contemporaries. Moreri. Gen. Biog.

GAUDENTIUS *the Philoſopher*, one of the ſeven Greek writers on muſic, collected and publiſhed by Meibomius 1652, with a Latin tranſlation and commentary. We can find no very ſatisfactory information concerning this writer's country, or the time when he flouriſhed. Fabricius, Bibl. Græc. lib. iii. cap. x. ſeems to think that he preceded Ptolemy; but being a follower of the doctrines of Ariſtoxenus, he compoſed an introduction to harmonics, which Caſſiodorus has twice celebrated as an elegant little work; though he neither tells us when nor where he lived. However, on his authority, Caſſiodorus relates, that Pythagoras diſcovered the original precepts of the art, by the beating of hammers, and the percuſſion of tuneful ſounds; and concerning this tradition, Gaudentius is very explicit. His work, however, in general, except a few definitions, and a repreſentation of the muſical characters after the manner of Alypius, is little more than an abridgment of Ariſtoxenus, and that ſo ſhort and obſcure, that little knowledge is to be acquired by its peruſal.

GAUDIANO, in *Geography*, a town of Naples, in the province of Baſilicata; 10 miles N. E. of Venoſa.

GAUDIES, old Fr. jovial, riotous tunes.

GAUDIO MELL. FIAMINGO, in *Biography*, a Fleming, ſaid by the Italians to have been the maſter of the venerable Paleſtrina, by whom they mean CLAUDE GOUDIMEL; ſee that article.

GAUDISCHKAHN, in *Geography*, a town of Pruſſian Lithuania, ſituated on the Angerap; five miles E. S. E. of Gumbinnen.

GAUDKE, a town of Pruſſia, in the circle of Samland; eight miles N. of Pillau.

GAUDMA. See BOODH and GODAMA.

GAVE, a term uſed in the S. W. part of France, to expreſs a river or brook, as the gave of Oleron &c.

GAVEL, a term provincially uſed to ſignify a row or ſwath of corn, which has been cut down with the ſcythe. It alſo ſignifies ground.

GAVEL, or *Gabel*, in *Law*, ſignifies tribute, toll, cuſtom, yearly rent, payment, or revenue, of which there were anciently ſeveral kinds; *gavel-corn*, *gavel-malt*, *out-gavel*, *gavel-fodder*, &c.

GAVEL is ſometimes alſo uſed for what we more uſually call the *gable*; which ſee.

GAVELCESTER, *Sextarius Vectigalis*, a certain meaſure of rent ale. Among the articles to be charged on the ſtewards and bailiffs of the manors belonging to the church of Canterbury in Kent, according to which they were to be accountable, this of old was one: "de gavelceſter cujuſlibet bracini braciati infra libertatem maneriorum, *viz.* Unam logenam & dimidiam cereviſiæ." This duty elſewhere occurs under the name of *tolceſter*, in lieu whereof, the abbot of Abingdon was wont of cuſtom to receive the penny mentioned by Selden, in his Diſſertation annexed to Fleta, c. 8. Nor does it differ from what is called *oakgavel* in the gloſſary at the end of the laws of Henry I.

GAVELET, GAVELETUM, in *Law*, a ſpecial and ancient kind of *ceſſavit* uſed in Kent, where the cuſtom of gavel-kind continues; whereby the tenant ſhall forfeit his lands and tenements to the lord, if he withdraw from him his due rents and ſervices.

The proceſs of the gavelet is thus: the lord is firſt to ſeek by the ſteward of his court, from three weeks to three weeks, to find ſome diſtreſs upon the tenant, till the fourth court; and if, at that time, he find none, at this fourth court it is awarded, that he take the tenement in his hand, in name of a diſtreſs, and keep it a year and a day without manuring; within which time, if the tenant pay his arrears, and make reaſonable amends for the with-holding, he ſhall have and enjoy his tenement as before; if he come not before the year and day be paſt, the lord is to go to the next county court, with witneſſes of what had paſſed at his own court, and pronounce there his proceſs to have farther witneſſes; and then, by the award of his own court, he ſhall enter and manure the tenement as his own; ſo that, if the tenant deſire afterwards to have and hold it as before, he muſt agree with the lord, according to this old ſaying: "has he not ſince any thing given, or any thing paid, then let him pay five pound for his were, ere he become healder again." Other copies have the latter part with ſome variations: "let him nine times pay, and nine times repay."

The word gavelet, in its original ſignification, imported rent; but it means alſo a proceſs for the recovery of rent peculiar to Kent, and London. The gavelet, thus prevailing by the cuſtom of Kent, may be uſed whether there be a ſufficient diſtreſs on the land or not; but is reſtricted to gavel-kind tenure. This remedy of gavelet, as well as that of *ceſſavit*, is now wholly fallen into diſuſe; nor, whilſt they continued in uſe, were they applicable, except where the tenure was in fee. Booth on Kent Act. 133. 1 Inſt. 142. n. 2.

GAVELET, in London, a writ uſed in the huſtings of London, "Breve de gaveleto in London, pro reditu ibidem quia tenementa fuerunt indiſtringibilia." And the ſtatute of gavelet, 10 Edw. II. gives this writ to lords of rents in the city of London as well as in Kent. Here the parties, tenant and demandant, appear by *ſcire facias*, to ſhew cauſe why the one ſhould not have his tenement again, on payment of his rent, or the other recover the lands, on default thereof.

GAVEL-GELD, denoted payment of tribute or toll. Mon. Angl. tom. 3.

GAVEL-KIND, a tenure or cuſtom, annexed and belonging to lands in Kent, whereby the lands of the father are equally divided, at his death, among all his ſons; or the lands of the brother among all the brethren, if he have no iſſue of his own. Lit. 210.

Lambard compounds this term of the three Saxon words *gyfe*, *eal*, *kyn*, *omnibus cognatione proximis data*. Verſtegan calls it *gavelkind*, quaſi *give all kind*, *i. e.* to each child his part; and Taylor, in his Hiſtory of Gavel-kind, derives it from the Britiſh *gavel*, *i. e.* a hold or tenure, and *cenned*, or *cenedl*, *generatio*, or *familia*; and thus *gavel cenedl* might ſignify *tenura generationis*.

"Teutonicis priſcis patrios ſuccedit in agros
Maſcula ſtirps omnis, ne foret ulla potens."

This cuſtom anciently obtained throughout England, before the year 1066; but after the conqueſt, when knight-ſervice was introduced, the deſcent was reſtrained to the eldeſt ſon for the preſervation of the tenure. (Lamb. 167. 3 Salk. 129.) But it is ſtill of force in a great part of Kent, Urchenfield in Herefordſhire, and elſewhere, though with ſome difference: but, by the ſtat. 34 and 35 Hen.

Hen. VIII. c. 26. all gavel-kind lands in Wales are made deſcendible to the heir, according to the courſe of common law; whereby it appears, that this tenure was alſo in that principality; and was probably of Britiſh original.

In an ancient book of records in Chriſt-church, Canterbury, of the time of Henry VIII. our Saxon anceſtors are ſaid to have held all their lands either by writing, or without; the firſt were called *bockland*, whoſe owners were men, whom we now call *freeholders*: the ſecond were called *folkland*, the owners whereof were of ſervile condition, and poſſeſſed *ad voluntatem domini*. Now the inheritance, or freehold, did not, in thoſe days, deſcend to the eldeſt ſon, but to all alike; which, in Saxon, was called *landeſcyftan*; and, in Kent, to *ſhift land*; whence came the cuſtom gavelkind. And the reaſon why it was retained in Kent more than other places was, that the people of Kent, upon the Norman invaſion, could not be induced to ſurrender to the conqueror, but on theſe conditions, that they ſhould retain their ancient county-cuſtoms without any infringement or diminution; and eſpecially that called *gavelkind*.

Blount, in v. *Gavelkind*, relates a ſtory of the Kentiſh men ſurrounding Will. I. with a moving wood of boughs, and thus obtaining a confirmation of their ancient rights.

In the reign of Hen. VI. there were not above thirty or forty perſons in the whole county of Kent, who held by any other tenure than this of gavel-kind; which was afterwards altered upon the petition of ſeveral Kentiſh gentlemen, with regard to great part of the land of that county, ſo as to be deſcendible to the eldeſt ſon, according to the courſe of common law; by 31 Hen. VIII. c. 3.: though the cuſtom to deviſe gavel-kind land ſtill remains; and all lands in Kent ſhall be taken to be gavel-kind, except thoſe which are *diſgavelled* by particular ſtatutes. (Co. Lit. 140.) Blackſtone relies on the nature of tenure in gavel-kind, as a pregnant proof that tenure in free ſocage was a remnant of Saxon liberty. It is well known that the Kentiſh men vigorouſly ſtruggled to preſerve their ancient liberties, and theſe ſtruggles were attended with ſucceſs. And as it is principally in Kent that we find the cuſtom of gavelkind, we may fairly conclude that this was a part of thoſe liberties; agreeably to Mr. Selden's opinion, that gavel-kind, before the Norman conqueſt, was the general cuſtom of the realm.

The diſtinguiſhing properties of this tenure are various; ſome of the principal are theſe: the lands, held under this denomination of *gavel-kind*, which is an ancient ſocage tenure, deſcend equally, and are divided, ſhare and ſhare alike, among all the male children; and, in defect of theſe, among the females. They are of age, or qualified to take the lands upon them, at fifteen; and may then give, vend, or alienate the ſame to any perſon, without the conſent of any lord: and children here inherit their father's land, though convicted of felony, murder, &c. according to the maxim, "The father to the bough, the ſon to the plough." It has been held, however, that in matters of treaſon, which ſtrike at the foundations of policy and government, even gavel-kind lands are forfeitable, and *always were*. The tenants in gavel-kind are to do fealty, and to be in the tuition of the next a-kin, who is not next heir after them, till fifteen years of age; to pay acknowledgment to the lord for the lands, &c.

Gavel-kind is ſaid to be only a ſpecies of a ſocage tenure, modified by the cuſtom of the country; the lands being holden by ſuit of court and fealty, which is a ſervice in its nature certain. (Wright, 211.) And therefore by a charter of king John, Hubert, archbiſhop of Canterbury, was authorized to exchange the gavel-kind tenures holden of the ſee of Canterbury, into tenures by knight's ſervice; and by the above-mentioned ſtatute of 31 Hen. VIII. c. 3. for diſgavelling lands in Kent, they are directed to be deſcendible, for the future, like other lands, which were never holden by ſervice of ſocage. The immunities which the tenants in gavel-kind enjoyed, are ſuppoſed to be ſuch as cannot be conceived to have been conferred on mere ploughmen and peaſants; from all which the learned commentator apprehends it to be ſufficiently clear, that tenures in free ſocage are in general of a nobler original than is aſſigned by Littleton, or after him by the bulk of common lawyers. Bl. Com. v. ii.

The cuſtom of gavel-kind is not altered, though a fine be levied of the lands at common law; becauſe it is a cuſtom that runs with the land. (6 E. VI.) A wife ſhall be endowed of gavel-kind land, of a moiety of the land of which her huſband died ſeiſed, during her widowhood. (Co. Litt. 3.) And it has been adjudged, that a widow cannot have election to demand her thirds or dower at common law, ſo as to avoid the cuſtom, by which ſhe ſhall loſe her dower, if ſhe marry a ſecond huſband. (Moor. 26c. 1 Leon. 62.) See DOWER. The huſband ſhall be tenant by the curteſy of half the gavel-kind lands of the wife, during the time he continues unmarried, without having any iſſue by his wife; but if he marry, he ſhall forfeit his tenancy by the curteſy. (Co. Lit. 3.) If the huſband had iſſue by his wife, he ſhall be tenant by the curteſy of the whole land; and though he marry he ſhall not forfeit his tenancy. (Mich. 21 Car. B.R. 1 Lil. Abr. 649.)

A rent in fee granted out of gavel-kind lands ſhall deſcend in gavel-kind to all the heirs male, as the lands would have done; it being of the ſame nature with the land itſelf. (2 Lev. 138. 1 Mod. 97.) If lands are alleged to be in Kent, it ſhall be intended that they are gavel-kind; if the contrary doth not appear. (2 Sid. 153.) By Hale, Ch. J. gavel-kind law is the law of Kent, and is never pleaded, but preſumed; and it has been held that the ſuperior courts may take notice of gavel-kind generally without pleading; though not of the ſpecial cuſtom of deviſing it, which ought to be pleaded ſpecially. (1 Mod. 98. Cro. Car. 465. Lutw. 236. 756.)

The gavel-kind deſcent of lands in Ireland was an incident to the cuſtom of *taniſtry*; and as ſuch fell to the ground with its principal, in conſequence of a ſolemn judgment againſt the latter in a caſe Ann. 5 Jac. I. (Dav. Rep. 28.) But in the reign of queen Ann the policy of weakening the Roman Catholic intereſt in Ireland was the cauſe of an Iriſh ſtatute to make the lands of papiſts deſcendible according to the gavel-kind cuſtom, unleſs the heir conformed within a limited time. (See Rob. on Gavelkind, c. 17.) However now, by an Iriſh ſtatute of the preſent reign (17 and 18 Geo. III. c. 49.) the deſcent of the lands of papiſts is again reduced to the courſe of the common law. (1 Inſt. 176. n. 1.)

GAVELKOVEN, in *Geography*, a town of Germany, in Lower Bavaria; 20 miles S.E. of Landſhut.

GAVELLER, in *Mining*, ſignifies a bar-maſter or bailiff of a mineral liberty or diſtrict, an officer who collects the cope, tolls, or dues of the king, or lord of the ſoil, from the ſeveral mine-adventurers; to whom alſo he gives poſſeſſion of their mines, according to the eſtabliſhed laws and cuſtoms of the field or diſtrict. See MINING.

GAVELLING, is the act of freeing a mine, or obtaining the right to work it, by paying the accuſtomed fees to the gaveller or bar-maſter, whether in ore obtained from the mine to be freed, as is the cuſtom of the king's field in Derbyſhire, or in money, as is done in ſome diſtricts.

GAVELLO, in *Geography*, a town of Italy, in the Polesino de Rovigo ; 8 miles S.W. of Adria.

GAVELMAN, a tenant who is liable to tribute.

"Villani de Terring, qui vocantur gavelmanni." Somner, *Gavelkind*. Hence gavel-kind has been thought to be land in its nature taxable. Blount.

GAVELMED, the duty or work of mowing grass, or cutting of meadow land, required by the lord from his customary tenants. "Consuetudo falcandi quæ vocatur gavelmed." Somner.

GAVELOCK, in *Rural Economy*, an iron bar or crow used in entering stakes, posts, &c. into the earth. It should have sufficient substance in order to prevent its being bent in employing it ; and have a claw at one end for the purpose of wrenching out nails, &c.

GAVELRIP, bedreap, or duty of reaping, at the command of the lord—"de consuetudine metendi 40 acras et dimid. de gavelrip in autumno 40 sol. et sex denar."

GAVELWERK, was either *manu-opera*, by the hands and person of the tenant, or *carr-opera*, by his carts or carriages.

GAVENNY, in *Geography*, a river of Wales, which runs into the Usk, near Abergavenny.

GAUER, a river of Scotland, which forms a communication between loch Lydoch and loch Rannock.

GAVEREN, a town of France, in the department of the Scheldt, on the Scheldt ; 7 miles E. of Ghent.

GAUERS, a town of Silesia, in the principality of Neisse ; 5 miles W.N.W. of Potschau

GAVETA, La, a town of Naples, in Capitanata ; 16 miles S.W. of Manfredonia.

GAVETTO, a sea-port town of Algiers, on the east side of the gulf of Stora.

GAUGAMELA, in *Ancient Geography*, a small place of Asia, on a plain between the rivers Zabus and Bumadus, to the north of the place where the latter discharges itself into the former. This place is famous for the battle, called the battle of *Arbela* ; which see.

GAUGE, in *Engineery*, sometimes signifies the same with weir : a gauged bar is an upper gate, or over-fall to a weir. See Smeaton's Reports, vol. i. p. 62.

Gauge-*line*, a line on the common gauging-rod, whose description and use see under the article Gauging.

Gauge-*point* of a solid measure is the diameter of a circle, whose area is equal to the solid content of the same measure.

Thus the solidity of a wine gallon being 231 cubic inches : if you conceive a circle to contain so many inches, the diameter of it will be 17.15 : and that will be the gauge-point of wine measure.

And an ale-gallon containing 282 cubic inches ; by the same rule, the gauge-point for ale-measure will be found to be 19.15 : and after the same manner may the gauge-point of any other measure be determined.

Hence we deduce, that when the diameter of a cylinder in inches is equal to the gauge-point in any measure (given likewise in inches) every inch in length thereof will contain an integer of the same measure. In a cylinder, whose diameter is 17.15 inches, every inch in height contains one entire gallon in wine-measure ; and in another, whose diameter is 19.15, every inch in length contains only one ale-gallon.

Gauge-*weir*, in *Engineery*, is a weir or over-fall, out of some reservoir, or pound of a canal, calculated to discharge a given quantity of water daily, for the supply of mills, or some other canal. See Canal.

GAUGER, an officer appointed by the king to gauge, *i. e.* to examine or measure, all casks, tuns, pipes, barrels, hogsheads of beer, wine, oil, &c. and to give them a mark of allowance (which is a circle burnt with an iron) before they be sold in any place within the extent of this office.

Of this officer and his office we have many statutes ; thus, by 27 Edw. III. c. 8. all wines, &c. imported, are to be gauged by the king's gaugers or their deputies ; by 31 Edw. III. c. 5. selling wine before gauged, incurs forfeiture, or the value : and by 23 H. VI. c. 15. the gauge penny is to be paid gaugers on gauging wines. The 31 Eliz. ordains that beer, &c. imported shall be gauged by the master and wardens of the Coopers' company : see 12 Car. II. c. 4. The wardens of the Coopers shall attend to gauge vessels upon request. 23 Hen. VIII. c. 4. Gaugers may take samples not exceeding half a pint, 32 Geo. II. c. 29. See Excise.

GAUGING, the art or act of measuring the capacities or contents of all kinds of vessels, and determining the quantity of fluids or other matters contained therein.

Gauging is the art of reducing the unknown capacity of vessels of divers forms, cubical, parallelepepidal, cylindrical, spheroidal, conical, &c. to some known cubic measure ; and of computing, for instance, how many gallons, quarts, pints, or the like, of any liquor, *e. gr.* ale, beer, wine, brandy, &c. are contained therein.

Gauging is a branch of stereometry.

The principal vessels that come under its operation are pipes, barrels, rundlets, and other casks ; also backs, coolers, vats, &c.

The solid content of cubical, parallelepepidal, and prismatical vessels, is easily found in cubic inches, or the like, by multiplying the area of the base by the perpendicular altitude.

And for cylindrical vessels, the same is found by multiplying the area of the circular base by the perpendicular altitude, as before.

Casks of the usual form of hogsheads, kilderkins, &c. may be considered as segments of a spheroid cut off by two planes perpendicular to the axis : which brings them to Oughtred's theorem for measuring ale and wine casks, which is thus : add twice the area of the circle at the bung to the area of the circle of the head ; multiply the sum by one-third of the length of the cask, the product is the content of the vessel, in cubic inches. But for accuracy, Dr. Wallis, Mr. Caswell, &c. think, that most of our casks had better be considered as frustums of parabolic spindles, which are less than the frustums of spheroids of the same base and height, and give the capacity of vessels nearer the truth than either Oughtred's method, which supposes them spheroids ; or than that of multiplying the circles of the bung and head into half the length of the cask, which supposes them parabolic conoids : or than that of Clavius, &c. who takes them for two truncated cones : which is farthest off of all.

The common rule for all wine or ale casks is to take the diameters at the bung, and at the head, by which you may find the area of the circle there ; then taking two-thirds of the area of the circle at the bung, and one-third of the area of the circle at the head, and adding them together into one sum, this sum, multiplied by the internal length of the cask, gives the content in solid inches ; which are converted into gallons, by dividing by 282 for ale, and by 231 for wine gallons.

The readiest method for common use is to reduce the cask

to a cylinder of equal contents; and this is done by conſidering what is called the variety of the caſk. Suppoſe a cylinder inſcribed in a caſk, and another circumſcribed about it, there will be a cylindrical ſpace included between the ſuperficies of the two cylinders, whoſe diameter or thickneſs is equal to the difference between the bung and head diameters of the caſk; the curvature of the ſtaves of the caſk takes in a certain proportion of the cylindrical ſpace, which is greater or leſs, as the curvatures bend, or bulging of the ſtaves is greater or leſs; and this determines what is called the variety; and it will be the firſt variety, if the caſk bulges very much; ſecond variety, if leſs, and ſo on: it is, therefore, evident, that the diameter of the inſcribed circle may be increaſed ſo as to take in a portion of the interjacent cylindrical ſpace equal to that taken in by the curvature of the ſtaves of the caſk; and then the caſk and increaſed cylinder will be equal in content. The diameter of the inſcribed cylinder is the head diameter of the caſk; the thickneſs of the cylindrical ſpace is equal to the difference between the bung and head diameters. The only difficulty, therefore, lies in determining what portion of this difference muſt be added to the head diameter of the caſk, in order to obtain the diameter of the mean cylinder, or the cylinder of equal content. Now experience ſhews, that if 7-10ths of the difference between the head and bung diameters of any caſk be added to the head diameter, the cylinder whoſe diameter is equal to this ſum, and whoſe length is equal to that of the caſk, will contain as much or more than that caſk, though the ſtaves have the greateſt degree of curvature that is ever given to them. And as the difference between the bung and head-diameters of caſks is ſeldom very great, the contents of a caſk whoſe ſtaves are quite ſtraight from bung to head, or of a caſk made up of two equal fruſtums of two equal cones, will generally be nearly equal to the contents of a cylinder, whoſe diameter is equal to the ſum of the head diameter of the caſk, and a little more than half the difference between the bung and head diameters, and whoſe length is equal to the length of the caſk. Therefore, all the varieties of which caſks are capable, lie between 5-10ths and 7-10ths of the difference between the bung and head diameters; and the gauger has only to take ſuch a part of this difference (always between 5-10ths and 7-10ths) as his judgment and experience inform him to be moſt ſuitable to the curvature of the caſk; and this, added to the head diameter, gives the diameter of the mean cylinder.

It may not be amiſs to note here, that the difference between the bung and head diameters may be very great, and yet the caſk have no bulging at all, for the bulging is the bend or curvature of the half-ſtave, between the bung and the head.

Mathematicians give us abſtruſe theorems, for computing the contents of caſks, upon the ſuppoſed reſemblance between the curvature of the caſk and that of an ellipſis, parabola, or hyperbola; but they may be as much miſtaken in judging of the curvature, as an experienced gauger between 5-10ths and 7-10ths: for after all, the contents of caſks cannot be determined to a mathematical exactneſs; becauſe the forms of caſks do not exactly anſwer any mathematical figures. The buſineſs of gauging is at beſt but gueſs-work; but it is ſuch a way of gueſſing, as comes near enough the truth for the common purpoſes of life.

Hence we may add ſuch decimal multipliers, for the difference between bung and head diameters as have been found by experience to be the trueſt, and beſt ſuited to the ſeveral varieties or curvatures of caſks.

Firſt variety, or ſtaves very much bulging,	.7 or .695
Second variety, or ſtaves not ſo much curved,	.65 or .63
Third variety, or ſtaves ſtill leſs curved,	.6 or .56
Fourth variety, or ſtaves almoſt ſtraight,	.55 or .51

The following rule will ſerve for gauging caſks by the pen: take the difference of the bung and head diameters of any caſk, and multiply that difference by the number which ſtands againſt the name of the caſk given in the table, add the product to the head diameter; and the ſum will be the diameter of a cylinder, which, being of the ſame length with the given caſk, will contain as much; ſquare the diameter thus found, and multiply that ſquare by the length, and divide the product by 359 for beer gallons, and 294 for wine.

The multipliers for a caſk, which is taken for varieties:

The middle fruſtum	1. Of a ſpheroid	.7	greateſt bulge.
	2. Of a parab. ſpindle	.63	next leſs.
	3. Two conoids	.56	next leſs to that.
	4. Two cones	.51	next leſs to that.

Example.—Let a caſk be taken as the middle fruſtum of a ſpheroid, the bung diameter of which is 32 inches, the head 26, and length 50 inches; what is the content in beer and wine gallons? $\overline{32 - 26} \times .7 = 4.2$. To which add 26, and we ſhall have 30,2 for the mean diameter; and $\overline{30.2}|^2 = 912.04$, which multiplied by the length 50 will give 45602; and $\frac{45602}{359} = 127$ beer gallons; and $\frac{45602}{294} = 155.1$ wine gallons. The contents of other caſks may be found in the ſame manner by uſing the proper multipliers. See Everard's SLIDING *rule*.

For the ready computation of the contents of veſſels, or of any ſolids in the meaſures in uſe in Great Britain, we ſhall here inſert the following rules taken from a Treatiſe of Practical Geometry, publiſhed at Edinburgh in 1745, 8vo. Vide pag. 137. ſeq.

1°. To find the content of a cylindric veſſel in Engliſh wine gallons, the diameter of the baſe and altitude of the veſſel being given in inches and decimals of an inch: ſquare the number of inches in the diameter of the veſſel; multiply this ſquare by the number of inches in the height, then multiply this product by the decimal fraction 0.0034, and you will have the contents of the veſſel in gallons, and decimals of a gallon. For example, let the diameter be = D = 51.2 inches, the height = H = 62.3 inches, then will the content be D D H × 0.0034 = 51.2 × 51.2 × 62.3 × 0.0034 = 555.27342 wine gallons.

2°. Suppoſing the Engliſh ale gallon to contain 282 cubical inches, the content of a cylindric veſſel is computed in ſuch gallons, by multiplying the ſquare of the diameter of the veſſel by its height as before, and their product by the decimal fraction 0.0027851, that is, the ſolid content in gallons will be D D H × 0.0027851.

3°. If the Scotch pint contains 103.4 cubical inches, the content of ſuch a veſſel in Scotch pints, will be D D H × 0.0076.

4°. Suppoſing the Wincheſter buſhel to contain 2178 cubic inches, the content of a cylindric veſſel is computed in thoſe buſhels, by multiplying the ſquare of the diameter of the veſſel by the height, and the product by the decimal fraction 0.0003606. But the legal Wincheſter buſhel containing only 2150.42 ſolid inches, the content of a cylindric veſſel is computed in ſuch buſhels, by multiplying the ſquare of the diameter by the height, and their product by the decimal 0.0003652. Or the content will be D D H × 0.0003652 See BUSHEL.

5°. Suppoſing the Scotch wheat firlot to contain $21\frac{1}{4}$ Scotch pints, or about 2197 cubical inches, the contents of a cylindric veſſel in ſuch firlots will be D D H × 0.000358.

And if the beer firlot contain 31 Scotch pints, the contents of ſuch a veſſel in beer firlots will be D D H × 0.000245. See FIRLOT.

6°. It is to be obſerved, that when the ſection of the veſſel is not a circle, but an ellipſis, the product of the greateſt diameter by the leaſt is to be ſubſtituted in theſe rules, for the ſquare of the diameter.

7°. To compute the content of a veſſel, which may be conſidered as the fruſtum of a cone in any of thoſe meaſures. Let A repreſent the number of inches in the diameter of the greater baſe, B the number of inches in the diameter of the leſſer baſe. Compute the ſquare of A, the product of A by B, and the ſquare of B. Take the third part of the ſum of all theſe, and ſubſtitute it in the preceding rules for the ſquare of the diameter, and proceed in all reſpects as before. Thus for example, the content in wine gallons will be $\overline{A\,A + A\,B + B\,B} \times \frac{1}{3}\,H \times 0.0034$. Or thus: To the ſquare of half the ſum of A and B add one-third of the ſquare of half their difference; and ſubſtitute this ſum in the preceding rules for the ſquare of the diameter of the baſe of the veſſel. For the ſquare of $\frac{1}{2}\,A + \frac{1}{2}\,B$ added to $\frac{1}{3}$ of the ſquare of $\frac{1}{2}\,A - \frac{1}{2}\,B$ gives $\frac{1}{4}\,A\,A + \frac{1}{2}\,A\,B + \frac{1}{4}\,B\,B + \frac{1}{12}\,A\,A - \frac{1}{6}\,A\,B + \frac{1}{12}\,B\,B = \frac{1}{3}\,A\,A + \frac{1}{3}\,A\,B + \frac{1}{3}\,B\,B$.

8°. When the veſſel is a fruſtum of a parabolic conoid, meaſure the diameter of the ſection at the middle of the height of the fruſtum: and the content will be the ſame as of a cylinder of this diameter, of the ſame height with the veſſel.

9°. When a veſſel is a fruſtum of a ſphere, if you meaſure the diameter of the ſection at the middle of the height of the fruſtum, then compute the content of a cylinder of this diameter, and of the ſame height with the veſſel, and from this ſubtract $\frac{1}{3}$d of the content of a cylinder of the ſame height, on a baſe, the diameter of which is equal to that height; the remainder will give the content of the veſſel. That is, if D repreſent the diameter of the middle ſection, and H the height of the fruſtum, you are to ſubſtitute $D\,D - \frac{1}{3}\,H\,H$ for the ſquare of the diameter of the cylindric veſſel in the firſt ſix rules.

10°. When the veſſel is a fruſtum of a ſpheroid, if the baſes are equal, the content is readily found by the rule given from Oughtred. In other caſes, let the axis of the ſolid be to the conjugate axis, as n to 1; let D be the diameter of the middle ſection of the fruſtum, H the height or length of the fruſtum, and ſubſtitute in the firſt ſix rules $D\,D - \frac{H\,H}{3\,n\,n}$ for the ſquare of the diameter of the veſſel.

11°. When the veſſel is a hyperbolic conoid, let the axis of the ſolid be to the conjugate axis as n to 1, D the diameter of the ſection at the middle of the fruſtum H, the height or length, compute $D\,D + \frac{H\,H}{3\,n\,n}$, and ſubſtitute this ſum for the ſquare of the diameter of the cylindric veſſel in the firſt ſix rules.

12°. In general, it is uſual to meaſure any round veſſel, diſtinguiſhing it into ſeveral fruſtums, and taking the diameter of the ſection at the middle of each fruſtum; thence to compute the content of each, as if it was a cylinder of the mean diameter; and to give their ſum as the content of the veſſel. From the total content computed in this manner they ſubtract ſucceſſively the numbers which expreſs the circular areas that correſpond to thoſe mean diameters, each as often as there are inches in the altitude of the fruſtum to which it belongs, beginning with the uppermoſt; and in this manner calculate a table for the veſſel, by which it readily appears how much liquor is at any time contained in it, by taking either the dry, or the wet inches; having regard to the inclination, or drip of the veſſel, if it has any.

This method of computing the content of a fruſtum from the diameter of the ſection at the middle of its height, is exact in that caſe only when it is a portion of a parabolic conoid; but in ſuch veſſels as are in common uſe the error is not conſiderable. When the veſſel is a portion of a cone or hyperbolic conoid, the content by this method is found leſs than the truth; but when it is a portion of a ſphere or a ſpheroid, the content computed in this manner exceeds the truth. The difference or error is always the ſame in different parts of the ſame, or ſimilar veſſels, when the altitude of the fruſtum is given. And when the altitudes are different, the error is in the triplicate ratio of the altitude. If exactneſs be required, the error in meaſuring the fruſtum of a conical veſſel, in this manner, is $\frac{1}{4}$th of the content of a cone, ſimilar to the veſſel, of an altitude equal to the height of the fruſtum. In a ſphere it is $\frac{1}{3}$d of a cylinder, of a diameter and height equal to the fruſtum. In the ſpheroid and hyperbolic conoid, it is the ſame as in a cone, generated by the right-angled triangle contained by the two ſemiaxes of the figure revolving about that ſide which is the ſemiaxis of the fruſtum. Theſe are demonſtrated in a treatiſe of fluxions by Mr. Maclaurin, where thoſe theorems are extended to fruſtums that are bounded by planes oblique to the axis in all the ſolids, that are generated by any conic ſection revolving about either axis. Vide p. 25. and 715.

In the uſual method of computing a table for a veſſel, by ſubducting from the whole content the number that expreſſes the uppermoſt area, as often as there are inches in the uppermoſt fruſtum, and afterwards the numbers for the other areas ſucceſſively, it is obvious that the contents aſſigned by the table, when a few of the uppermoſt inches are dry, are ſtated a little too high, if the veſſel ſtands on its leſſer baſe, but too low when it ſtands on its greater baſe; becauſe, when one inch is dry, for example, it is not the area at the middle of the uppermoſt fruſtum, but rather the area at the middle of the uppermoſt inch, that ought to be ſubducted from the total content, in order to find the content in this caſe.

But gauging, as now practiſed, is chiefly done by means of inſtruments called *gauging-rods*, or *rules*, which do the buſineſs at once, and anſwer the queſtion without ſo much calculation; which is no inconſiderable addition, both to the eaſe and diſpatch of the work. This inſtrumental way of gauging, therefore, we ſhall here chiefly inſiſt upon.

Dr. Hutton in his "Menſuration" has given rules for computing the contents of the various fruſtums of ſolids, which bear reſemblance to the ſeveral varieties or forms of different caſks. Rules adapted to theſe forms will be found under the denominations of the ſeveral ſolids to which they belong in this Cyclopædia; and they occur in moſt books, profeſſedly written on the ſubject of Gauging. We ſhall here ſubjoin one general rule, extracted from the above-cited treatiſe, (p. 592) which may be eaſily applied to the caſes that occur.

General Rule.

Add into one ſum 39 times the ſquare of the bung diameter,
25 times the ſquare of the head diameter,
and
26 times the product of thoſe diameters.

Multiply the ſum by the length of the caſk, and the product by the number .00034; then this laſt product divided by 9

will

will give the wine gallons, and divided by 11 will give the ale gallons: or, $\overline{39\,B^2+25\,H^2+26\,BH} \times \frac{L}{114}$ is the content in inches; which being divided by 231 for wine gallons, or by 282 for ale gallons, will be the content.

E. G. If the length of a cask be 40 inches, the bung diameter 32, and the head diameter 24.

Here $32^2 \times 39 = 39936$
$24^2 \times 25 = 14400$
$32 \times 24 \times 26 = 19968$

The sum - - 74304
multiplied by - 40

divided by 114) 2972160
gives - - 26071 cubic inches: and
this divided by 231 gives 112 wine gallons,
or divided by 282 gives 92 ale gallons.

Construction of a Gauging-rod, whereby the content of any cylindrical, or common vessel, is easily had.—Take the diameter A B of a cylindrical vessel, A B D E, *Plate* IV. *Surveying, fig.* 2, that holds one of the measures wherein the fluid is estimated, *e. gr.* gallons, and join it at right angles to the indefinite line A 7. From A to 1, set off a right line equal to A B; then will B 1 be the diameter of a vessel, that holds two measures, or gallons, of the same height as the former.

Again, let A 2 = B 1; then will B 2 be the diameter of a vessel that holds three measures, but of the same height as that which only holds one. And, after the same manner, find the diameter of other large vessels, B 3, B 4, B 5, B 6, B 7, &c.

Lastly, set off the several divisions thus found, A 1, A 2, A 3, &c. upon the side of a rod or rule; and, on the other, the height or depth of a cylinder, that holds one measure or gallon, repeated as oft as it will go. Thus is the gauging-rod complete.

For cylinders, that have the same altitude, are to each other as the squares of their diameters; consequently the square of the diameter of the vessel that holds 2, 3, or 4 gallons, must be double, triple, or quadruple of that which only holds one. And since in the first, A B = A 1, the square of B 1 is double, that of B 2 triple, that of B 3 is quadruple, &c. it is evident, that the right lines A 2, A 3, A 4, &c. are the diameters of the vessels required.

These divisions, therefore, being applied to the side of a cylindrical vessel, it will immediately appear how many measures, *e. gr.* gallons, a cylindrical vessel of that base, and of the height of that which holds one gallon, will contain.

Wherefore, finding by the divisions on the other side of the rod, how often the height of one gallon is contained in the height of the given vessel; and multiplying the diameter before found by this number; the product will be the number of gallons the vessel contains.

Thus, *e. gr.* if the diameter of the cylindrical vessel be 8, and its height 12, its contents will be 96 gallons.

Note, 1°. The less you take the height of the cylinder containing one gallon, the greater will the diameter of the base be: whence both that, and the diameters of the cylinders containing several gallons, will be the more easily divisible into lesser parts. Bayer directs such height to be only one digit, or tenth of an inch.

2°. The diameters of vessels holding one or more decimal parts of a gallon will be had, by dividing one or more decimal parts of the vessel holding a whole gallon, by its height: which gives us the area of the circular base; from whence the diameter is easily found by the rules delivered under DIAMETER, CIRCLE, &c. And after the same manner, the diameters are found for the divisions of vessels, that hold two or more gallons.

GAUGING-*rod, use of the.*—To find the content of a cask; that is, to determine the number of measures, *e. gr.* gallons, it will hold: apply the gauging-rod to the vessel, as directed in the preceding article, and find both the length of the cask, A C, *fig.* 3, and both diameters, G H and A B. Now, as we find, by experiment, how far soever it may be from geometrical exactness, that a common cask of this form may safely enough be reputed as a cylinder, whose base is a medium between the head and the belly; find such medium, which call the *equated diameter.*

Then multiplying the number thus found by the length of the cask A C, the product will be the number of measures the vessel contains.

Suppose, *e. gr.* A B = 8, and G H = 12, and A C = 15, the equated diameter will be 10, which multiplied by 15, gives the capacity of a cask, 150 measures.

If it happen, that the diameters of the two ends be not equal, measure them both, and take half their sum for the diameter to work by.

There is another method whereby the content of a vessel is had, without any calculation at all, which obtains in divers parts of Germany and the Low-Countries: but as this supposes all vessels to be similar to each other, and their length double of the equated diameter, that is, of half the sum of the diameters A B and G H, it is not safe to use it in all places. Kepler, however, prefers it so much before all others, as including all the precautions possible, that he recommends it to the public, to enact it by law, that all casks be made in this proportion.

The methods of gauging, which chiefly obtain among us, are, by the four-foot gauging-rod, and Everard's sliding-rule.

GAUGING-*rod, description and use of the four-foot.*—The four-foot gauging-rod, represented in *fig.* 4, is usually made of box, and consists of four rules each a foot long, and about three-eighths of an inch square, joined together by three brass joints; by which means the rod is rendered four feet long, when the four rules are quite opened, and but one foot when they are all folded together.

On the first face of this rod, marked 4, are placed two diagonal lines; one for beer, and the other for wine: by means of which the content of any common vessel in beer or wine gallons may be readily found, by putting the rod in at the bung-hole of the vessel, till it meets the intersection of the head of the vessel with the staves opposite to the bung-hole. For distinction of this line, there is written on it, *beer* and *wine gallons.*

On the second face, 5, are a line of inches, and the gauge-line; which is a line expressing the areas of circles, whose diameters are the correspondent inches in ale gallons. At the beginning is written, *ale area.*

On the third face, 6, are three scales of lines; the first, at the end of which is written *hogshead,* is for finding how many gallons there are in a hogshead, when it is not full, lying with its axis parallel to the horizon. The second line, at the end of which is written *B. L.* signifying a *butt lying,* is for the same use as that for the hogshead. The third line is to find how much liquor is wanting to fill up a butt when it is standing: at the end of it is written *B. S.* signifying a *butt standing.* In the half of the fourth face of the gauging-rod, 7, there are three scales of lines, to find the wants in a firkin, kilderkin, and barrel, lying with their

their areas parallel to the horizon. They are diſtinguiſhed by letters *F. K. B.* ſignifying a *firkin, kilderkin,* and *barrel.*

GAUGING-*rod, uſe of the diagonal lines on the.*—To find the content of a veſſel in beer or wine gallons, put the braſed end of the gauging-rod into the bung-hole of the caſk, with the diagonal lines upwards, and thruſt its braſed end to the meeting of the head and ſtaves; then with chalk, make a mark at the middle of the bung-hole of the veſſel, and alſo on the diagonal lines of the rod, right againſt, over one another, when the braſed end is thruſt home to the head and ſtaves: then turn the gauging-rod to the other end of the veſſel, and thruſt the braſed end home to the end, as before.

Laſtly, ſee if the mark made on the gauging-rod come even with the mark made on the bung-hole, when the rod was thruſt to the other end; which if it be, the mark made on the diagonal lines will, on the ſame lines, ſhew the whole content of the caſk in beer or wine gallons.

If the mark made on the bung-hole be not right againſt that made on the rod, when you put it the other way, then, right againſt the mark made on the bung-hole, make another on the diagonal lines; and the diviſion on the diagonal line, between the two chalks, will ſhew the veſſel's whole content in beer or wine gallons.

Thus, *e. gr.* if the diagonal line of a veſſel be 28 inches four-tenths, its contents in beer gallons will be near 51, and in wine gallons 62.

If a veſſel be open, as a half-barrel, tun, or copper, and the meaſure from the middle on one ſide to the head and ſtaves be 38 inches, the diagonal line gives 122 beer gallons; half of which, *viz.* 61, is the content of the open half tub.

If you have a large veſſel, as a tun or copper, and the diagonal line, taken by a long rule, proves 70 inches; the content of that veſſel may be found thus:

Every inch at the beginning-end of the diagonal line, call ten inches. Thus ten inches become 100 inches; and every tenth of a gallon call 100 gallons; and every whole gallon call 1000 gallons.

Exam.—At 44.8 inches, on the diagonal beer-line, is 200 gallons; ſo that four inches 48 parts, now called 44 inches 8 tenths, is juſt two-tenths of a gallon, now called 200 gallons: ſo alſo, if the diagonal line be 76 inches and 7 tenths, a cloſe caſk, of ſuch diagonal, will hold a 1000 beer gallons; but an open caſk but half ſo much, *viz.* 500 beer gallons.

GAUGE-*line, uſe of the.*—To find the content of any cylindrical veſſel in ale gallons: ſeek the diameter of the veſſel in inches, and, juſt againſt it, on the gauge-line, is the quantity of ale gallons contained in one inch deep: this, multiplied by the length of the cylinder, will give its content in ale gallons.

For example, ſuppoſe the length of the veſſel 32.06, and the diameter of its baſe 25 inches; to find what is the content in ale gallons?

Right againſt 25 inches, on the gauge-line, is one gallon, and 745 of a gallon; which multiplied by 32.06, the length, gives 55.9447 gallons for the content of the veſſel.

The bung diameter of a hogſhead being 25 inches, the head diameter 22 inches, and the length 32.06 inches, to find the quantity of ale gallons contained in it?

Seek 25, the bung diameter, on the line of inches; and right againſt it, on the gauge-line, you will find 1.745: take one-third of it, which is .580, and ſet it down twice: ſeek 22 inches in the head diameter, and againſt it you will find, on the gauge-line, 1.356; one-third of which, added to twice .580, gives 1.6096; which multiplied by the length 32.06, the product will be 51.603776, the content in ale gallons.

Note, this operation ſuppoſes, that the aforeſaid hogſhead is in the figure of the middle fruſtum of a ſpheroid.

The uſe of the lines on the two other faces of the rod is very eaſy; you need only put it downright into the bung-hole (if the veſſel you deſire to know the quantity of ale gallons contained therein be lying) to the oppoſite ſtaves; and then where the ſurface of the liquor cuts any one of the lines appropriated to that veſſel, will be the number of gallons contained in that veſſel.

The deſcription and uſe of Everard's ſliding-rule for gauging, ſee under SLIDING-*rule.*

GAUGING MASTER, on *Canals,* is an officer appointed to meaſure, weigh, and aſcertain exactly the tonnage of the boats uſed on canals; the proceſs of which, as practiſed on the Grand Junction canal, we have deſcribed under the article CANAL. It may be proper here, however, to remark, that the practice, now followed on many of the Britiſh canals, was firſt ſuggeſted by Thomas Walker, eſq. of Bilborough, Notts, in 1798, who contrived a weighing-houſe, and with the concurrence of the Cromford canal company, and thoſe of the Derby, Erewaſh, Grantham, Leiceſter, Milton-Mowbray, Nottingham, Nutbrook, and Trent canals and navigations, drew up a ſet of general regulations for the boats uſed on all theſe navigations, and ſuperintended the gauging of the firſt ſet of boats, and the eſtabliſhment of gauging-maſters, at the ſouth end of the Erewaſh canal, and other places, for gauging the boats, affixing proper numbers and graduated plates on each, for aſcertaining thereby the exact loading carried by each boat, every time which it paſſed a weighing-houſe; and in order to aboliſh a practice which had previouſly prevailed, of giving large and unequal weights to the purchaſers of coals, at the different wharfs belonging to the coal-maſters, on the Cromford, Erewaſh, Nottingham, and Nutbrook canals. The coal-maſters of that diſtrict, with ſome very few exceptions, came to the reſolution of all ſelling their coals by the gauging-maſter's accounts, and by which alſo the canal-companies agreed to take their tonnage: and thus one uniform weight is eſtabliſhed in the trade on theſe ſeveral canals. The full particulars of the dimenſions and condition of the ſeveral boats uſing theſe navigations, ſhewing the loading which they have on board at every inch of their draught of water, is printed from time to time, in an uniform manner, ſo as to bind up in octavo volumes for the uſe of the ſeveral gauging-maſters, boat-owners, colliers and traders, &c. Of theſe we have ſeen four volumes, printed by Tupman & Co. of Nottingham, containing the particulars of 430 wide and 60 narrow boats. Mr. Walker was, in January 1805, preſented with a large and ſuperb ſilver cup, at the joint expence of the above canal companies, for his important ſervices in contriving and bringing theſe regulations to perfection. We have been the more particular in mentioning theſe regulations, in order to call the attention of the owners and traders on other canals to the adoption of ſimilar plans, by which trade in general would be much facilitated, and the fair trader protected from the deceptive arts of thoſe who are ſtriving to obtain buſineſs, by pretending to give large and unuſual weights of their commodities to purchaſers, inſtead of lowering the prices, which they would do if their pretenſions to cheapneſs were well founded.

GAVI, in *Geography,* a town of Genoa, once ſo ſtrong as to command the paſs of the Bochetta, but now diſmantled; 20 miles N. of Genoa. N. lat. 44° 43′. E. long. 8° 48.

GAVIA,

GAVIA, a town of Spain, in the province of Grenada; four miles S.S.W. of Grenada.

GAVIA, in *Ornithology*. See LARUS and STERNA.

GAVIAON, the name by which the Portugueſe called the *caracara*, a ſpecies of Braſilian hawk, of the bigneſs of our kite.

GAVILAN, in *Natural Hiſtory*, a name given by the Spaniards to a ſpecies of hawk, common in the Philippine iſlands; it is ſomewhat larger than our ſparrow-hawk, and is of a yelloviſh colour on the back and wing, and whitiſh under the belly: it is the moſt common of all the birds of prey in that part of the world, and is very voracious and miſchievous.

GAVINO, in *Geography*, a town of Portugal, in Alentejo; 20 miles N.W. of O-Crato.

GAVINO, *St.* a town of the iſland of Sardinia; 24 miles S.E. of Oriſtagni.

GAVIOTA, in *Ornithology*, the name given by the Portugueſe to a water-fowl of the gull kind, common in Braſil, and called by the natives *guacu guacu*. See LARUS *Hibernus*.

GAUL, or GALLIA, in *Ancient Geography*, a country of Europe, bounded on the north and weſt by the ſea, on the eaſt by the Rhine and Alps, and on the ſouth by the Mediterranean and the Pyrenées, and extending from 42° 30′ to 52° N. lat., and from 4° 40′ to 8° 20′ E. long. The greateſt breadth was 600 Engliſh miles, but much diminiſhed towards each extremity; and its length was from 480 to 620 miles. It was therefore much more extenſive than modern France, before the late revolution; for to the dominions of that powerful monarchy, with its more recent acquiſitions of Alſace and Lorraine, we muſt add the duchy of Savoy, the cantons of Switzerland, the four electorates of the Rhine, and the territories of Liege, Luxemburg, Hainault, Flanders, and Brabant. This extenſive region was called by the Greeks "Galatia," and "Celto-galatia," to diſtinguiſh it from Galatia, a province of Aſia; and by the Romans "Gallia Ulterior, or Tranſalpina," *i. e.* Gaul beyond the Alps, in order to diſtinguiſh it from "Gallia Citerior, or Ciſalpina," which lay on the ſame ſide of the Alps with Rome, and properly formed a part of Italy.

Ciſalpine Gaul, which comprehended Piedmont and Lombardy, was denominated "Togata," from the Roman gown or dreſs, which was uſed by the inhabitants; but this country was called "Italia Subalpina," or Italy at the foot of the Alps, by Plutarch and Pliny, and ſimply Italy by Polybius. The appellation of Gallia Ciſalpina, however, was antiquated in the reign of Auguſtus, when he divided Italy into eleven regions; and accordingly this name frequently occurs in authors who flouriſhed before, and ſcarcely ever in thoſe who wrote after, the reign of Auguſtus. As to the boundaries of this country, it extended from the Alps and the river Varus, parting it from Tranſalpine Gaul, to the river Aeſis, according to Livy, or by Pliny's account, to the city of Ancona, in the ancient Picenum. On the north, Ciſalpine Gaul was divided from Rhætia by the Alps, called "Alpes Rhæticæ," and from Illyricum by the river Formio; but on this ſide, the borders of Italy were, in Pliny's time, extended to the river Arſia in Iſtria. On the ſouth it reached to the Liguſtic ſea, and the Apennines parting it from Etruria; ſo that, under the common name of Ciſalpine Gaul, were comprehended the countries lying at the foot of the Alps, called by Pliny and Strabo the Subalpine countries, Gallia Ciſpadana, and Gallia Tranſpadana. "Gallia Ciſpadana" lay next to Liguria, extending from Trebia to the city of Ancona, bounded on the north by the Po and part of the Adriatic, and on the ſouth by the Apennines parting it from Etruria. It was called "Gallia" from its inhabitants, and "Ciſpadana," becauſe it lay on the ſide of the Padus or Po, next to Rome. It was poſſeſſed by the Boii, the Lingones, and the Senones. "Gallia Tranſpadana" extended from the countries of the Lepontii, Libicii, and Cunini, which were referred by Strabo and Pliny to the claſs of Subalpine nations, to the Adriatic ſea, and the river Formio, now Il Riſano, parting it from Iſtria, being bounded on the ſouth by the Po, and on the north by the Alpes Rhæticæ and Carnicæ; the former ſeparating it from Rhætia, now the Trentin, and the latter from the country of the Carni, now Carniola. This part of Ciſalpine Gaul was inhabited by the Orobii, the Inſubres, the Lævi, the Cenomani, the Euganei, and the Veneti, and contained many conſiderable cities. See ITALY.

Tranſalpine Gaul was called "Comata" from the long hair worn by its inhabitants; and the ſouth part of it, poſſeſſed by the Romans and called by them "Provincia, or Romana Provincia," whence is derived the appellation of Provence, was afterwards denominated "Narbonenſis" and "Braccata," from the bracca or breeches uſed by the inhabitants. Gaul was chiefly peopled, at different periods, by colonies from Italy, to which it was contiguous; and about 120 years before the Chriſtian era, when the Romans meditated the conqueſt of this extenſive region, it was portioned out among three great nations. The *Celtæ*, called by Cæſar Galli or Gauls, occupied more than one half, *viz.* from the Seine and the Marne to the Garonne, and from the upper part of the Rhine to the Mediterranean. This province was anciently called "Celtica." The *Belgæ* inhabited the territory on the lower part of the Rhine. The *Aquitani* were cantoned between the Garonne, the Pyrenées, and the bay of Biſcay. When Cæſar reduced Gaul into the form of a Roman province, he divided the whole country into three parts, and named them according to three principal nations, which he found inhabiting them reſpectively, *viz.* Belgia, Aquitania, and Gallia Propria. By a new diviſion, B. C. 27, Auguſtus extended the northern boundary of Aquitania to the Loire. The country between the Loire and the Seine was denominated "Gallia Celtica," and afterwards "Lugdunenſis," from a colony ſettled at Lugdunum, or Lyons. Part of Celtica, contiguous to the Rhine, and occupied by the Sequani and Helvetii, was added to Belgica, the adjacent province. Gallia Narbonenſis firſt ſubmitted to the Roman arms. A ſmall canton, called "Viennenſis," in the Alps, maintained its liberty until ſome time after the reduction of Gaul. The remainder of Narbonenſis was divided into "Prima" and "Secunda." When the Romans gained poſſeſſion of thoſe parts of the Belgic territory, which had been ſeized by the Germans not long before the age of Cæſar, they divided the country along the Rhine, from Baſil to Leyden, into "Germania Superior and Inferior." Hence, under the Antonines, Gaul is found partitioned into ſix provinces, *viz.* Narbonenſis, Aquitania, Celtica or Lugdunenſis, Belgica, Germania Superior and Germania Inferior. Under the empire of Probus, about the year 278, Gaul was divided into ſeven provinces, *viz.* the ſix former, and the Viennenſis, which had formed a part of Narbonenſis. About the year 392, Diocleſian, having divided the empire between the two Auguſti and the two Cæſars, ſeparated the Helvetii and Sequani from Belgica, and formed a new province under the appellation of "Maxima Sequanorum." Belgica was divided into "Prima and Secunda," which was alſo the caſe with reſpect to Lugdunenſis. The four provinces of the Alps, *viz.* Alpes Penninæ, Graiæ, Maritimæ, and Cottiani, were

were reduced into two, *viz.* Alpes Maritimæ and Graiæ, and placed in the department of the Gauls. The city of Bourges was withdrawn from Aquitania, and that of Langres from Belgica, and were re-united to Lugdunenſis Prima. Accordingly Gaul, under this emperor, was divided into twelve provinces, *viz.* Narbonenſis, Viennenſis, Aquitania, Lugdunenſis Prima and Secunda, Belgica Prima and Secunda, Germania Prima and Secunda, Maxima Sequanorum, Alpes Maritimæ, and Graiæ. Under the empire of Valentinian, Gaul was again divided, by the diſmemberment of Aquitania, of which were compoſed Aquitania Prima and Secunda, and Novempopulana. The other provinces remained the ſame as they were under Dioclefian. The new provinces were Aquitania Prima and Secunda, and Novempopulana. Bourges was withdrawn from Lugdunenſis Prima, and made the metropolis of Aquitania Prima. Under the empire of Gratian the two Lugdunenſes were ſeparated into four, and Narbonenſis into two; and the number of provinces was 17, *viz.* Narbonenſis Prima and Secunda, Viennenſis, Alpes Maritimæ, Alpes Graiæ et Penninæ, Aquitania Prima and Secunda, Novempopulana, Lugdunenſis Prima, Secunda, Tertia, and Quarta, Belgica Prima and Secunda, Germania Prima and Secunda, and Maxima Sequanorum.

Such was the ſtate of Gaul, when Honorius A.D. 419, permitted the Goths to take poſſeſſion of Aquitania Secunda, a maritime province, between the rivers Garonne and Loire, the limits of which were gradually extended by the gift of ſome neighbouring territories. About the ſame period the Burgundi, a fierce and warlike tribe of Vandals, eſtabliſhed themſelves in Upper Germany, and afterwards occupied two provinces, which ſtill retain the name of that colony. The rapacity, or ambition, of the Franks was ſtimulated by the ſucceſs of thoſe invaders. Colonies multiplied along the banks of the Meuſe, the Scheld, and the Rhine, and ſoon filled the whole extent of Lower Germany.

Gaul, according to Ptolemy, was divided into four provinces, *viz.* Aquitania, Lugdunenſis, Belgica, and Narbonenſis.

Gallia Narbonenſis, comprehending Dauphiné, Provence, and Languedoc, with a part of Savoy, was at firſt divided into Prima and Secunda, and afterwards into three provinces, *viz.* Narbonenſis Propria, Viennenſis, and Narbonenſis Secunda; to which were added, Alpes Maritimæ, and Alpes Graiæ. Narbonenſis Propria, ſince called Languedoc, was chiefly inhabited by two conſiderable tribes, *viz.* the "Volcæ Arecomici," cantoned in the vicinity of the Rhone, and "Volcæ Tectoſagæ," in the weſtern parts of the province.

The *Viennenſis*, which was a province extending from Maſſilia, or Marſeilles, along the left bank of the Rhone to the lake of Geneva, was inhabited by ſeveral ſmall tribes, among which were the Allobroges, who occupied the northern diſtrict of Dauphiné, with a ſmall part of Savoy; on the S. bounded by the Iſere, on the W. by the Rhone, and on the N. by an imaginary line drawn from Lyons to Geneva: —the Vocontii, a powerful tribe who inhabited the modern dioceſes of Vaiſon and Die, together with ſome neighbouring diſtricts:—the Segalauni, poſſeſſing an inconſiderable territory near the Rhone, below the influx of the Iſere, ſince called the duchy of Valentinois:—the Tricaſtini, whoſe capital, Senomagus, now St. Paul des Trois Chateaux, lay on the left hand of the Rhone, 15 miles northward of Orange: —and the Cavares, who peopled the ſouth part of Comtat Venaiſſin, together with the principality of Orange in Provence.

Narbonenſis Secunda was occupied by the territories of the Salues, or Saluvii and Salices, a tribe of the Ligures, which reached from the ſprings of the Durance to the gulf of Lyons, and from the ſettlements of the Cavares to the Alps.

Alpes Maritimæ conſiſted of a mountainous territory on the eaſtern border of Provence, terminating at the mouth of the Varus, or Var, a ſmall river conſidered as the boundary of Gaul and Italy.

Gallia Lugdunenſis, ſo called from Lugdunum its capital, and ſometimes Celtica, from Celtæ, the general appellation of its inhabitants, extended from the Rhone weſtward to the ocean; on the S. bounded by Aquitania, and on the N. by Belgica. It was divided into Prima, Secunda, Tertia and Quarta.

Lugdunenſis Prima comprehended almoſt the whole of the modern provinces of Lyonnois, Nivernois, and Bourgogne; and was peopled by the Seguſiani, planted between the Rhone and the Loire:—the Ædui, one of the moſt powerful and opulent nations in Gaul, and ſtyled the friends of the Romans, who occupied the ſouthern parts of Bourgogne and Nivernois, *viz.* the dioceſes of Autun, Challon, Maçon, and Nevers;—and the Lingones, a conſiderable tribe, denominated by Pliny Roman allies, who eſtabliſhed themſelves on the right of the Saone, near the ſource of the Marne, in the dioceſe of Langres, formerly including that of Dijon.

Lugdunenſis Secunda was nearly of the ſame extent with Normandy, and was peopled by the Veliocaſſes, on the right hand of the Seine, in the dioceſe of Rouen:—the Caleti, on the S. coaſt called Littus Saxonicum, N. of the mouth of the Seine, in the diſtrict of Caux:—the Lexovii on the ſea-coaſt, on the left of the Seine, between the Carnutes and Viducaſſes:—the Aulerci Eburovices, above the Lexovii, on the left hand of the Seine:—the Saii, to the weſtward of the Aulerci, near the S. border of Normandy, in the dioceſs of Seez:—the Viducaſſes, a colony of the Ædui, below the Saii, on the Orne, in the dioceſe of Baieux:—the Bajocaſſes, on the ſea-coaſt, in a diſtrict watered by the Aure:—the Unelli, or Venelli, planted along the weſt coaſt of Normandy:—and the Abrincatui, who poſſeſſed a ſmall diſtrict, now called Avranchin, near the ſouth-weſt extremity of Normandy.

Lugdunenſis Tertia comprehended the provinces ſince called Bretagne, Maine, and Anjou, with a part of Touraine; inhabited by different tribes, of which the moſt conſiderable were the Turones, whoſe capital is now Tours on the Liger, or Loire, or was near that city:—the Andes, or Andecavi, in Anjou:—the Aulerci Cenomani, in the dioceſe of Mans:—the Diablintes or Diaulitæ, in Maine:—the Arvii, in the S.W. diſtrict of Maine, on the border of a river which falls into the Sarte:—the Redones in the dioceſes of Rennes, St. Malo, and Dol in Bretagne:—the Namnetes, in the dioceſe of Nantes, between the Andecavi and the ſea-coaſt, on the north ſide of the Loire:—the Veneti, in a territory called by Cæſar Venetia, now Vannes, ſeparated from the Namnetes by the river Herius, or Vilaine:—the Curioſolites, or Cariofuelites, on the E. bounded by the Redones, S. by the Veneti, W. by the Oſiſmii, N. by the ſea, in the dioceſes of St. Brieuc and St. Malo:—the Oſiſmii, on the N.W. coaſt of Bretagne, in the dioceſes of Quimper and Leon:—and the Coriſopiti, of whom no mention occurs before the 5th century, in the S.W. corner of Bretagne.

Lugdunenſis Quarta, or Senonia, included part of Orleanois, of Iſle de France, and of Champagne. It was peopled by the following tribes, *viz.* the Senones, a brave nation in an extenſive territory, on the left hand of the river Sequana or Seine, in the dioceſes of Sens and Auxerre:— the Carnutes, an ancient and powerful tribe, in Orleanois, between the Seine and the Loire:—the Pariſii, N. of the Carnutes

nutes and Senones, in the middle of Iſle de France :—the Aureliani, S. of the Carnutes and W. of the Senones, in a diſtrict of Orleanois, traverſed by the Loire :—the Meldi, in the dioceſe of Meaux :—and the Tricaſſes, Tricaſſini, or Treci, in South Champagne.

Aquitania Prima comprehended ſeveral inland modern provinces, *viz.* Berri, Marche, Auvergne, Limoſin, Quercy, Rouergue, and a portion of Languedoc ; and was inhabited by the Bituriges, in Berri, to the weſtward of the Loire : —the Arverni, a powerful tribe in Auvergne, extending in the time of Strabo from Marſeilles to the Pyrenees, and from the ocean to the Rhine ; but their territory is now repreſented by the dioceſes of Clermont and St. Flour :—the Lemovici, in Limoſin :—the Cadurci, in Quercy, on the river Oltis or Olt, called in the middle age Cadurcinum :—the Ruteni, in Rouergue :—and the Gabali and Vellavi, or Velauni, S. of the Arverni, in the weſtern part of Languedoc.

Aquitania Secunda extended ſouthward along the coaſt from the Loire to the Garonne ; and was peopled by the Bituriges Vibiſci, near the mouth of the Garonne in Bourdelois :—the Meduli, in Medoc, a ſmall diſtrict between the lower part of the Garonne and the ocean :—the Petrocorii, in Perigord, to the right of the lower part of the Garonne :—the Nitiobriges, or Nithobroges, in a territory watered by the Olt or Lot, and more extenſive than the dioceſe of Agen, in Guienne :—the Santones, N. of the Garonne, along the ſea-coaſt in the dioceſes of Saintes and Angouleme, and territory of Aunis :—the Pictavi, or Pictones, planted between the Santones, and the river Loire, in Poitou :—and the Ageſinates, an inconſiderable tribe, whoſe name may be recognized in Aiſenai, an archdeaconry in the dioceſe of Lucon. See AQUITANIA.

Novempopulana, the ſouth-weſt corner of France, between the river Garonne and the Pyrenean mountains, was inhabited by the Eluſates, who occupied the N.W. diſtrict of Armagnac :—the Auſci, in Armagnac Cliberris, now Auch, on the river Ger, which runs northward, and falls into the Garonne above Agen :—the Sotiates, in Sos, a diſtrict of Condomois :—the Lactorates, N. of the Auſci, on the left hand of the Garonne :—the Vaſates, in the dioceſe of Bazas : —the Boii, in the vicinity of the river Sigmanus, now Archachon, a ſmall baſon on the ſea-coaſt, into which the Loire falls, about 30 miles S.W. of Bourdeaux :—the Tarbelli, along the ſea-coaſt between the ſettlements of the Boii and Pyrenean mountains :—the Bigerrones, in the dioceſe of Bigorre, at the foot of the Pyrenees :—the Convenæ, in the dioceſe of Cominge :—and the Conſoranni, in the dioceſe of Conſerans, on the border of Languedoc.

Gallia Belgica, or Belgic Gaul, was bounded, according to the diviſion of Cæſar, on the W. by the Seine, on the E. by the Rhine, on the N. by the ocean, and to the S. undefined. Auguſtus added to this province the Sequani and Helvetii, who had formed a part of Gallia Celtica. Belgia Propria, diſtinguiſhed from Belgica, as a part from the whole, included the ſettlements of the Bellovaci, Atrebates, and Ambiani, and reached to the ſea-coaſt. Gallia Belgica was divided into Prima and Secunda, Germania Prima and Secunda, and Maxima Sequanorum.

Belgica Prima comprehended the greater part of Loraine and Treves, beſides ſome adjacent diſtricts ; and was inhabited by the Treveri, in the electorate of Treves :—the Mediomatrices, who anciently occupied a very extenſive territory, but after the conqueſt of Gaul by Cæſar, they cannot be traced beyond their ſettlements in Belgica Prima. In the middle age Pagus Metenſis was of the ſame extent with the dioceſe of Metz :—the Leuci, in Loraine, S. of the Mediomatrices, on the Moſelle, towards Mons Vogeſus, now Mont de Vauge :—and the Verodunenſes, in Loraine, N. of the Leuci, on the river Moſa, or Meuſe.

Belgica Secunda was ſituated between the river Meuſe and the Britiſh channel ; and was occupied by the Remi, in the dioceſe of Laon, or N. part of Champagne :—the Catalauni, in the middle of Champagne :—the Sueſſiones, in the N. diſtrict of Iſle de France :—the Veromandui, N. of the Sueſſiones, in the N.E. part of Picardy :—the Bellovaci, a numerous and powerful tribe, whoſe territories extended beyond the dioceſe of Beauvais :—the Silvanectes, on the left bank of the Oiſe, oppoſite to the Bellovaci :—the Ambiani, planted near the bank of the Samara, or Some, who held a diſtinguiſhed rank among the Belgic tribes :—the Atrebates, N. of the Ambiani, in Artois :—the Morini, in a maritime territory, which comprehends the dioceſes of Boulogne and St. Omer :—and the Nervii, a brave and powerful tribe, in the ancient dioceſe of Tournay, which included thoſe of Gand (Ghent) and Bruges, and reached to the ſea-coaſt.

Maxima Sequanorum included Franche Comté and a great part of Switzerland. It was occupied by the Sequani, the Helvetii, and the Rauraci ; which ſee reſpectively.

Germania Prima, or *Superior*, was a tract on the left bank of the Rhine, ſince called Alſace ; and was inhabited by the Triboci, who occupied the dioceſe of Straſburg :—the Nemetes, ſituated between the Vangiones and Triboci, in the biſhopric of Spire, in Lower Alſace :—the Vangiones and Carcates, N. of the Nemetes, in the palatinate of the Rhine.

Germania Secunda, or *Inferior*, on the left bank of the Rhine, comprehended the duchy of Juliers, Luxembourg, Limbourg, Liege, and Brabant ; and was occupied by the Ubii, in the electorate of Cologne :—the Gugerni, a remnant of the Sicambri eſtabliſhed by Auguſtus on this ſide of the Rhine, in a territory formerly occupied by the Menapii, between the Ubii and Batavi, in the ſmall diſtricts of Gueldres and Cleves :—the Eburones, in Liege and Limbourg, on both ſides of the Meuſe, who, after being exterminated, were ſucceeded by the Tungri :—the Sunici, Condruſi, Segni, and Paemani, in conſiderable tribes, which were cantoned along the ſkirts of Arduenna :—the Menapii, who occupied a territory ſometimes called Pagus Monapiſcus in Brabant, N. of the Toxandri, who were planted in the S. part of Brabant between the Scheldt and the Meuſe :—and the Batavi, a branch of the Catti, who, being expelled their country, ſettled on the extremity of the coaſt of Gaul, and in an iſland formed by two branches of the Rhine and the ſea. See BATAVI.

It is extremely difficult to diſtinguiſh the various tribes with which Gaul was peopled in the time of Cæſar, of Tacitus, or of Ptolemy. Modern nations are fixed and permanent ſocieties ; but the tribes of Germany and Gaul were fluctuating aſſociations of ſoldiers and ſavages : ſo that the ſame territory often changed its inhabitants in the tide of conqueſt and emigration. The ſame communities, uniting in a plan of defence or invaſion, beſtowed a new title on their new confederacy. The diſſolution of an ancient confederacy reſtored to the independent tribes their peculiar but long-forgotten appellations. A victorious ſtate often communicated its own name to a vanquiſhed people. Sometimes crowds of volunteers flocked from all parts to the ſtandard of a favourite leader : his camp became their country, and ſome circumſtances of the enterpriſe ſoon gave a common denomination to the mixed multitude. The diſtinctions of the ferocious invaders were perpetually varied by themſelves, and confounded by the aſtoniſhed ſubjects of the Roman empire. Gibbon's Hiſt. Rom. Emp. v. 1.

The following *Table*, extracted from Playfair's Geography, exhibits

exhibits a comparative view of the ancient and modern political diviſion of Gaul.

Roman Provinces under Auguſtus.	Provinces under the French Monarchy.
1. Narbonenſis, I^ma . .	Languedoc, Conſerans, Comté de Foix, Rouſſillon.
2. Narbonenſis, II^aa. . .	Part of Lower Provence,
3. Alpes Maritimæ . . .	——— Upper Dauphiné, ——— Eaſtern Provence, Nice, Monaco.
4. Lugdunenſis, I^ma. . .	Lyonois, Nivernois, Burgogne, Beaujolais, Forez, Part of Champagne.
5. Lugdunenſis, II^da. . .	Normandie, Vexin Français.
6. Lugdunenſis, III^a. .	Bretagne, Maine, Anjou, Touraine.
7. Lugdunenſis, IV^a. .	Mantois, Chartrain, Iſle de France, Brie, Part of Champagne, ——— Bourgogne, ——— Nivernois, ——— Orleanois.
8. Aquitania, I^ma. . . .	Berri, Marche, Limouſin, Part of Poitou, Bourbonnais, Auvergne, Velay, Gevaudan, Rouergue, Alby in Languedoc, Quercy.
9. Aquitania, II^a. . . .	Part of Poitou, Angoumois, Saintonge, Perigord, Bordelais, Agenois,
10. Novempopulana . .	Landes, Bazadois, Condomois, Comminge, Bigorre, Bearn, Navarre, Gaſcogne.
11. Gallia Belgica, I^ma.	Territory of Treves, ——— Luxembourg, Duchy of Gueldre, Meſſin, Toulounais, Lorraine, Barrois.
12. Belgica, II^a.	Laonois, Beauvoiſis, Noyonnais, Picardie, Artois, Flandre.
13. Maxima Sequanorum	Part of Bourgogne, ——— Franche Comté, ——— Switzerland.
14. Germania, I ^ma. . .	Electorate of Mentz, ——— Treves, ——— Palatinate, Worms, Spire, Alſace, Some diſtricts in Swabia and in Switzerland.
15. Germania, II^a. . . .	United Provinces, Part of Weſtphalia, &c.
16. Gallia Viennenſis . .	Savoy, Vivarais, Dauphiné, Comtat-Venaiſſin, Part of Provence.

Playfair's Geog. vol. i. Anc. Un. Hiſt. vols. ix. xvi.

For a further account of Gaul, ſee FRANKS and FRANCE. For its principal mountains, ſee ALPS; and an account of its rivers will be found under their ſeveral appellations, *Garamna*, *Sequana*, &c. or their Engliſh names, *Garonne*, *Seine*, &c. For an account of the original inhabitants of Gaul, their government, language, religion, &c. we refer to the articles CELTS and DRUIDS. After the conqueſt of Gaul by the Romans, its hiſtory will be blended with that of *Rome*, which ſee. See alſo the biographical articles AUGUSTUS and CÆSAR.

GAULAN, GAULON, or *Golan*, a town of Paleſtine, on the other ſide of Jordan, the capital of Gaulonitis, which was a diſtrict belonging to the half-tribe of Manaſſeh (Deut. iv. 43.), and extending from Peræa quite to Lebanon. This city was given to the Levitical tribe, of the family of Gerſhon, and became a city of refuge. (Joſh. xxi. 27.) It was the birth-place of Judas Gaulonites, chief of the Herodian ſect.

GAULEN, in *Geography*, a river which riſes in the north part of Norway, and, after a courſe of about twenty leagues weſtward, runs into the ſea about a league W. from Drontheim. In the year 1344 this river ſeemed to be drained; but by ſome means it paſſed under ground, from whence it emerged, and deſtroyed ſeveral churches, 48 farm-houſes, and 250 perſons.

GAULLY, a river of America, in Virginia, which riſes in a ſource that is unknown, and runs into the Kanhawa above the falls on the eaſtern ſide. N. lat. 37° 57'. W. long. 80° 58'.

GAULONITÆ, among the *Jews*, the name of a faction rather than a religious ſect, the ſame with the *Galilæans*. This political faction was raiſed up and headed by Judas Gaulonites, or Judas of Galilee, who is mentioned Acts, v. 37. Joſephus has called him in one place (Antiq. l. 18. § 1. p. 869. ed Haverc.) Judas Gaulanites, and in another place (Id. l. 20. c. 1. § 2. p. 965.) Judas of Galilee. Judas the Gaulonite and Judas of Galilee were, therefore, the ſame perſon;

called by one or other of theſe names, becauſe Gaulona or Gaulonitis, his native country, which lay beyond Jordan, was otherwiſe called Galilee, or Galilee of the Gentiles, to diſtinguiſh it from the other Galilee on this ſide of Jordan. (See GALILEE.) This Judas had raiſed and headed an inſurrection againſt the Roman government, on occaſion of the tax which Auguſtus levied on Judæa, when he reduced it into the form of a Roman province. Judas became popular by either firſt broaching or reviving the principle, that the Jews ought to obey none but God; and we learn from Joſephus (De Bell. l. ii. c. 8. § 1.) that Judas roufed their rebellious ſpirit, by charging them with meanneſs, if they could endure to pay tribute to the Romans, and acknowledge mortal men for their lords, after God had been their king. But notwithſtanding the pretenſions of Judas, the Jews had before this time been ſubject to mortal lords; for they had been tributary to the Romans in the reign of Herod; and even before Herod's reign, they had paid tribute to the Romans: for Joſephus ſays (Ant. l. xiv. c. 11. § 2.) that "Caſſius impoſed a heavy tribute upon the people (in Syria); and in particular bore very hard upon Judæa, exacting of them 700 talents of ſilver." The Gaulonite faction was ſoon ſuppreſſed; and we read no more of it in the New Teſtament, unleſs, as ſome have conjectured, thoſe perſons belonged to it, who were otherwiſe called Galileans, and whom Pilate ſlew as they were performing the ſacred rites at the altar, thus mingling their blood with their ſacrifices. Luke, xiii. 1.

GAULONITIS. See GAULAN.

GAULTHERIA, in *Botany*, named by Kalm in honour of a French phyſician ſettled in Canada, whoſe name was really *Gautier*, and who wrote an account of the ſugar obtained from the maple, *Acer ſaccharinum*, publiſhed in the Mem. etrangers de l'Acad. des Sciences de Paris, v. 2. 378, according to Dryander's Bibl. Banks, v. 3. 565.—Linn. Gen. 220. Schreb. 295. Willd. Sp. Pl. v. 2. 616. Ait. Hort. Kew. v. 2. 71. Mart. Mill. Dict. v. 2. Juſſ. 161. Lamarck Illuſtr. t. 367. Gærtn. t. 63.—Claſs and order, *Decandria Monogynia*. Nat. Ord. *Bicornes*, Linn. *Ericæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, permanent, of one leaf, five-cleft, bell-ſhaped; its ſegments half-ovate. *Cor.* of one petal, ovate, ſlightly five-cleft; limb ſmall, revolute. Nectary of 10 awl-ſhaped, erect, very ſhort bodies, ſurrounding the germen between the ſtamens. *Stam.* Filaments 10, awl-ſhaped, incurved, ſhorter than the corolla, inſerted into the receptacle; anthers with two cloven horns. *Piſt.* Germen ſuperior, roundiſh, depreſſed; ſtyle cylindrical, the length of the corolla; ſtigma obtuſe. *Peric.* Capſule roundiſh, obtuſely pentagonal, depreſſed, of five cells and five valves, opening at the top in five places, clothed all round with the perianth, become a roundiſh, coloured berry, open at the ſummit. *Seeds* numerous, nearly ovate, angular, bony.

Eſſ. Ch. Calyx inferior, five-cleft, permanent. Corolla ovate. Nectary of ten awl-ſhaped points. Capſule of five cells, clothed with the pulpy calyx.

1. G. *procumbens*. Linn. Sp. Pl. 565. Andr. Repoſ. t. 116.—Leaves obovate, pointed, ſlightly ſerrated, ſmooth, crowded about the tops of the branches. Stems aſcending, wavy, naked.—Found by Kalm in barren ſandy ground in Canada. It is eaſily cultivated with us in a light ſandy loam, with a mixture of peat earth, and is very hardy, bearing flowers and fruit moſt part of the year. The *roots* are moderately creeping. *Stems* procumbent in their lower part, then aſcending, ſubdivided, wavy, ſomewhat angular, ſmooth, woody, naked except about the top, where they bear a few ſcattered, evergreen, broadiſh obovate *leaves*, paler beneath, on ſhort thick ſtalks. *Flowers* axillary, ſolitary, ſtalked, drooping, white, with a reddiſh calyx, which becomes a ſcarlet ſpongy berry. Every part of the plant has more or leſs of an aromatic flavour, like ſyrup of capillaire, with ſome aſtringency. A few of the leaves are ſaid to communicate an agreeable perfume to tea. The two ſcales at the baſe of each flower are rather bracteas than an outer calyx, as appears by the analogy of other plants in this order, and their appearance after flowering.

2. G. *antipoda*. Forſt. Prod. 34.—"Leaves ſcattered, roundiſh, with tooth-like ſerratures. Stem ſhrubby, diffuſe."—Native of New Zealand. *Forſter*.

Mr. R. Brown, in his valuable *Prodromus*, v. 1. 559, has propoſed to augment this genus with the *Andromeda rupeſtris* of Forſter, and ſeveral American plants, hitherto referred to *Andromeda*. We have not had ſufficient opportunity to examine into the propriety of this meaſure. Another indubitable ſpecies, however, is

3. G. *erecta*. Venten. Jard. de Cels, t. 5.—Leaves ovate, pointed, finely ſerrated, ſcattered. Stem erect. Flowers in long hairy cluſters.—Native of Peru. *Ventenat*. It conſtitutes the underwood of the pine foreſts on the weſt coaſt of North America. *Mr. A. Menzies*. *Stem* ſhrubby, branched, leafy, erect, 18 inches to three feet high; the branches hiſpid. *Leaves* an inch and half or two inches long, broad-ovate, with minute ſharp ſerratures; dark-green and ſhining above; paler and roughiſh beneath. *Cluſters* three inches long, hairy, viſcid, with broad, concave bracteas. *Flowers* bright red, drooping. *Berry* red.—Ventenat ſays the late Mr. Cels received this ſhrub in 1792, and kept it in his greenhouſe. From Mr. Menzies' information, it may be preſumed capable of bearing our climate, and of growing under the ſhade of evergreens; a very deſirable property. We have not ſeen it alive in England.

GUALTIER, ST., in *Geography*, a town of France, in the department of the Indre; and chief place of a canton in the diſtrict of Le Blanc; 15 miles S.W. of Chateauroux. The place contains 962, and the canton 5,417 inhabitants, on a territory of 327½ kiliometres, in 10 communes.

GAULUS, in *Antiquity*, a ſhip of a roundiſh form, moſtly uſed by the people of Phœnicia.

GAULUS alſo ſignified a kind of cup.

GAUN, a term provincially applied to the gallon meaſure, and ſometimes to a ſmall tub.

GAUNA, in *Ancient Geography*, a town of Aſia, in Media. Ptol.

GAUNERSDORFF, in *Geography*, a town of Auſtria, 16 miles N.N.E. of Vienna.

GAUNLASSE, a river of England, in the county of Durham, which runs into the Wear at Biſhop's Auckland.

GAVNOE, in ſmall iſland of Denmark, near the S.W. of Zealand. N. lat. 55° 12'. E. long. 11° 53'.

GAUNT-BELLIED, in *Rural Economy*, a term applied to ſuch animals as are drawn up ſmall or thin in their bellies: when horſes have this appearance, they are ſuppoſed to be waſhy, tender, and unhealthy, conſequently of but little value for hard labour, or any other purpoſe. In the removal of this ſtate there is ſeldom much to be accompliſhed, but ſuch animals ſhould be fed as little as poſſible with any ſort of dry fodder. Graſs and other kinds of moiſt food are conſtantly the moſt proper.

GAUNTLET. See GANTLET.

GAVOTTA, or GAVOTTE, derived from the *Gavots*, a people inhabiting a mountainous diſtrict in France, called Gap, in *Italian Muſic*, is a kind of dance, the air of which has two ſtrains, briſk and lively, and in common time: each of its ſtrains are played twice over; the firſt has uſually four or

eight bars, and the ſecond contains eight, twelve, or more, The time begins with a minim, or two crotchets, or notes of equal value, and the hand riſing; and ends with the fall of the hand upon the dominant, or mediant of the mode, never upon the final, unleſs it be a rondeau. And the laſt begins with the riſe of the hand, and ends with the fall upon the final of the mode.

The Gavots of Corelli, Albinoni, Vivaldi and others of the Italians, correſpond with theſe rules as far as they relate to the meaſure, the number of bars in each ſtrain, and the cadences; but in reſpect to the initial notes of the air they deviate from it; for they ſometimes begin with a whole bar, and ſometimes with an odd quaver. Cotgrave, in his Dictionary, defines Gavote a kind of Brawle, danced commonly by one alone.

GAVOTTA, *Tempo di*, is when only the time or movement of a gavotte is imitated, without any regard had to the meaſure or number of bars, or ſtrains. We often find parts of ſonatas which have this phraſe to regulate their motions.

GAUPP, JOHN, in *Biography*, an able divine and mathematician, was born at Lindau, in Swabia, in the year 1667. Here he received the early parts of his education, from whence, at the age of 15, he was ſent to Ulm. From Ulm he went to the univerſity of Jena, where he took the degree of M.A. and became a conſiderable proficient in mathematics. After this he ſpent ſome time in different German univerſities, improving himſelf in theology and mathematics, and then viſited Amſterdam and London. In 1693 he was admitted to the office of the miniſtry, in which he roſe to the ſtation of principal paſtor of Lindau, about the year 1728. As much of his time as he could ſpare from the duties of the paſtoral office he devoted to mathematical and philoſophical purſuits, and became a lecturer in theſe branches of ſcience. He ſoon attained ſuch a rank among the philoſophers of the age, as to be honoured by the correſpondence of many of the moſt learned mathematicians in foreign countries. He was a practical mechanic, as well as an able illuſtrator of the higher branches of ſcience, and many of the inſtruments which he made uſe of in his obſervatory, and in his experimental reſearches, were conſtructed by himſelf. He had begun the erection of an obſervatory, but death terminated his labours in 1738. He was the author of "Gnomonica Mechanica Univerſalis:" of various calendars, and calculations and deſcriptions of eclipſes: of other philoſophical treatiſes, and of ſermons. His Ephemerides and aſtronomical obſervations were received by the Royal Academies of Sciences at Paris and Berlin, and ſeveral of them were inſerted in the Memoirs of thoſe learned ſocieties. Moreri.

GAUR, or ZOUF, in *Geography*, a city of Aſia, and capital of a ſmall kingdom or ſtate, in the ſouthern part of Greater Bucharia, ſeparated by mountains from Cabul and Candahar. This city was taken by Mamood I., and in 1009 annexed with its territory to Ghizni. It is ſaid to be now ſubject to the kingdom of Candahar: 150 miles S.W. of Balk. N. lat. 34° 40'. E. long. 63° 54'. The mountains of Gaur on the N. and N.W. of Candahar, are probably the Paropamiſus of antiquity; and they have no connection with the chain of Caucaſus, as the ancients ſuppoſed.

GAURA, in *Botany*, from γαῦρος, *pompous* and *elated*; a tall ſhewy plant. Linn. Gen. 187. Schreb. 250. Willd. Sp. Pl. v. 2. 311. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2, 4. Juſſ. 319. Lamarck Illuſtr. t. 281. Gærtn. t. 127.—Claſs and order, *Octandria Monogynia*. Nat. Ord. *Calycanthemæ*, Linn. *Onagræ*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, ſuperior, deciduous; tube cylindrical, long, thickeſt at the baſe, containing four obſolete, oblong, attached glands; limb in four deep, oblong, acute, reflexed ſegments. *Cor.* Petals four, inſerted into the tube of the calyx, oblong, directed towards the upper ſide, equal, with narrow claws. *Stam.* Filaments eight, thread-ſhaped, broadeſt towards the extremity, with an obſolete, conical, nectariferous gland withinſide of the baſe of each; anthers oblong, verſatile. *Piſt.* Germen inferior, oblong, of four cells, with the rudiments of ſeveral ſeeds affixed to the central columnar receptacle; ſtyle thread-ſhaped, as long as the ſtamens; ſtigmas four, round, ovate, ſpreading. *Peric.* Drupa dry, ſquare, tapering at each end, its angles dilated and compreſſed, of four cells, three of which are uſually abortive. *Seed* ſolitary, oblong, angular.

Eſſ. Ch. Calyx four-cleft, tubular. Corolla of four petals, turned upward. Drupa dry, inferior, quadrangular.

1. G. *biennis*. Linn. Sp. Pl. 493. Curt. Mag. t. 389.—Leaves lanceolate. Stem herbaceous. Stamens and ſtyle pendulous.—Native of Virginia and Pennſylvania. A hardy biennial plant in our gardens, flowering from Auguſt to October, and when the autumn is favourable, propagating itſelf copiouſly by ſeed. The *ſtem* riſes to the height of ſix or eight feet, and is leafy, much branched. *Leaves* alternate, ſoft, bluntly toothed. *Flowers* extremely numerous, in denſe corymboſe terminal cluſters, elegantly conſpicuous on account of their red calyx and white petals.

2. G. *fruticoſa*. Jacq. Ic. Rar. v. 3. t. 457.—Leaves linear-lanceolate. Stem ſhrubby. Stamens and ſtyle direct.—Native of South America. Jacquin and Willdenow have well diſtinguiſhed this from the former, on account of its ſhrubby ſtem, ſmooth and narrow leaves; and flowers not a quarter ſo large, whoſe corolla is not ſo much expanded, and whoſe ſtamens and ſtyle are prominent, not pendulous. The colours of the parts agree.

The *Gaura mutabilis* of Willdenow and Cavanilles, figured in Curt. Mag. t. 388. by the name of *Oenothera anomala*, is, at beſt, a very doubtful *Gaura*. According to the account and figure of the ripe fruit in Cavanilles, Ic. v. 3. 30. t. 258, it ſeems indeed to agree; but the ſection of the germen in Curtis is rather that of an *Oenothera*, with which latter its flower perfectly accords. Curtis's hint of its being probably a genus diſtinct from both, is perhaps neareſt the truth.

GAURA, in *Geography*, a town of Peru, in the juriſdiction of Chançay, containing about 200 houſes, and two churches, ſituated in a fertile country, and watered by a river of the ſame name. Its chief commerce is in ſalt and ſalt beef.

GAURA *Mons*, in *Ancient Geography*, a mountain mentioned in the Itinerary of Jeruſalem, between Mons Seleucus, and Lucus, ſituated, as M. D'Anville conjectures, in Dauphiné.

GAURANUM PROMONTORIUM, a promontory of Aſſyria, near the mouth of the Tigris.

GAVRAY, in *Geography*, a town of France, in the department of the Channel, and chief place of a canton in the diſtrict of Coutances; 9 miles S. of Coutances. The place contains 1823, and the canton 14,806 inhabitants, on a territory of 162½ kiliometres, in 15 communes.

GAURBEND. See GHOURBEND.

GAURIANISI, a ſmall iſland in the Grecian Archipelago, W. of Andros. N. lat. 37° 52'. E. long. 24° 50'.

GAURITZ RIVER, a river of Africa, on the ſouth coaſt of the colony of the Cape of Good Hope, which is a collection of water from the Great Karroo plains, the Black mountains, and the chain that runs parallel and neareſt to the ſea-coaſt. The branches to the northward of this chain are periodical, but it flows to the ſouthward, throughout the year, though in the ſummer months with a very weak current. In the rainy ſeaſon it is conſidered as the moſt rapid

and dangerous river in the whole country. Its mouth opens into the ſea, where the coaſt is ſtraight, and it is croſſed by a bar of ſand, which, in ſummer, is generally dry.

GAURES, or rather *Gavres*, or *Gabres*. See GABRES.

GAURUS, in *Ancient Geography*, a mountain of Italy, in Campania.

GAUSAPHNA, a town of Africa Propria, named alſo *Gazauphala*. Ptol.

GAUSWANNY, in *Geography*, a town of Hindooſtan, in the circar of Gohud; 30 miles N.W. of Narna.

GAUT, or GHAUT, ſignifies in India either a paſs through mountains, or a landing place on the bank of a river; but in a more extenſive ſenſe it is applied to the mountains themſelves; and as the Myſore country is a kind of table land, or tract elevated above the reſt of the peninſula, the term is particularly applied to that country.

The *Gauts*, peculiarly ſo called, are ranges of mountains, which run along the eaſt and weſt coaſts of the Deccan; the latter being called by the natives the mountains of Sukhien. Theſe mountains riſe abruptly from the low country, particularly on the weſt ſide, towards the ſea, forming, as it were, a ſtupendous wall of mountains, and ſupporting, like a terrace, a vaſt extent of fertile and populous plains, which are ſo much elevated as to render the air cool and pleaſant. This elevated tract is continued not only through the Mahratta territories, but extends through the peninſula, to the ſouthern extreme of Myſore; and it is named "Balla-Gaut," through its whole extent, denoting literally the "Higher, or Upper Gauts;" or perhaps more correctly the countries lying *above* or *below* the Gauts. In the peninſula it is applied in contradiſtinction to "Payen-Gaut," or the "Lower Gauts;" but in the Deccan it ſeems to be uſed only as a proper name. Oppoſite to Paniany, on the weſtern coaſt, there is a break or interruption of the mountains, about 16 miles in breadth, occupied chiefly by a foreſt. Excluſively of this gap, the mountains of Sukhien extend from cape Comorin to Surat, at unequal diſtances from the coaſt; ſeldom more than 70 miles, and commonly about 40; and within one ſmall ſpace only. This range approaches within ſix miles. The ridge, which we are now deſcribing, does not terminate in a point or promontory, when it approaches the Tapty, or Surat river; but, departing from its meridional courſe, bends eaſtward, in a wavy line, parallel to the river, and is afterwards loſt among the hills, in the neighbourhood of Burhanpour. In its courſe along the Tapty, it forms ſeveral paſſes, or deſcents (that is, *gauts*) towards that river; whence the country into which the paſſes deſcend was originally named Candeiſh, or the low country. The ridge alſo ſeems to abate of its great height, after paſſing the parallel of Baſſeen, northward. (See BUGLANA.)

This famous Apennine marks, perhaps with more preciſion, as Mr. Rennell obſerves, than any other boundary whatever, the line of ſummer and winter, or rather of dry and wet, and extends 13 degrees of latitude. Although the preciſe altitude of theſe mountains has not been aſcertained, yet being from 3000 to 4000 feet, it is ſufficient for preventing the great body of clouds from paſſing over them; and accordingly the alternate N.E. and S.W. winds, called the monſoons, occaſion a rainy ſeaſon on one ſide of the mountains only: that is, on the windward ſide. It would appear, however, that during the firſt part of the rainy monſoon, on the Malabar coaſt, (*i. e.* May and June,) a conſiderable quantity of rain falls in the upper region, or table land of Myſore, &c.; but it is ſuppoſed that this weather is rather of the nature of the periodical rains within the tropics, than of the proper monſoons. Be this as it will, there is no doubt that great quantities of clouds paſs over the weſtern edge of the Gauts. But the quantity of rain that falls *above*, does not bear any kind of proportion to that which falls *below*, the Gauts. Mr. Rennell concludes that the region of the Gauts ſhelters only a particular tract; beyond which, the light and elevated clouds which paſs over it deſcend in rain. Madras is within the limits of the ſheltered tract, though at leaſt 300 miles to the leeward of the Gauts. It has been, till of late, a general opinion, that the Gauts extended from the Northern, or Bootan mountains, to cape Comorin; and occaſioned a diverſity of ſeaſons at one and the ſame time throughout all India. But the truth is, that different ſeaſons exiſt at the ſame moment, only in a part of the peninſula; for in the parallel of Surat the cauſe ceaſes; the S.W. wind, no longer oppoſed by a wall of mountains, carrying its ſupply of moiſture uninterruptedly, both far and near, over the whole face of the country. Rennell's Memoir.

GAUTHIER, or GAULTIER, JOHN BAPTIST, in *Biography*, was born at Louviers, in the dioceſe of Evreux, in the year 1685. He was from early life attached to the ſtudy of theology, but, in obedience to the wiſhes of his parents, he commenced the ſtudy of the law; finding, however, his diſlike to that ſtudy inſurmountable, he was permitted to follow his inclination, and entered, in the year 1704, on a courſe of theology, in the ſchools of the Sorbonne. Having finiſhed his early ſtudies, he was admitted to deacons' orders, and commenced a ſeries of catechetical lectures to young people, and of conferences for the inſtruction of junior eccleſiaſtics. His diligence and ability attracted the notice of M. le Normand, biſhop of Evreux, who took him into his family, where he applied himſelf to the ſtudy of eccleſiaſtical antiquities. In 1713, he was, by the intrigues of the Jeſuits, obliged to quit the dioceſe of Evreux, and was received into the houſe of M. de Langle, biſhop of Boulogne. By that prelate he was admitted into prieſts' orders, and after taking his degrees in law, he was nominated to the canonry of his cathedral: he afterwards made him his proctor, and vicar-general, becauſe Gauthier's ſentiments proved a bar to his elevation in the church. From this time M. Gauthier was the boſom friend of his patron and benefactor, who, in a great meaſure, ſubmitted himſelf to his advice in the concerns of his dioceſe. The biſhop likewiſe availed himſelf of his pen in various publications, particularly in the "Letters and Memoirs," which he printed during his diſpute with the archbiſhop of Rheims. Upon the death of M. de Langle, Gauthier entered into the ſervice of M. Colbert, biſhop of Montpellier, as librarian, a character which was intended to conceal the more intimate connection that ſubſiſted between them; for till the death of M. Colbert, Gauthier was his chief adviſer in all eccleſiaſtical matters, his private chaplain, and confidential ſecretary. He then went to Paris, where he ſpent the remainder of his days in literary employment. He died in 1755, in conſequence of an injury which he ſuſtained by the overthrow of a carriage as he was travelling from Evreux to Paris, when he was ſeventy-one years of age. His publications were extremely numerous, chiefly on theological ſubjects. The titles of them all are given in Moreri, to which the reader is referred.

GAUTTY, in *Geography*, a town of Bengal; 28 miles W. of Nagore.

GAUTUMPOUR, a town of Hindooſtan, in Oude; 20 miles W. of Corah.

GAW, in *Mining*, ſignifies a *Fault*, in parts of Yorkſhire and ſome other places. See that article.

GAWAITTAN, in *Geography*, a town of Pruſſia, in Samland; 7 miles W. of Goldap.

GAWILE, or GYALGUR, a town of Hindooſtan, in Goondwana; 20 miles N.N.W. of Ellichpour. N. lat. 21° 27′. E. long. 77° 58′.

GAWNAGH, LOUGH, a lake of Ireland, in the northern part of the county of Longford, near the borders of Cavan.

GAWRAH, a town of Hindooſtan; 5 miles N.E. of Benares.—Alſo, a river of Aſia, which riſes in the mountains of Kemaoon, and runs into the Ganges with the Ramgonga.

GAWSE, or GAWZE, in the *Manufactures*, a very thin, ſlight, tranſparent kind of ſtuff, woven ſometimes of ſilk, and ſometimes only of thread.

To warp the ſilk for making of gawze, they uſe a peculiar kind of mill, upon which the ſilk is wound: this mill is a wooden machine, about ſix feet high, having an axis perpendicularly placed in the middle thereof, with ſix large wings, on which the ſilk is wound from off the bobbins, by the axis turning round.

When all the ſilk is on the mill, they uſe another inſtrument to wind it off again on two beams: this done, the ſilk is paſſed through as many little beads as there are threads of ſilk: and thus rolled on another beam, to ſupply the loom.

The gauze-loom is much like that of the common weavers, though it has ſeveral appendages peculiar thereto. See LOOM.

There are figured gauzes; ſome with flowers of gold and ſilver, on a ſilk ground, theſe laſt are chiefly brought from China.

GAWZYGUR, in *Geography*, a town of Hindooſtan, in the circar of Gohud; 30 miles N.W. of Narwa.

GAY, a term ſignifying ſpeckled or light coloured in cattle.

GAY, JOHN, in *Biography*, an eminent Engliſh poet, was born in 1688, at Barnſtaple, in Devonſhire, where he was educated with a view to trade. He was accordingly put out as an apprentice to a ſilk-mercer, in London. He ſoon ſhewed an utter diſlike to the duties enjoined on him in this ſituation; and in a few years a mutual ſeparation took place between him and his maſter. From this time he ſeems to have devoted himſelf to poetical compoſition; and, in 1711, he publiſhed his "Rural Sports," inſcribed to Pope. This compliment, joined to the excellent temper of Gay, laid the foundation of mutual friendſhip, which death only could divide. In 1712, Gay accepted the offer of reſiding with the ducheſs of Monmouth, in quality of her ſecretary: this ſituation afforded him ſufficient leiſure to purſue the bent of his own inclinations, and in the courſe of the year he gave to the world a poem, entitled "Trivia, or the Art of walking the Streets of London." This little work diſplayed in a ſtriking manner the talent which its author had for making obſervations, and which gave him an originality beyond what his powers of invention, properly ſo called, could have effected. About the ſame time, he engaged in dramatic writing. The "Mohocks, a tragi-comical farce," was attributed to his pen; and he brought out a comedy, called "The Wife of Bath." In 1714, Gay appeared as the advocate of his friend Pope, in a diſpute between him and Ambroſe Phillips, reſpecting the merits of their paſtorals: thoſe of Pope were written in poliſhed, and thoſe of Phillips in the ruſtic ſtyle. Gay, to ſerve his friend, undertook to compoſe a ſet of burleſque paſtorals, in which the manners of the country ſhould be exhibited in their natural coarſeneſs, with a view of proving, by a ſort of carricature, the abſurdity of Phillips' ſyſtem of paſtorals. His work was entitled "The Shepherd's Week," as the ſix pieces of which it conſiſted were denominated by days of the week. They proceed through the common topics of a ſet of paſtorals in a humorous ſtrain of parody; nevertheleſs his pictures of rural life and its accompanying ſcenery were ſo natural and amuſing, and intermixed with circumſtances ſo truly beautiful and touching, that they proved the moſt popular works of the kind in the Engliſh language. Gay dedicated his work to lord Bolingbroke; and at this period he ſeems to have enjoyed a large ſhare of favour from the Tory party then in power. He was appointed ſecretary to the earl of Clarendon, in his embaſſy to the court of Hanover. Upon the death of the queen his proſpects were damped; but he made ſome efforts to obtain the favour and patronage of the new family; the experiment did not ſucceed. He wrote a poetical epiſtle upon the arrival of the princeſs of Wales, which compliment procured him the honour of the attendance of the prince and princeſs, at the exhibition of his next dramatic piece. Gay had many friends among perſons of rank and opulence, and he was generally eſteemed for the excellent qualities of his heart, yet nothing was done towards fixing him in a ſtate of independence. He publiſhed a collection of poems, in 1720, by ſubſcription, by which he gained a thouſand pounds, and a preſent of ſome ſouth-ſea ſtock from Craggs, ſecretary of ſtate, which raiſed his hopes of fortune to a conſiderable height; but by refuſing to ſell his ſtock at the critical period, he loſt the whole, and was ſo dejected by his diſappointment as to be thrown into a dangerous ſtate of ill health. He retired to Hampſtead for the air; and by this and the kindneſs of his friends he recovered, and wrote the tragedy of "The Captives," which was acted in 1723. His next work was his "Fables," written profeſſedly for the inſtruction of the duke of Cumberland, to whom it was dedicated. This was publiſhed in the year 1726. A ſecond part of the Fables, directed to political ſubjects, was publiſhed after Mr. Gay's death, but it did not take with the public; whereas the Fables, properly ſo called, have been reprinted in almoſt a thouſand different forms. The poet naturally expected a handſome reward for this performance; but upon the acceſſion of George II., though not wholly forgotten, he was offered nothing better than the poſt of gentleman-uſher to the young princeſs Louiſa, which he declined, by ſaying he was too old for ſuch a place. Solicitations were made afterwards in his behalf, but he was ſtill unſucceſsful, and his hopes at court came to an end. He left the purlieus of the palace, and finding that he muſt depend on himſelf for his future ſupport, he began to deviſe plans for the purpoſe. In 1727, he brought out his famous "Beggar's Opera," which was refuſed at Drury-lane; but when it did appear on the ſtage, it was, after once or twice performing, received with unbounded applauſe: it was the leading topic of the town, and upwards of ſixty ſucceſſive repreſentations were inſufficient to ſatiate the metropolis. It was likewiſe acted with equal popularity at all our country theatres. "If," ſays an able critic, "the cauſe of this extraordinary ſucceſs be enquired, the anſwer is perhaps not very obvious. But it ſeems to indicate a kind of coarſeneſs in the national taſte, which could be delighted by the repetition of popular ballad tunes, and the delineation of ſcenes of vice and vulgarity, painted indeed in a natural ſtyle, and in their incidents appealing to the feelings implanted in every human breaſt. But if the Beggar's Opera obtained applauſe on the ſtage, it underwent more ſerious cenſure in other places than almoſt any dramatic piece that has

has been exhibited. By making a highwayman the hero, and bringing him off in a kind of triumph, the author has been charged with rendering the character of a freebooter an object of popular ambition; and by furniſhing his perſonages with a plea for their diſhoneſty, drawn from the univerſal depravity of mankind, and particularly of thoſe in offices of authority, he has been accuſed of ſapping the foundations of all ſocial morality. It cannot be denied that ſuch is the manifeſt tendency of the piece in its principles; but whether a mere ſpectacle is capable of producing important effects upon the public morals, may be queſtioned. That Gay himſelf had no miſchievous intentions in writing it, is highly credible; and his friend Swift warmly defended it as a wholeſome ſatire againſt the corruption of the times."

Government, it is imagined, thought unfavourably of the tendency of the Beggar's Opera, inaſmuch as they prevented the repreſentation of the ſecond part of it, which was written and publiſhed under the title of "Polly." For the injury which he ſuſtained in the ſuppreſſion of this piece, he was amply compenſated by the ſale of the publication, and by the patronage of the duke of Queenſbury, who took him into his houſe and ſhewed him every kindneſs. Raiſed above the preſſure, or the fear of want, he fell into a dejected ſtate of ſpirits, and was in other reſpects much out of health; but in the happier intervals, he produced his "Acis and Galatea," and the opera of "Achilles." He died in December, 1732, at the age of forty-four, ſincerely lamented by his friends; and his memory was honoured by a monument in Weſtminſter Abbey, where his remains were depoſited, and an epitaph was written by Pope. He poſſeſſed but little energy of mind, and had too much indolence to ſupport that independence, which he was ever deſirous of aſſerting. Gay was author of ſome other pieces beſides thoſe already noticed, and of two ballads generally known, *viz.* "All in the Downs," and "'Twas when the Seas were roaring." Biog. Brit. Lives of the Poets.

Gay *Head*, in *Geography*, a kind of peninſula, in America, on Martha's vineyard, between three and four miles in length, and two in breadth, and almoſt ſeparated from the other part of the iſland by a large pond. The Indians, inhabiting this part, lately numbered, amounted to 203. The ſoil is good, and with cultivation will produce moſt vegetables. Traces are perceived of former volcanoes on this peninſula. N. lat. 41° 20'. W. long. 70° 50'.

GAYA, or Kygow Gaya, a town of Moravia, in the circle of Hradiſch; 14 miles W.S.W. of Hradiſch. N. lat. 48° 59'. E. long. 17° 2'.

Gaya, a town of Hindooſtan, in the country of Bahar; 50 miles S. of Patna. N. lat. 24° 46'. E. long. 85° 8'.—Alſo, a river of Spain, from which Scipio formed an aqueduct to Tarragona.—Alſo, a ſmall iſland in the Eaſt-Indian ſea, near the eaſt coaſt of Borneo. N. lat. 4° 46'. E. long. 118° 48'.

GAYAC. See Guaiacum.

GAYACH, in *Geography*, a river of Bavaria, which runs into the Danube, 5 miles W. of Paſſau.

GAYETA, a town of Spain, in Valencia; 30 miles S. of Valencia.

GAYLAH, a town of Hindooſtan, in Oude; 8 miles S. of Banſey.

GAYMENT, Fr. has been ſaid to be equal to *Allegro*, Ital. chearful, lively, quick; but the French word, as Rouſſeau has well obſerved, is not ſo extenſive in its ſignification, being confined to chearful, light, airy ſtrains alone; whereas allegro extends to quick movements of all kinds of character and expreſſion.

GAZA, Theodore, in *Biography*, a learned modern Greek, who flouriſhed in the 15th century, was born at Theſſalonica. After the deſtruction of his native city, in 1430, by the Turks, he took refuge in Italy, and ſtudied the Latin language with ſuch diligence, that in three years he was ſo thoroughly acquainted with it as to become one of the moſt eloquent writers in his time. From 1441 to 1450 he was a profeſſor in the univerſity of Ferrara, and afterwards its principal rector. Before this he was in a ſtate of extreme indigence, and was obliged to copy Greek manuſcripts for a livelihood. From Ferrara he went into the ſervice of pope Nicholas V., and at the ſame time obtained the patronage of cardinal Beſſarion, who made him his confidential friend. Upon the death of the pope he was ſome time with king Alphonſo at Naples, upon whoſe deceaſe he returned to Rome. His patron cardinal Beſſarion procured him a rich benefice in Calabria, but being inattentive to his own affairs, he was ſtill in but depreſſed circumſtances. At the inſtance of Nicholas V. he undertook a tranſlation of Ariſtotle's work on animals, which was not finiſhed till the reign of Sixtus IV., to whom he preſented it, and expected no doubt a handſome remuneration, inſtead of which he was mortified with a preſent of fifty crowns only, which, it is ſaid, ſo enraged him that he actually threw the money into the Tyber. After this he returned to Ferrara, and from thence to Calabria, where it is probable he died in 1478. Gaza was one of the moſt learned men of his time, and his great talents have been celebrated by the principal ſcholars among his contemporaries. His works are "A Greek Grammar," printed by Aldus in 1495, together with his treatiſe "On the Grecian Months." Beſides the work already noticed of Ariſtotle, he tranſlated the Aphoriſms of Hippocrates: Theophraſtus on Plants: Ælian's Tactics: Dionyſius Halicarn. de Compoſitione Orationis: the Homilies of John Chryſoſtom, and ſome other works. He tranſlated Cicero de Senectute, and other pieces from Latin into Greek; and in the controverſy between the Platoniſts and Ariſtotelians he compoſed a work againſt the notions of the former. Gen. Biog.

Gaza, in *Ancient Geography*, one of the five Philiſtine ſatrapies or principalities, ſituated towards the ſouthern extremity of Canaan, about 15 miles S. of Aſcalon, four or five N. of the river Bezor, and at a ſmall diſtance from the Mediterranean. It was placed on an eminence, ſurrounded by beautiful and fertile vallies; watered by the above-mentioned river and a number of other ſprings, and, at a further diſtance, encompaſſed on the inland ſide with hills highly cultivated. It was ſtrong, on account of its ſituation, and alſo by means of the walls and ſtately towers that ſurrounded it. It was, however, taken by Caleb, then chief of the tribe of Judah, or aſſigned to this tribe by Joſhua; but ſoon after regained by its inhabitants; and held by them till Samſon carried off the gates of it in the night. (Joſh. xv. 47. 1 Sam. vi. 17.) It often changed maſters, and paſſed from the Philiſtines to the Jews, from them to the Chaldeans, who conquered Syria and Perſia, afterwards to the Perſians, who held it, when Alexander beſieged, took, and deſtroyed it. It was afterwards poſſeſſed by the kings of Egypt. Antiochus the Great took and ſacked it; it was taken ſeveral times from the Syrians by the Maccabees; taken and deſtroyed by Alexander Jannæus, king of the Jews; repaired by Gabinius; and given by Auguſtus to Herod the Great; but not ſubject to his ſon Archelaus. The evangeliſt Luke ſays (Acts, viii. 26.) that, in his time, Gaza was a deſert place. Some geographers make Gaza a ſea-port, confounding

ing it with New Gaza, or Majuma; and others place it at a great diſtance from the ſea. Calmet has erroneouſly made this diſtance 20 miles; whereas Arrian ſtates it at 20 furlongs or 2½ miles.

New Gaza, or Majuma, was the ancient ſea-port to the former, and on that account a place of ſome note; but much more ſo in the reign of Conſtantine the Great, who called it Conſtantia from the name of his ſon Conſtantius, and endowed it with many ſingular privileges, of which it was deprived by Julian the Apoſtate. Majuma ſtood near the mouth of the river Bezor, about 10 miles ſouth of Aſcalon, and as many N.W. of Anthedon; it has ſtill ſome curious antiquities remaining; but it is not eaſy to ſay whether they belonged originally to New or Old Gaza.

Gaza, now called by the Arabs "Razza," is compoſed of three villages, one of which, under the name of the "Caſtle," is ſituated between the two others, on an inconſiderable eminence. This caſtle is now a mere heap of rubbiſh. The Serai of the Aga, which conſtitutes a part of it, is in a ruinous ſtate; but it has the advantage of a moſt extenſive proſpect. From its walls may be ſeen the ſea, from which it is ſeparated by a ſandy beach, a quarter of a league wide; and the adjacent country reſembles Egypt, by means of its date trees, and flat aſpect; and in this latitude, the ſoil and climate both appear to be truly Arabian. The heats, the drought, the winds, and the dews, are the ſame as thoſe of the banks of the Nile; and the inhabitants have the complexion, ſtature, manners, and accent of the Egyptians, rather than thoſe of the Syrians. The ſituation of Gaza, by its convenience for commerce, has rendered it at all times a town of ſome importance. The ruins of white marble ſometimes found there prove that it was formerly the abode of luxury and opulence; nor was it unworthy of this preference. The black ſoil of the ſurrounding country is extremely fertile, and the gardens, watered by limpid ſtreams, ſtill produce, without art, pomegranates, oranges, exquiſite dates, and ranunculus roots, in great requeſt, even at Conſtantinople. It has, however, ſhared in the general deſtruction; and notwithſtanding its proud title of the capital of Paleſtine, it is no more than a defenceleſs village, peopled by at moſt only 2000 inhabitants. The manufacture of cottons is their principal ſupport; and as they have the excluſive ſupply of the peaſants and Bedouins of the neighbourhood, they employ about 500 looms. Here are likewiſe two or three ſoap manufactories. The commodity of aſhes, or kali, was formerly an article of conſiderable commerce; theſe aſhes are procured by the Bedouins, who burn the plants of the deſert; but ſince the Aga has monopolized this commodity, and the Arabs are compelled to ſell it at his price, they are no longer anxious to collect it; and the inhabitants, conſtrained to purchaſe at his pleaſure, neglect the manufacture of ſoap. Another branch of commerce, more advantageous to the people of Gaza, is furniſhed by the caravans, which paſs and repaſs between Egypt and Syria. The proviſions which they are obliged to take for their four days' journey in the deſert occaſion a conſiderable demand for their flour, oil, dates, and other neceſſaries. Sometimes they correſpond with Suez; they likewiſe fit out every year a great caravan, which goes to meet the pilgrims of Mecca, and conveys to them the convoy of Paleſtine, and ſupplies of various kinds. They meet them at Maon, four days' journey to the S.S.E. of Gaza, and one day's journey to the N. of Akaba, on the road to Damaſcus. They alſo purchaſe the plunder of the Bedouins, which is occaſionally an article of great value. Beyond Gaza there are only deſerts, with ſome cultivated ſpots and villages along the ſea-coaſt. Gaza, however, ſuffers, in common with other places, by the ſands which daily accumulate; inſomuch that many places which were anciently ſea-ports, are now four or five hundred paces within land; and this is the caſe with reſpect to Gaza. N. lat. 31° 25′. E. long. 35° 40′. In 1799 Gaza was taken by the French. Anc. Un. Hiſt. vol. ii. Volney's Travels in Egypt and Syria, vol. ii.

Gaza, or *Ganzaca*, *Tebriz* or *Tauris*, a town of Aſia, which held the firſt rank in Media Atropatena. It was the depoſitory of great wealth, and the ſummer reſidence of the kings of Atropatena. It was ſituated N.E. of the lake Spauta, and at ſome diſtance from it.

Gaza *Giovane*, in *Ornithology*, the name of a ſmall ſpecies of heron, of a fine white colour, the *Ardea Garzetta*. See Garzetta and Heron.

GAZALI, in *Biography*, ſurnamed *Abou Hamed Mohammed Zein Eddin Al Thouſi*, one of the moſt celebrated of the Muſſulmen doctors, was born at Thous, a town in Khoraſan, in the year 450 of the Hegira, or 1072 of the Chriſtian era. He was appointed profeſſor of the college founded at Bagdat, but ſoon relinquiſhed the duties of the ſituation for the ſake of embracing a life of retirement and ſtudy, and after having made a pilgrimage to Mecca, he returned to his native country, where he died in the year 504 or 505. He obtained a high reputation for learning and virtues, which occaſioned him to be diſtinguiſhed in the oriental manner by many magnificent titles. Being aſked what means he had uſed to arrive at that eminence in ſcience to which he had attained, he replied, "that he had never been aſhamed to aſk for information on ſubjects concerning which he had been ignorant." He was author of many works, but his principal production was entitled "The different Claſſes of the ſciences which relate to Religion." Gen. Biog.

Gaze-Hound. See Hound.

GAZEEDEEN, in *Geography*, a town of Hindooſtan; 14 miles E. of Delhi.

GAZELLA, or Gazelle, a ſpecies of *Antelope*, which ſee.

GAZER, or Gazara, in *Ancient Geography*, a town of Paleſtine, belonging to the tribe of Ephraim, ſituated on the torrent of Gaas, S.W. of Bethel. It was given to the Levites of the family of Kohath. (Joſh. xxi. 21.) In the time of Solomon, Pharaoh, king of Egypt, took and burnt it; but it was rebuilt by Solomon. At a future period, it was taken by Judas Maccabæus, and fortified by his brother Jonathan. Joſeph. Ant. l. xiii. c. 11.

Gazer, in *Geography*, a town of Africa, in the country of Aſben; 50 miles N. of Aſouda.

GAZETTE, a news-paper, or printed account of the tranſactions of divers countries, in a looſe ſheet or half-ſheet.

The word is formed from *gazetta*, a kind of coin, formerly current at Venice, which was the ordinary price of the firſt news-paper printed there: though others derive it, by corruption, from the Hebrew *izgad*, which ſignifies *nuntius*, a meſſenger, but this etymology is too much forced.

Gazettes, which moſt people look on as trifles, are by ſome held the moſt difficult kind of compoſitions that have appeared. They require a very extenſive acquaintance with the languages, and all the terms thereof, and a great facility and command of writing, and of relating with perſpicuity, and in a few words.

To write a gazette, a man ſhould be able to ſpeak of war both by land and ſea; be thoroughly acquainted with every thing relating to geography, the hiſtory of the time, and that of the noble families; with the ſeveral intereſts of princes, the

the ſecrets of courts, and the manners and cuſtoms of all nations.

Vignuel de Marville recommends a ſet of gazettes, well written, as the fitteſt books for the inſtruction of young perſons coming into the world.

The firſt gazette publiſhed in theſe parts, is ſaid to have been that of Paris, begun in the year 1631, by Theophraſt. Renaudot, a phyſician of Montpelier, in his office of intelligence.

The firſt gazette in England was publiſhed at Oxford, the court being there, in a folio half ſheet, Nov. 7, 1665. On the removal of the court to London, the title was changed to the "London Gazette." The Oxford gazette was publiſhed on Tueſdays, and the London on Saturdays; which have continued to be the days of publication ever ſince.

GAZETTE, *Extraordinary*. See EXTRAORDINARY.

GAZNA, in *Geography*. See GHIZNI.

GAZNIN, a town of Hindooſtan, in Candahar; 106 miles E. of Candahar.

GAZOLDO, a town of Italy, in the department of the Mincio; 13 miles W.N.W. of Mantua.

GAZOMETER, GASOMETER, or *Gas-holder*, are names given to certain inſtruments or veſſels formed as reſervoirs for large quantities of gas, to which are added ſuitable conveniences for receiving and applying the ſame, and for meaſuring the volume. Lavoiſier and Meuſnier were the firſt to deſign and execute ſuch an inſtrument, of which a plate, accompanied with a deſcription, was given in the Elements of Chemiſtry, publiſhed by the former celebrated philoſopher in 1789. This inſtrument was too complicated and expenſive to be of general uſe. Since that time various have been the alterations and improvements made by ſucceeding chemiſts according to the objects they had in view.

Lavoiſier's gazometer conſiſted of a cylindrical copper veſſel, open at bottom, and inſerted into another larger veſſel of the ſame kind, open at top. The internal veſſel is 18 inches in diameter, and 20 inches deep. Around the bottom of this, on its outſide, is fixed a border divided into compartments, intended to receive leaden weights, 1, 2, 3, 4, &c. in order to increaſe the weight of the veſſel when conſiderable preſſure is requiſite. The top of this veſſel is furniſhed with a tube and ſtop-cock, forming a communication between the external and internal air, alſo with a thermometer cemented into it to ſhew the temperature of the air within. The veſſel is ſupported by a chain from one of the circular ends of a balance beam; and to the other end a ſcale and weight are ſuſpended as a counterpoiſe. The external veſſel is partly filled with water, and has tubes along the bottom and riſing up to communicate with the air in the interior veſſel, for the purpoſe of admitting or diſcharging it. Some auxiliary glaſs tubes and a ſcale of inches are attached to the veſſel, to ſhew the height of the water in the inner and outer veſſel, and the difference of the heights, in order to correct for the preſſure. This partial deſcription will give an idea of the outline of the ſtructure, which is much too complicated to be exhibited as a model for the preſent time.

In the 12th vol. of the Annales de Chimie, 1792, is given the deſcription of a gazometer by Van Marum: the immediate object of it was to exhibit the compoſition of water by the ſlow combuſtion of hydrogen in a large glaſs receiver. Two of theſe gazometers were employed; the one to introduce a ſtream of hydrogen gas, and the other oxygen. The hydrogen was lighted at the commencement of the experiment by electricity. The apparatus diſplays ingenuity; but it is complicated and expenſive. In the 14th vol. of the ſame work he gives a ſimplification of the gazometer as applied to the ſame purpoſe; but it is ſtill too complex and too partial in application for general uſe.

In 1794, Mr. Watt of Birmingham publiſhed a pamphlet containing a deſcription of an apparatus for elaſtic fluids. In this he deſcribes two veſſels, the one under the name of *hydraulic bellows*, which is, in fact, the modern gazometer, and the other under the name of *air-holder*. Theſe were illuſtrated with plates. The hydraulic bellows or gazometer conſiſts of two veſſels H and J, *Plate* XIV. *(Chemiſtry) fig.* 1. The outer veſſel, H, conſiſts of two cylinders placed one within the other, and about half an inch aſunder. Theſe cylinders are joined together at bottom by a circular rim, well ſoldered to them both; and the inner cylinder is ſhut at top by a cover alſo ſoldered on. This inner cylinder is about two inches ſhorter than the outer cylinder, and the latter is ſurmounted by a cup, W W, about 1½ inch deep, and one inch all around more in diameter than the cylinder to which it is attached. The pipe, P Q, paſſes diametrically acroſs the veſſel H; the end, Q, is open, and made ſo as to be ſtopt with a cork or cock. From this pipe, P Q, proceeds a pipe V, which paſſes upwards through the cover of the inner cylinder to which it is ſoldered, and is open at its upper end. The ſecond veſſel, J, of the bellows, is a hollow cylinder of one foot diameter, and eighteen inches long, ſhut at top, and open at bottom; it is made ſo as to move up and down eaſily in the circular interſtice between the inner and outer cylinders of the veſſel H; and when that interſtice is filled with water, as high as the cover of the inner cylinder, if the veſſel J is moved up and down, it will act the part of a bellows, drawing in and blowing out air, by the pipes V and P Q. The bellows are made of tinned iron plates japanned, or of tinned copper-plates not japanned.

The air-holder is thus deſcribed: Let a cylindrical veſſel *(fig.* 2.) be made of ſtrong tin plate; this veſſel is to be cloſe at both ends, which are made concave outwards; cloſe to both the bottom and cover, ſhort pipes, U and V, proceed from the ſide of the veſſel; their diameters ſhould be the ſame as the pipe, P Q, of the bellows. Another pipe, T, paſſes through the middle of the cover or upper end of the veſſel, to which it is well ſoldered; and reaches within half an inch of the bottom. To guard this veſſel from ruſt it ſhould be japanned both inſide and out; and for the greater convenience of japanning it within, it may be made to come aſunder at the middle of its height, and when varniſhed may be cemented together by a mixture of wax and roſin uſed hot. When this veſſel is completed, the upper pipe, U, is to have a ſhort pipe, W, inſerted into it, which ſhould alſo fit the pipe, Q, of the bellows. The lower pipe, V, is then to be corked, and the veſſel filled with water by the central pipe T. This veſſel is to be placed in an empty tub, the pipe, W, inſerted into the pipe, Q, of the bellows, and cemented to it. When the bellows are filled with artificial air, the cork of the lower pipe, V, is to be taken out, and the counterpoiſe of the bellows is to be lifted up; the water in the air-holder will then run out into the tub, and the air deſcend from the bellows into the former veſſel, which, when full, muſt have its pipes cloſe corked. To transfer the air from this veſſel into a bag or bladder, fix the faucet or mouth-piece of the bag or bladder into the upper pipe U, and if you want a quart or gallon, or other meaſure of air, pour ſo much water into the air-holder through the central pipe, and exactly that quantity of air will iſſue out; then re-cork your veſſel until you want more air from it.

In the 5th vol. of the Philoſophical Magazine 1799, Mr. Pepys deſcribes a new mercurial gazometer. The principle of it is nearly the ſame as the hydraulic bellows of Mr. Watt. A *(fig.* 3.) is a repreſentation of the bell of the gazometer,

zometer, made of glaſs, furniſhed with a cock at top, and able to contain 34 ounces Troy of diſtilled water. The diviſions of capacity, determined by actual meaſurement, are marked on the glaſs with a diamond. B B, are the ſections of two cylinders of lignum vitæ (or caſt iron), the outward one ſcrewed upon the ſolid internal one, which is made to project at its lower extremity, and furniſhed with a male ſcrew, to work into a female ſcrew, with which the lower end of the external cylinder is furniſhed. The ſpace between theſe is ſo adjuſted as to be almoſt filled up by the ſubſtance of the glaſs bell, A, when dropped into it, ſo that the quantity of mercury neceſſary to fill up that ſpace is proportionally ſmall. The internal cylinder has a conducting tube up through its axis, the lower end of which is furniſhed with a female ſcrew anſwering to the male ſcrew of the cock of the ſmall receiver C. The receiver, C, is of glaſs, and open at the bottom. When this receiver is uſed, it is ſcrewed into its place, and reſts upon a ſmall cup or ciſtern of mercury, D, in which the beak of a retort, furniſhed with a bent glaſs tube, may be introduced into the receiver. E E E E ſection of a wooden ſtand upon which the cylinders of lignum vitæ or caſt iron are ſupported, having an opening through the top to permit the cock of the receiver, C, to be joined to the conducting tube of the internal cylinder B. The ciſtern, D, is adjuſted to its height by means of a riſing cylinder in the pedeſtal F. G is a transfer glaſs for mixing alkaline gaſes in vacuo, or other purpoſes, and when uſed, is joined to the top of the bell A. H, a glaſs globe and ſtop-cock, capable of holding 14 ounces Troy of water, for weighing gaſes; it receives its gas by being inverted and ſcrewed into the bell A. I, a bladder furniſhed with a ſtop-cock, to aſſiſt in holding, transferring, or mixing different gaſes. K, an elaſtic gum bottle capable of containing 30 ounces of water, for holding the acid gaſes; when uſed it is ſcrewed into the top of the transfer G; the bottom cock of the latter being at the ſame time joined to the bell A, previouſly charged with the alkaline gas; the cocks being turned, the gaſes ruſh together in vacuo. L, a ſmall portable air-pump for exhauſting the globe H. M, a double male ſcrew, which fits any part of the apparatus, and on which a valve may be faſtened. N, a double female ſcrew. O, a ſmall inſtrument, of ſervice in collecting ſpilled mercury, or transferring ſmall quantities of it.

Mr. Davy's Reſearches, &c. publiſhed in 1800, contain an account of a mercurial gazometer by Mr. Clayfield. The peculiarity of this conſiſts, in having the counterpoiſe to the cylinder ſuſpended by a ſtring which runs in a ſpiral groove ſo as to balance the cylinder, whatever its depreſſion in the mercury may be.

The 53d vol. of the Journal de Phyſique, 1801, contains a deſcription of a new gazometer by Victor Michelotti, M. D. of Turin. This inſtrument, however, can ſcarcely be recommended for its ſuperiority.

In the 13th vol. of the Philoſophical Magazine, 1802, Mr. Pepys has deſcribed a new gas-holder. The apparatus is in ſome reſpects ſimilar to that recommended by Mr. Watt. A ſmall circular ciſtern is added at top, which is connected with the gas-holder by means of two pipes furniſhed with cocks. It has alſo a braſs cock on the ſide, and a glaſs gage or regiſter tube, ſhewing the quantity of included gas by the level of the water. The following is a deſcription of the different parts, *fig.* 4. The gas-holder, G, may contain from two to ten gallons. R, the regiſter tube, the ends of which are cemented into two tin ſockets by corks at the top and bottom of the gas-holder, into which it opens at both ends; of courſe the level of the water in the apparatus will always be ſeen in the tube, and conſequently that of the gas. C, the circular ciſtern with its two cocks and pipes, marked 1 and 2. C *k* a braſs cock on the ſide, with a ſcrew, to which bladders or a blow-pipe may be attached. O, an opening into the gas-holder, in which a pipe is ſoldered at ſuch an angle, that when all the uppermoſt cocks are ſhut, no water can poſſibly eſcape. But when a conducting pipe from a retort or other apparatus generating gas, is introduced into this opening, then, as the gas paſſes up into the gas-holder, an equal quantity of water will be diſcharged at O into any veſſel fit to receive it. S *p*, a ſpout on the ſide of the ciſtern to enable the operator to add water, even when the receiver fills its whole area. H, H, handles to lift the gas-holder. R *c*, a glaſs deflagrating receiver, ſtanding in the ciſtern. A, its adopting cork and cock. S, a watch ſpring in a ſlit wire prepared for combuſtion. The wire paſſes through a cork. D, a deflagrating diſk of iron for ſulphur, phoſphorus, charcoal, ſugar, camphor, &c. B, a blow-pipe with a gum elaſtic tube, E, capable of joining the cock C *k*.

To make uſe of this apparatus; firſt fill the gas-holder with water, by cloſing the opening, O, with a cork, and alſo the cock, C *k*, and keeping the circular ciſtern full of water, while the cocks 1 and 2 are both open. The air is driven out of the gas-holder through the cock 1, by the water deſcending into it by the cock 2. When full, the water in the regiſter will be on a level with the top of the gas-holder. Then ſhut the cocks 1 and 2. You may now remove the cork from the opening, O, which is then prepared to receive the conducting pipe from any apparatus from which the gas is generating. As the gas is delivered the water eſcapes, and ſhould be caught in any convenient veſſel. The regiſter will then ſhew the quantity received; when full, cloſe the opening, O, with a cork wrapped in leather, which prevents the communication with the atmoſphere. It may now be eaſily removed or conveyed where it is wanted. When it is required to fill a glaſs receiver, as R *c*, with the gas, having previouſly filled the circular ciſtern with water, place it in the ciſtern, put in the adopting cork, A, and with the mouth applied to the cock, exhauſt the receiver in which the water will riſe till full. Then cloſe the cock, A, and open the two cocks, 1 and 2, and the gas will aſcend into the receiver, while the water will take its place in the gas-holder.

In the ſame volume of the Magazine Dr. Warwick ſuggeſts a more ſimple alteration of Mr. Watt's air-holder than the above. It conſiſts in having a rim at the top of Watt's air-holder, ſo as to admit of a column of water of an inch in depth above the ſtop cock, ſoldered to the ſhorter tube in the top of the air-holder.

In the 23d vol. of Nicholſon's Philoſophical Journal, 1809, Mr. Clegg has given a deſcription of a gazometer or gas-holder for receiving the gas from coals, for the purpoſe of lighting manufactories, &c. This is on a large ſcale, ſo as to hold ſeveral hundred cubical feet. The veſſel containing the air is made of wrought iron plates, and may be cylindrical, or, which is better, ſquare or oblong, with an internal frame of wood to preſerve the figure. This veſſel is balanced by a weight in the manner of other gazometers, and is let down into a large well or reſervoir of water, like the upper cylinder of Mr. Watt's hydraulic bellows. When in operation, a ſmall head of water preſſes on the gas, and forces it through the tubes to the lamps, where it is burned. As this apparatus is daily receiving improvement, we ſhall defer giving a full deſcription of it till the article GAS-*Light*. See alſo LIGHT.

Rules for reducing meaſures of gaſes to weights.—In order to reduce any given meaſure of a gas to weight, the exact

weight of a given volume at a certain preſſure and temperature muſt be previouſly known. This may be ſeen in a table under the article GAS. The mean preſſure of the atmoſphere may be taken at 30 inches of mercury, and the mean temperature at 55° of Fahrenheit. The reduction, on account of preſſure, ariſes from the principle that "the volume of any gas is inverſely as the preſſure." The reduction, on account of temperature, muſt be $\frac{1}{475}$th for every degree of Fahrenheit, between the limits of 32° and 80°. At leaſt this is a ſufficient approximation: that is, the volume muſt be *increaſed* if the temperature is below 55°, and *diminiſhed* if above 55°, by the fractional part above ſpecified.

Example 1.—Required the weight of 1000 cubic inches of common air in a mercurial gazometer; the mercury within being 2½ inches above the level of that without, the barometer at the ſame time being 29.5 inches, and the thermometer 62°

Solution.—Here the real preſſure of the gas is 29.5 — 2.5 inches = 27. Hence, 30 : 1000 :: 27 : 900 = the volume of gas reduced to 30 inches of preſſure. Again, 62° — 55° = 7°, and $\frac{7}{475}$ of 900 = 14.5, which being taken from 900, leaves 885.5 cubic inches of gas at the common preſſure and temperature. But 100 cubic inches weigh 31 grains; whence 885.5 × 31 = 274½ grains, as required.

Example 2—Required the weight of 1000 cubic inches of common air in a water gazometer; the water within being 3 inches below that without, the barometer at the ſame time being 29.8, and the thermometer 38°.

Solution.—Here the real preſſure of the gas is 29.8 + the preſſure of 3 inches of water; but 3 inches of water = $\frac{3}{13.6}$ inches of mercury = .22 inch. Whence the preſſure = 30.02. And 30 : 1000 :: 30.02 : 1000.7, the volume of gas reduced to 30 inches of preſſure. Again, 55° — 38° = 17°, and $\frac{17}{475}$ of 1000.7 = 39.1, which being added to 1000.7, gives 1039.8 cubic inches of gas at the common preſſure and temperature = 322⅓ grains.

GAZONS, in *Fortification*, turfs, or pieces of freſh earth covered with graſs, cut in form of a wedge, about a foot long, and half a foot thick, to line or face the outſides of works made of earth, in order to keep up the ſame and prevent their mouldering.

GAZOPHYLACIUM, in the *Jewiſh Antiquities*, according to the Greek etymology, of γαζα, *treaſure*, and φυλαττω, *I keep*, ſignifies the treaſury-chamber. There were ſeveral places in the temple of Jeruſalem, where the rich preſents conſecrated to God by kings, princes, or private perſons, were kept. But the ſignification of this word, gazophylacium, has been farther enlarged, ſo as to comprehend the rooms where the proviſions of the temple were laid up, both for ſacrifices, and for the ſupport and ſuſtenance of the prieſts, and in general this word is uſed for all the apartments of the temple. In the Goſpel, by gazophylacium is meant the cheſt into which people caſt their offerings at the entrance of the temple. It has been alſo uſed by naturaliſts for a collection of figures of curious ſubjects. Mark xii. 41, 43. Luke xxi. 1.

GAZOPHYLAX, Γαζοφυλαξ, in *Antiquity*, an officer who had the care and management of the treaſure belonging to the kings of Perſia.

GAZUA, in *Geography*, a mountain of Arabia; 60 miles E. of Mecca.

GAZUATI, a name given by the natives to a chain of mountains in the viceroyalty of La Plata, which is conſidered as terminating the wide plains or ſteppes called Pampas on the ſouth. It is called by the Spaniards La Vantana, and the eaſtern part is denominated the Volcan, from its form, as there is no indication of a volcano. It is ſuppoſed not to exceed 1000 feet in height.

GAZYPOUR, a circar, or province, of Hindooſtan, bounded on the north-eaſt by the Dewah, on the ſouth by the Ganges, and on the weſt by Benares and Jionpour; of a triangular form, and about 180 miles in circumference. —Alſo, a town, the capital of the forementioned circar, on the left bank of the Ganges; 92 miles E. of Allahabad. N. lat. 25° 36′. E. long. 84° 48′.

GAZZA, in *Ornithology*, the name of a ſpecies of *heron* (ARDEA *alba*), common in Italy, and called by many authors *ardea alba major*, the *greater white heron*. Its whole body is of a ſnow white, its beak yellow, its head ſmooth, its legs black, and the membranes about its eyes green; though called large in compariſon of the leſſer white one, it is ſmaller than the common grey heron. Its tail alſo is much longer, and has no creſt. It is ſometimes ſeen in England, and has been miſtaken for a common heron become accidentally white, as ſparrows and other birds ſometimes are. See HERON.

GAZZANIGA, GIUSEPPE, of Verona, in *Biography*, a diſciple of Sacchini, and an agreeable compoſer in the elegant and graceful ſtyle of his maſter. He has compoſed more comic than ſerious operas, and began to be noticed as a muſician of taſte and genius in 1771, when his burletta, intitled "La Locanda," excited the attention and hopes of the public, which have not been diſappointed. He was living in 1796, and compoſed operas, chiefly comic, for ſeveral cities of Italy.

GAZZETTA, in *Ornithology*, a name given by Geſner and others to a ſpecies of ſmall white heron, ſold in the markets of Italy, and ſeeming to be the *ardea alba minor* of authors, or *gaza giovane* of the Venetians. See GARZETTA and HERON.

GAZZETTO, in *Ichthyology*, the name of a fiſh of the turdus or wraſſe kind, (a ſpecies of *Labrus*, which ſee,) caught in the Mediterranean, and ſold in the markets of Italy. It is of a fine green colour, and is conſiderably thick, though broad; its fins are ſpotted, and it has a large purple tubercle near the anus. It has only one back-fin which has twenty-four ribs or nerves, the firſt fifteen of which are rigid and prickly, the reſt ſmooth and flexile.

GEA, in *Ancient Geography*, a town of Arabia, near Petra. Steph. Byz.

GEANNIDES, in *Natural Hiſtory*, a name given by ſome authors to the ſtone called by others encymonites. It ſeems to have been the ſame with our ſparry incruſtations on the tops of caverns, &c. but the word has been generally underſtood to mean the eagle-ſtone.

GEAR, or *about your gear*, at *Sea*, a command to work on all hands.

GEARON, or JAROON, in *Geography*, a town of Perſia, in the province of Farſiſtan, celebrated for its excellent fruits, raiſins, pomegranates, dates, and quinces; 70 miles S.E. of Schiras.

GEASTRUM, in *Botany*, from γεα, *the earth*, and αστηρ, *a ſtar*. Perſoon Syn. Fung. 131. (Geaſter; Mich. Gen. 220. t. 100.)—Claſs and order, *Cryptogamia Fungi*. Nat. Ord. *Fungi*; ſect. *Dermatocarpi*, Perſ.

Micheli founded this very natural genus on the Puff-balls with a ſtellated volva, *Lycoperdon ſtellatum* of Linnæus, and its allies. Perſoon, in adopting it, very properly altered the termination of the name, that it might not be a mere compound of another eſtabliſhed generic name, *Aſter*. He gives the following generic character.

Volva thin, evaneſcent. Outer coat of the *peridium* cloven

ſtar-wiſe, at length reflexed: orifice of the head uſually hairy.

We ſhould rather call this "outer coat" an inner volva, after Linnæus; the true *peridium*, or receptacle of the ſeeds, being the membranous round head, whoſe orifice is uſually hairy.—The ſpecies are ſix; among them are

G. *coliforme*, (Lycoperdon coliforme; Sowerby's Fung. t. 313. Dickſ. Crypt. faſc. 1. t. 3.), found only in ſome few places in Norfolk and Suffolk, remarkable for having numerous orifices in its head, and as many ſtalks to ſupport it.

G. *coronatum*, (Lycoperdon ſtellatum; Sowerb. Fung. t. 312. L. volvam explanaus; Schmid. Ic. t. 46.), is much more common, and appears to be what Linnæus intended by his *ſtellatum*.

G. *quadrifidum*, (Lycoperdon fornicatum; Hudſ. 644. Sowerb. Fung. t. 198.), has a ſingularly vaulted and elevated volva. It is found in Kent, Norfolk, and Yorkſhire.

G. *rufeſcens*, figured in Schmidel, t. 43, and in Schæffer's Fungi, t. 182, has a ſeſſile head. This is found in Germany and England. We believe Bolton's t. 179, belongs rather to the *coronatum*. See Persoon.

GEAUNE, in *Geography*, a town of France, in the department of the Landes, and chief place of a canton in the diſtrict of St. Sever; 12 miles S.E. of St. Sever. The place contains 788, and the canton 7479 inhabitants, on a territory of 167½ kiliometres, in 19 communes.

GEBA, a town and country of Africa, on a river of the ſame name, which joins the river St. Domingo. N. lat. 11° 55'. W. long 14°. The river *Geba*, or *Geſves*, which is one of thoſe that forms the delta of the Biſſagos, has a very ſteep deſcent, and is ſubject to a tremendous *bore*, or influx of the tide, which aſcends in three hours or leſs, while the decline is of ſix hours. This phenomenon is known in ſeveral other rivers, as the Ganges, Maranon, Severn, and at Libourne near Bourdeaux. See Bore.

GEBAL, in *Ancient Geography*, a town of Phœnicia, the ſame with Byblos and Gabala. Ptol.

GEBALA, a town of Hiſpania Tarragonenſis, in the country of the Varduli. Ptol.

GEBALITÆ, a people of Arabia Felix, diſtinguiſhed by Pliny from the *Catabani*, though probably connected with, or ſubordinate to, one another; for Tanna, or Thomna, the capital of the one, was alſo the capital of the other. Strabo places them near the entrance of the Arabic gulf: but Ptolemy fixes their ſituation at the mouth of the Perſic gulf.

GEBAU, in *Geography*, a town of Bohemia, in the circle of Boleſlaw; ſix miles S. of Benatek.

Gebau, *New*, a town and caſtle of Sileſia, in the principality of Oppeln; 10 miles S.E. of Falkenburg.

GEBBAR, a town of Aſiatic Turkey, in the province of Diarbekir; 10 miles S.E. of Jadida.

GEBBATHON, or Gibbethon, in *Ancient Geography*, probably the ſame with *Gabbatha*, a Levitical city in the tribe of Dan, on the frontiers of Judah; 12 miles from Eleutheropolis, where was ſhewn the tomb of the prophet Habbakuk.

GEBEL, or Gebal, ſignifying a mountain, gives denomination, with appropriate additions, to ſeveral mountains in Arabia, Egypt, and Abyſſinia: ſuch as, G. *Camar*, a mountain of Arabia, extending N.E. from Fartach:—G. *Docan*, a mountain of Egypt, 100 miles S. of Suez:—G. *Ezzeit*, a mountain of Egypt, near the coaſt of the Red ſea; 110 miles S.S E. of Suez:—G. *Geranat*, a mountain of Arabia, on the right bank of the Nile; 28 miles N. of Enſeneh:—G. *Farah*, a mountain of Arabia; 15 miles S.W. of Ailah:—G. *Ibn Jakub*, a mountain of Arabia; 65 miles S.S.E. of Hali:—G. *Naklan*, a mountain of Egypt; 8 miles S.W. of Fayoum:—G. *Ollak*, a mountain of Abyſſinia, rich in gold; N. lat. 20° 50':—G. *El Silſili*, or the Chained mountain, a mountain of Egypt, on the E. ſide of the Nile, ſo called, becauſe in ancient times a chain was thrown acroſs the river; 42 miles N. of Syené:—G. *Sinan*, a mountain of the Arabian Irak; 25 miles N.W. of Baſſora:—G. *Tar*, a volcanic iſland in the Red ſea, anciently called *Combuſta*. N. lat. 15° 18'. E. long. 59° 19':—G. *Teileman*, a mountain of Egypt, on the W. ſide of the Nile; 12 miles N.N.W. of Syené:—G. *Teir*, or mountain of birds, a mountain of Egypt, on the E. bank of the Nile, named from a fabulous tradition that all the birds of the univerſe hold a council here annually; 24 miles N. of Enſeneh:—G. *Zaghir*, an iſland in the Red ſea. N. lat. 14°. E. long. 60° 28'.

Gebel-*Aroc*, a cluſter of ſmall iſlands in the Red ſea. N. lat. 13° 36'.

GEBER, in *Biography*, commonly called the *Arabian*, was a Greek by nation, according to Leo Africanus, who adds that he abandoned Chriſtianity and became a Mahometan. Other writers aſſert that Geber was born at Seville, in Spain, but that he was of Arabian origin; it is even affirmed that he was grandſon of Mahomet by his mother's ſide. There is equal difference of opinion as to the age in which he lived: according to Blancanus, he floriſhed in the ninth century; according to others in the eighth, and even in the ſeventh. This laſt period is moſt generally ſuppoſed to be the true one.

That Geber was a man of extenſive attainments, the catalogue of his writings, given in the Bibliotheca of Geſner, ſufficiently evinces. He was learned in chemiſtry, and is conſidered as having been one of the firſt reformers in that art. Paracelſus, who ſeldom beſtowed praiſe, called him the maſter of maſters in the art; and Boerhaave ſpeaks of him, in his Inſtitutes of Chemiſtry, with great reſpect. His works, indeed, contain much curious matter relative to the nature, purification, fuſion and malleability of the metals, with excellent hiſtories of the ſalts and acids: and the accuracy of many of his operations is ſurpriſing. He was addicted, however, to all the reveries and vain purſuits of the alchemiſts, and condeſcended occaſionally to uſe the myſtical jargon of the tribe. Dr. Johnſon is diſpoſed to derive the word *gibberiſh*, which he ſays was anciently written *gebriſh*, and probably ſignified the jargon of the alchemiſts, from Geber. The works of this author were publiſhed in Engliſh at Leyden by Richard Ruſſell, in 1668.—Eloy. Dict. Hiſt.

GEBESEE, in *Geography*, a town of Germany, in Thuringia; 8 miles N.N.W. of Erfurt. N. lat. 51° 10'. E. long. 10° 59'.

GEBIZEH, a town of Aſiatic Turkey, in Natolia, ſuppoſed to be the ancient Libyſſa, where Hannibal killed himſelf; 18 miles W. of Iſmid.

GEBRES. See Gaurs and Gentoos.

GEBROOKEN, one of the ſmaller Japaneſe iſlands, near the S. coaſt of Niphon. N. lat. 34° 36'. E. long. 139°.

GEBUL, a town of Syria; 20 miles S.E. of Aleppo.

GEBY, an iſland in the Eaſt Indian ſea, between Waygoo and Gilolo, about 15 miles long and 3 broad, on the equinoctial line. E. long. 129° 25'.

GECCO, or Gekko, in *Natural Hiſtory*, a name given by the Indians to their terrible poiſon, which kills in ever ſo ſmall quantity when mixed with the blood. They ſay that this gecco is a venomous froth or humour, vomited out of the mouths of their moſt poiſonous ſerpents, which they procure

procure in this fatal ſtrength, by hanging up the creatures by the tails, and whipping them to enrage them: they collect this in proper veſſels as it falls, and when they would uſe it, they either poiſon a weapon with it, or wounding any part of the fleſh, introduce the ſmalleſt quantity imaginable of it, and this is ſaid to be immediate death.

GECKO, in *Zoology*, a ſpecies of *Lacerta*, which diſcharges the poiſonous juice above-mentioned. See LACERTA *Gecko*.

GED, or GID, in *Ornithology*, an Engliſh name for the ſmall ſpecies of ſnipe, uſually called the *Jackſnipe*, or *Judcock*, and by authors *gallinago minima*. See SCOLOPAX *Gallinula*.

GEDAN, in *Geography*, a ſmall iſland in the Red ſea. N. lat. 16° 20′.

GEDAN, or *Ziden*, a town of Arabia; 30 miles S.S.E. of Jidda.

GEDDES, ALEXANDER, in *Biography*, was born at Arradowl, in the county of Banff, and in the pariſh of Ruthven, September 4, 1737, old ſtyle. His father's name was Alexander Geddes, the ſecond of four brothers. His mother's maiden name was Janet Mitchel; ſhe was born in Nether Dalachy, in the pariſh of Bellay. They were reſpectable, but not opulent farmers, ſuch as farmers are in that part of the country, ſubject to grievous oppreſſions from their landlords. In that ſtation, however, they maintained an excellent reputation, and laboured inceſſantly to give an education to their children, far above their rank. In their religious ſentiments they were liberal Roman Catholics, in whoſe library, we are told, the principal book was an Engliſh edition of the bible, which they taught their ſon to read with reverence and attention at a very early period. In his infancy, the principal facts contained in that book were familiar to his mind, and, before he had attained his eleventh year, he knew all its hiſtory by heart. He was afterwards ſent to Scalan, an obſcure place of education in the Highlands, at which thoſe young perſons were brought up, who had been devoted to the prieſthood, and who were deſtined to finiſh their ſtudies at a foreign univerſity. At this ſeminary, we have reaſon to believe, young Geddes laid the foundation of that ſuperior ſkill in the learned languages, for which he was afterwards ſo eminently diſtinguiſhed. In October 1758, he was ſent from Scalan, to the Scotch college in Paris, where he arrived about the end of December, after having narrowly eſcaped ſhipwreck in his paſſage from Aberdeen to Camphire. Mr. Gordon was then principal of the college. In a few days after his arrival, he began to attend the lectures, and entered immediately into rhetoric. He ſoon got at the head of the claſs; although there were two veterans in it. Vicaire was then profeſſor, and contracted a friendſhip for him, which laſted all his life. At the beginning of the next ſchool-year, he ſhould have entered into a courſe of philoſophy; but was perſuaded to ſtudy philoſophy at home at intervals, and to enter in divinity. He attended the lectures of M. M. Buré and De Saurent at the college of Navarre, and of Ladvocat, for the Hebrew, at the Sorbonne. Ladvocat was particularly attentive to him, and wiſhed much to have him remain at Paris; but other counſels prevailed; and he returned to Scotland in the year 1764. On his arrival at Edinburgh he was ſent to Dundee, to officiate as prieſt to the Catholics in the county of Angus. But he did not remain long in that ſtation; being removed in May 1765, to Traquaire, where he reſided nearly three years as domeſtic chaplain to the earl of Traquaire. Of this connection he was accuſtomed to ſpeak with ſatisfaction and gratitude, as having afforded him much leiſure for literary purſuits, and the uſe of a well-furniſhed library, admirably adapted to aſſiſt him in his favourite ſtudies. He left Traquaire in the autumn of 1768; and after a few weeks ſtay in Angus, returned to Paris, where he remained the following winter; during which he was moſtly in the king's and other libraries, and made ſeveral extracts from rare books, particularly Hebrew ones. In the ſpring of 1769, he returned to Britain, and undertook the charge of a conſiderable Roman Catholic congregation at Auchinhalrig, in Banffſhire. In the ſummer of 1770, he projected and built a new chapel on the ſame ſpot where the old one ſtood; and ſoon after made the old houſe at Auchinhalrig one of the moſt neat and convenient belonging to the Roman Catholic clergy in Scotland. This, and other unavoidable expences, encumbered him with debt; from which he was however relieved by the generoſity of the late duke of Norfolk. He then thought, that a little farm would help him to live more comfortably; but the conſequence was quite the reverſe; he was obliged to borrow money to ſtock it, and the failure of three ſucceſſive crops plunged him deeper in debt. In 1779, he left Auchinhalrig; after having continued during ten years in the aſſiduous diſcharge of the various duties belonging to his paſtoral office; and when he retired, it was with the moſt ſincere and unfeigned regret of all thoſe among whom he had miniſtered. The attention which he paid to the inſtruction of the young had never been ſurpaſſed, and but rarely equalled, by any of his predeceſſors.

His great learning, which began now to be univerſally known among the literati of the north, obtained for him, in the year 1780, a diploma, creating him doctor of laws, from the univerſity of Aberdeen. This was an honour that had never ſince the reformation been conferred by that body on a Roman Catholic. About this period Dr. Geddes came to London, and officiated for a few months as prieſt in the Imperial Ambaſſador's chapel, till it was ſuppreſſed at the end of the year 1780, by an order from the emperor Joſeph II. Dr. Geddes afterwards preached occaſionally at the chapel in Duke-ſtreet, Lincoln's-inn-Fields, till Eaſter 1782, when it is believed he totally declined the exerciſe of all clerical functions. It was at a much earlier period than this, that he formed a deſign of giving a new tranſlation of the whole bible. About the year 1760, he began to read with this view: he was then acquainted with only two verſions of that book, the vulgar Latin, and the vulgar Engliſh; in favour of the latter he had been much prepoſſeſſed in the early part of his life; but when he had acquired a knowledge of the Latin language, ſufficient to enable him to compare the two tranſlations, he gave a decided preference to the Vulgate. The Engliſh appeared to him rugged, conſtrained, and often obſcure, where the Latin was ſmooth, eaſy, and intelligible.

In the year 1762, he began to read the originals, with theſe verſions conſtantly before him, when he quickly diſcovered that the great object of the Engliſh tranſlators had been to give a ſtrictly literal verſion, at the expence of almoſt every other conſideration; while the author of the Vulgate had endeavoured to render the original equivalently, into ſuch language as was current in his age. Struck with the advantages of the latter method, Dr. Geddes immediately reſolved to follow the ſame plan if he ſhould ever tranſlate the bible. His original ideas, in this reſpect, though frequently reviewed by him, underwent but few alterations. The unwearied attention which he paid to the ancient verſions in the Polyglott confirmed him in the opinion, that a ſtrictly literal verſion was not the moſt proper to convey its meaning, and diſplay its beauties, ſince even thoſe tranſlators, who had the text to render, not into a different language, but only into different dialects of the ſame language, had not

attempted

attempted a ſtrictly literal verſion, and that thoſe of them who were the leaſt literal, had the moſt forcibly and intelligibly rendered their text. That Dr. Geddes ſhould have had, among the members of his own church, an hoſt of oppoſers, will not afford matter of aſtoniſhment to any one: he ſeems to have anticipated obloquy from the rich and the low vulgar, as the principal reward of an almoſt more than Herculean labour. But he was contented to go through evil as well as good report. He knew he had not a "mercenary ſoul;" the public knows, and poſterity will confeſs, that he poſſeſſed one expanded with the beſt principles of liberality and diſintereſtedneſs. "I expect not," ſays he, "exceſſive profits from exceſſive exertions. I truſt I ſhall never want meat, and clothes, and fire; to a philoſophic and contented mind, what more is neceſſary?"

It appears that Dr. Geddes had been engaged ſeveral years in this great undertaking before he ſaw any proſpect of meeting with encouragement ſufficient to make it public, if it were completed, and ready for the preſs. He had, in addition to difficulties common to ſituations of this kind, to contend with others peculiar to himſelf. He had a mind ardently intenſe in the purſuit and inveſtigation of truth. He could not brook error in any perſon, however exalted, nor would he hear it advanced and maintained, without ſhewing the indignation of a high and noble ſpirit. The ſentiment contained in the preface to his letter, addreſſed to the Engliſh Catholics, was one of the leading maxims by which his life was governed. "At any rate, I do what I think it my duty to do, and do it fairly and openly. In the following pages, ye will find neither palliation nor diſguiſe. I pour out my ſentiments with the ſame ſincerity as if I were before the tribunal of Him who is to judge the living and the dead. Miſtake I may, but prevaricate I never will." Such a ſpirit ſhewn in almoſt every act of his life, and in all the ſocial intercourſes and connections with the world, though meriting the applauſe of every honourable mind, was not the moſt likely to conciliate the regards of thoſe who might have afforded him real and effectual aſſiſtance. After he had ſpent much of his valuable life in biblical ſtudies, he complains of having met with a long and cruel interruption to them, and ſays, "I had but little hopes of ever being in a ſituation to reſume them, when Providence threw me into the arms of ſuch a patron as Origen himſelf might have been proud to boaſt of, a patron, who, for theſe ten years paſt, has, with a dignity peculiar to himſelf, afforded me every conveniency that my heart could deſire towards the carrying on and completing of my arduous work." The public are not now to be told that this liberal patron, of high and diſtinguiſhed worth, and of biblical literature, was the late excellent lord Petre.

In the year 1786, Dr. Geddes publiſhed his "Proſpectus of a new Tranſlation of the Bible," which excited very conſiderable attention; and in 1788 he publiſhed "Propoſals for Printing by Subſcription a New Tranſlation of the Bible, &c." but it was not till the ſpring of the year 1792, that the firſt volume of this work made its appearance. The volume contained the firſt ſix books of the Old Teſtament, and was dedicated to his excellent patron lord Petre. Soon after the publication, three vicars apoſtolic, who ſtyled themſelves the biſhops of Rama, Acanthos, and Centuriæ, iſſued a paſtoral letter, addreſſed to their reſpective flocks, warning them againſt the reception of Dr. Geddes's verſion. This unwarrantable ſtretch of eccleſiaſtical power occaſioned a correſpondence between Dr. Geddes and the biſhop of Centuriæ, in the courſe of which, the prelate, probably feeling his own impotence in argument, availed himſelf of the little brief authority of office, and declared the doctor ſuſpended from the exerciſe of his eccleſiaſtical functions unleſs he would ſignify his ſubmiſſion to an injunction contained in the paſtoral letter. The worthy doctor was not to be intimidated: no dread of perſonal inconvenience could arreſt him in his progreſs. His reply was conceived in highly animated terms, and admirably adapted to the circumſtances of the caſe. And in a ſtill longer letter to the biſhop of Centuriæ, he ſays, "I truſt ye will not deem it preſumption in me to grapple with biſhops; indeed, I would boldly grapple with popes, if popes dared to injure me. Our Catholic anceſtors frequently grappled with them, and ſometimes came off victorious. A pope, and conſequently a biſhop, may do wrong, and if he do wrong, may be told of it even by an inferior." In the year 1797, the ſecond volume of the Tranſlation was given to the world. In the preface to this volume, the author controverts and indeed gives up the popular doctrine of the abſolute and plenary inſpiration of the Scriptures: he conſiders the Hebrew hiſtorians to have written, like all other hiſtorians, from ſuch human documents as they could find; conſequently, like them, liable to miſtakes. The doctor alſo gave up as fabulous, and totally unworthy of the divine goodneſs, ſuch commands and injunctions, as appeared to his mind to be unworthy even of human authority; and in this view of the ſubject he denied, without heſitation, that the command given to deſtroy the Canaanites could be of divine origin.

In his volume of "Critical Remarks," publiſhed in 1800, he entered into a full vindication of this theory. If the mention of obnoxious opinions created him an hoſt of opponents, a juſtification of them was not likely to abate their fury, nor very much diminiſh their number. As he wrote to pleaſe no party, he had enemies in every party, and indeed to a perſon who thought and wrote ſo freely, this will not be unexpected. Dr. Prieſtley even, who had himſelf been a thouſand times calumniated as an unbeliever, ſeemed to doubt if ſuch a man as Geddes, who believed ſo little, and who conceded ſo much, could be a Chriſtian. To doubts of every deſcription, and to all his various opponents, the doctor replied, in a work entitled "A General Anſwer to the Queries, &c." He had before this given a tolerably explicit avowal of his creed. "The goſpel of Jeſus is my religious code: his doctrines are my deareſt delight: his yoke is eaſy, and his burthen light; but this yoke I would not put on; theſe doctrines I could not admire; that goſpel I would not make my law, if reaſon, pure reaſon, were not my prompter and preceptreſs. I willingly profeſs myſelf a ſincere, though unworthy diſciple of Chriſt: Chriſtian is my name, and Catholic my ſurname. Rather than renounce theſe glorious titles, I would ſhed my blood, but I would not ſhed a drop of it for what is neither Catholic nor Chriſtian."

Beſides the tranſlation of the early books of the Bible, the Critical Remarks, and thoſe other works to which we have already referred, we ſhould notice, as highly deſerving the attention of the biblical ſcholar, a letter to the biſhop of London, 1787. In 1793, he wrote an addreſs to the public on the publication of his new tranſlation: and in the ſucceeding year, his letter to, and correſpondence with, the biſhop of Centuriæ, were publiſhed. As a controverſialiſt, Dr. Geddes diſtinguiſhed himſelf in the year 1787, by a letter to Dr. Prieſtley, in defence of the divinity of Jeſus Chriſt; and by a letter to a member of parliament, on the expediency of a general repeal of all penal ſtatutes that regard religious opinions. In a modeſt apology for the Roman Catholics of Great Britain, publiſhed in the ſpring of 1800, Dr. Geddes has diſplayed much zeal in defence of the tenets to which he adhered; great moderation when deſcanting upon the injuries to which himſelf and brethren

were

were ſubject, by the continuance of perſecuting laws; and found reaſoning when he argues in behalf of the juſtice and policy of aboliſhing all legal diſabilities for conſcience ſake. This work deſerves the attentive peruſal of the liberal and candid of every ſect. The author has taken large and comprehenſive views of his ſubject; and has, in the diſcuſſion of it, diſplayed great ingenuity and acuteneſs—very extenſive reading—great variety and depth of learning—uncommon vigour of thought and energy of diction. He was author of many lighter pieces, poetical and proſe. In purſuing his great work Dr. Geddes intended next to have preſented the world with a new tranſlation of the book of Pſalms; but during the laſt year of his life, his literary purſuits were greatly interrupted by a long ſeries of painful affliction, yet in every interval of eaſe he applied himſelf to a work in which his heart was engaged. He had already printed one hundred and four of the Pſalms, and had prepared completely for the preſs as far as the 118th, when he was arreſted by a moſt painful and excruciating diſorder, which terminated his valuable and important life on the 26th of February 1802. The tranſlation of the book of Pſalms was publiſhed in 1807, as a poſthumous work, by his highly valued friends the Rev. Dr. Diſney, and Charles Butler, eſq.

Dr. Geddes's diſpoſition was truly philanthropic and benevolent, and his wit and vivacity contributed greatly to the delight of the ſocial parties in which he mixed. He was a ſtrenuous and uniform advocate for uncontrolled freedom of opinion, and freedom of diſcuſſion: he was, in the ſtricteſt ſenſe of the word, a genuine Catholic, extending his good will to all of every ſect and party, and diſpoſed to grant to others every privilege which he claimed for himſelf. Monthly Magazine, 1802. New Annual Register. Good's Life of Geddes.

Geddes, James, a learned Scotch writer, deſcended from a reſpectable family in the county of Tweedale, was born about the year 1710. In early life, he made a rapid progreſs in the learned languages, and in the elements of philoſophy, and ſoon entered with ſpirit into the ſentiments, and felt the beauties of the ancient writers. Having gone through his elementary courſe at ſchool, he was transferred to the univerſity of Edinburgh, where he made conſiderable proficiency in mathematics and natural philoſophy, under the tuition of the celebrated Maclaurin. His attention at a proper period was directed to the law, and he was admitted an advocate. For ſeveral years he practiſed at the bar with a high and uniformly increaſing reputation, and afforded flattering hopes of riſing to eminence in his profeſſion, but he died of a decline while he was young. His private character was amiable, and his loſs was ſincerely lamented by all who knew him. He retained through life that reliſh for ancient literature which he had imbibed in his youth, and devoted what time he could ſpare from the duties of his buſineſs, and the affairs of his family, to the ſtudy of the ancient poets, philoſophers, and hiſtorians. He was author of "An Eſſay on the compoſition and manner of writing of the Ancients, particularly Plato." This was publiſhed after his death, and it was once intended to print ſome of the other papers which he left behind him.

Geddes, Michael, a learned divine who flouriſhed in the ſeventeenth and eighteenth centuries. The time and place of his birth are not known, nor is it aſcertained where he was educated. He is firſt noticed in the capacity of chaplain to the Engliſh factory in that city, the duties of which he diſcharged for nearly ten years But during that time, *viz.* in the year 1686, he was ſummoned to appear before the court of Inquiſition. On his entrance before the judges they received him with an affectation of civility, and deſired him to be ſeated, but almoſt before he could accept of their offer they ſternly demanded how he dared to preach, or to perform any of the duties of his office in that city. Geddes, knowing upon what ground he ſtood, was not to be intimidated, he boldly replied that he enjoyed that liberty by virtue of an article in the treaty between the crowns of Portugal and England; that it was a privilege which had never been called in queſtion, and that he had reſided at Liſbon eight years, during which time he had ſerved the Engliſh factory in the capacity of chaplain, as others had done before him. To theſe declarations they replied, in defiance of all truth and modeſty, that they had been ignorant that ſuch liberty had been aſſumed by him and others, or that it ſhould not have been allowed. They then ſtrictly enjoined him to miniſter no more to his congregation. Letters of complaint were addreſſed by the factory to the biſhop of London, but before their arrival the prelate was ſuſpended, and no hopes of redreſs could be expected from the arbitrary and tyrannical James, by whom and his courtiers the Portugueſe were probably excited to this ſtep. In this ſtate of affairs, Mr. Geddes, finding himſelf no longer of uſe to the Engliſh reſidents, thought it adviſable to return to his native country, which he did in 1688. In a ſhort time after this he was created doctor of laws, and made chancellor of the dioceſe of Sarum. He died about the year 1714, leaving behind him ſeveral valuable works. Among theſe were "The hiſtory of the church of Malabar, from the time of its being diſcovered by the Portugueſe, in the year 1501, and of the Synod of Diamper, celebrated in the year 1599." "The church hiſtory of Ethiopia, including an account of the two great Roman Miſſions into that empire." "The Council of Trent, no free Aſſembly &c. &c." Alſo three volumes of "Miſcellaneous Tracts," relating to ſubjects in civil and eccleſiaſtical hiſtory; ſeveral Tracts againſt Popery, and the life of "Don Alvaro de Luna." Biſhop Burnet, who was his acquaintance and friend, ſays "he was a learned and wiſe man. He had imbibed a true notion of popery, as he had found it eſtabliſhed in Portugal, and as it was known in this country during the reigns of the Stuarts, as a political combination, managed by falſehood and cruelty to eſtabliſh a temporal empire in the perſons of the popes." Burnet's Hiſt. of Reformation.

GEDDINGTON, in *Geography*, a pariſh in the hundred of Corby, Northamptonſhire, England, has been formerly a place of note; as king Henry II. held a parliament here in 1188, to raiſe money for a cruſade. Nearly in the centre of the village is a ſtone croſs, which king Edward I. raiſed to perpetuate the memory of his queen, Eleanor. This croſs conſiſts of a triangular ſhaft, raiſed on ſteps, and is decorated with various ornaments and ſtatues in niches. A plan, view, and details of it are publiſhed in "the Architectural Antiquities of Great Britain," wherein its hiſtory is narrated, with accounts of other croſſes erected on the ſame occaſion. See vol. X. of this work, under the word Cross. This village conſiſts of 152 houſes, which are occupied by 663 inhabitants. Beauties of England and Wales, vol. xi.

GEDER, and Gederoth, in *Ancient Geography*. See Gadara.

Geder, in *Geography*, a town of Aſiatic Turkey, in the government of Sives; 15 miles S.W. of Amaſieh. See Amasieh.

GEDERN, or Geudern, a town of Germany, in the county of Konigſtein; 25 miles S.E. of Gieſſen.

GEDIDE, a town of the Arabian Irak, on the Euphrates; 16 miles S.E. of Bagdad.

GEDIN-

GEDINGOOMA, a town of Africa, in Kaarta; 30 miles N.W. of Kemmoo.

GEDINNE, a town of France, in the department of the Sambre and Meuſe, and chief place of a canton in the diſtrict of St. Hubert. The place contains 270, and the canton 6340 inhabitants, on a territory of 347½ kiliometres, in 32 communes.

GEDOYN, Nicholas, in *Biography*, a French abbè, was born at Orleans in 1667. He was educated at the Jeſuits' college in Paris, and afterwards entered their ſociety, in which he remained ten years. He then quitted it, and appeared in the world as a man of gallantry and letters, and a wit. He was intimate with the celebrated Ninon de l'Enclos, but his way of life did not injure his fortune, for he was preſented with ſeveral inſtances of church preferment. He was, on account of his great literary reputation, admitted a member of the Academy of Belles Lettres, and alſo of the French academy. He died in 1744, leaving behind him the character of a man of ſtrict integrity, of great urbanity and candour. He was a great admirer of antiquity, and held all attempts in poetry and eloquence as vaſtly inferior to the maſter-pieces of the ancients. He publiſhed "Œuvres Diverſes" a collection of diſſertations on moral and literary topics: and he was the tranſlator of Quintilian and Pauſanias: his verſion of the firſt is accounted one of the moſt elegant performances of the kind; and his tranſlation of Pauſanias is alſo elegant, and is enriched with learned notes. Moreri.

GEDROSIA, in *Ancient Geography*, an extenſive province of Aſia, bounded on the W. by Carmania, on the N. by Drangiana and Arachoſia, on the E. by Guzerat, a province of India, and on the S. by the Indian ocean. It is now called *Makran*; which ſee. Its chief river was the Arbis; and its principal cities were Poſis, Arbis, and Cuni. It was anciently inhabited by the Arbitæ, Parſiræ, Maſarnæi, and the Rhamnæ; and was divided into eight provinces or ſatrapies, containing twelve conſiderable towns. Marcian of Heraclea and Ptolemy place in this county a famous emporium, called γυναικων λιμην, or the "Haven of Women."

GEDUMAH, in *Geography*, a country of Africa, on the eaſt ſide of the river Senegal, governed by a king, who is a Mahometan; bounded on the N. by Sahara, or the Great Deſert, on the E. by Jaffnoo, on the S. by Jaaga, and on the W. by Foota-Torra; of a ſquare form, about 60 miles each way. N. lat. 14° 50′ to 16°. W. long. 9° 40′ to 11° 20′.

GEDWABENEN, a town of Pruſſia, in the province of Oberland; 6 miles N.W. of Paſſenheim.

GEEL, John Van, in *Biography*, an hiſtorical painter of the Dutch ſchool:—one of thoſe imitators of Metzu, whoſe works ſerve not to aid the credit of the maſter, but more to puzzle the connoiſſeur and aſſiſt the picture-dealer in his nefarious practices of impoſition upon thoſe amateurs of painting whoſe zeal ſurpaſſes their knowledge. The arrangement of his pictures, and his colour and character of ſubjects, are the ſame with thoſe of Metzu; and his works are therefore conſtantly miſtaken for thoſe of that painter.

GEELE, or Gheele, or *Gele*, in *Geography*, a town of Brabant; 10 miles N.W. of Dieſt.

GEEMSKERSKOI Nos, a cape on the eaſt coaſt of Nova Zembla. N. lat. 77° 10′. E. long. 77° 14′.

GEEONG, a town of the iſland of Borneo. N. lat. 5° 10′. E. long. 117° 10′.

GEER, Charles de, in *Biography*, a celebrated naturaliſt, deſcended from an ancient noble Dutch family, eſtabliſhed in Sweden, in the time of Guſtavus Adolphus, an individual of which, introduced into that country various improvements in the manufactures and mechanical arts, particularly in the method of caſting and working in braſs, and on that account was ennobled. The ſubject of this article was born in 1720, and in his fourth year accompanied his parents to Holland, from which he returned to Sweden at the age of eighteen. At this period he had made very conſiderable progreſs in his ſtudies in natural hiſtory under Linnæus and other celebrated profeſſors; and by the death of his uncle he came into poſſeſſion of a conſiderable ſhare in the iron works of Dannemora, and it being then very difficult and expenſive to keep them free of water, he did a great and moſt important ſervice to theſe mines by the activity with which he promoted the improvements made in the machinery. By his other inventions he obtained conſiderable property, but the riches which he acquired by his genius and induſtry, he privately ſhared with the poor, and built or repaired churches, and eſtabliſhed various ſchools. His leiſure time he devoted to the ſtudy of the minuter parts of creation, which, by the help of glaſſes, he carried to a great degree of perfection. In the year 1761 he was appointed marſhal of the court, and knight of the Polar ſtar, and in 1772 he was made commander of the order of Vaſa, with the grand croſs, and in a few months he was raiſed to the dignity of baron. He died in March 1778, having at that time the laſt volume of his work upon inſects in the preſs. De Geer had cauſed his obſervations on this ſubject to be inſerted in the Tranſactions of the Learned Societies; but as they increaſed, he reſolved to publiſh them in ſeparate volumes, the firſt of which appeared in the year 1752 under the title of "Memoires pour ſervir à l'hiſtoire des Inſectes." Nineteen years afterwards the ſecond volume appeared, and in 1779 the ſeventh and laſt was publiſhed. On account of his extenſive knowledge of entomology he was called the Swediſh Reaumur. He was author of "An Oration on the procreation of Inſects," and alſo of many papers in the tranſactions of the academies of Stockholm and Upſal. Gen. Biog.

Geer, in *Mining*, ſignifies the feagh or refuſe ſpar and other matters from a mineral vein.

Geer-*barrel*, is the tub or barrel in which the ſpar or ore is drawn up the ſhaft from the mine, and diſcharged on the hillock.

GEERABAR, in *Geography*, a town of Bengal; 8 miles N.W. of Koonda.

GEERAR, a town of Hindooſtan, in Oude; 21 miles N.E. of Notchegong.

GEERING, in *Rural Economy*, a term applied provincially to the ladders and ſide-rails of a waggon or large cart.

GEERS, a term ſignifying the harneſs or trappings of draught or team-horſes.

Geers, in *Mining*, are two pieces of wood ſet up like a St. Andrew's croſs, or ×, at each ſide of a mine-ſhaft, and connected together by other pieces, for ſupporting the turn-tree or roll on which the rope winds for drawing up the geer-barrel and ore, or for winding water, and for drawing up and letting down the miners in ſome inſtances. See Stowse and Turn-tree.

Geers, in a *Ship*. See Jeers.

GEERVLIET, in *Geography*, a town of Holland, in the iſland of Putten; 5 miles from the Brill.

GEESE, a well known ſort of bird. See Goose.

GEESEH, in *Geography*, a village of Abyſſinia, near the ſource of the Nile. N. lat. 10° 59′. E. long. 86° 56′.

GEESTE, a river of Bremen, which fills the ditches of Cailſburg, and runs a little below into the Weſer.

GEETE,

GEETE, a river of Brabant, which runs into the Demer at Helen.

GEEVACH, mountains of Ireland, in the counties of Leitrim and Roſcommon, which contain ſeveral coal-mines; amongſt others thoſe which have been worked at Arigna.

GEFLE, a river of Sweden, which paſſes by the town of the ſame name, and runs into the gulf of Bothnia, about 10 miles below it. Here it begins to be navigable for veſſels drawing 9 or 10 feet of water.

GEFLE, or *Giavle*, a town of Sweden, in the province of Geſtricia, on an arm of the gulf of Bothnia, which divides the town, and ſurrounds it; thus forming two iſlands. This town is ancient; the houſes are conſtructed partly of brick or ſtone, plaiſtered white, which have a neat appearance, and partly of wood. It is commercial, has a good harbour, and is the reſidence of many rich merchants; its principal exports are iron, pitch and tar, and planks; many of its inhabitants are fiſhermen; 60 miles N. of Upſal. N. lat. 60° 42'. E. long. 16° 57'.

GEFREES, a town of Germany, in the principality of Bayreuth; 12 miles N.N.E. of Bayreuth. N. lat. 50° 5'. E. long. 10° 50'.

GEFRORN. See BRENNER.

GEGADIVAY, a town of Hindooſtan, in the Myſore; 8 miles S.E. of Kiſtnagheri.

GEGE, a river of Pruſſian Lithuania, which runs into the Wilde; 2 miles S.E. of Plaſchken.—Alſo, a town of Hindooſtan, in Cochin; 25 miles E. of Cochin.

GEGENDA, a town of European Turkey, in Bulgaria, on the Danube; 20 miles W. of Nicopoli.

GEGENES, Γεγενεις, in *Antiquity*. The ancients generally called themſelves Γεγενεις, *ſons of the earth*, as Heſychius informs us. Alluding to the ſame original, the Athenians ſometimes ſtyled themſelves Τεττιγες, *graſshoppers*; and ſome of them wore graſshoppers of gold faſtened to their hair, as badges of honour, to diſtinguiſh them from others of leſs antiquity, and leſs noble extraction, becauſe thoſe inſects were believed to be generated out of the ground. Pott. Archæol. Græc. lib. 1. cap. 1.

GEGENY, in *Geography*, a town of Hungary; 23 miles E. of Gros Wardein.

GEGLACKE, a town of Pruſſia, in Natangen; 10 miles N.E. of Raſtenburg.

GEGNO, a town of Italy, in the department of the Lario; 3 miles N. of Como.

GEHANPENNA, a town of Hindooſtan; 7 miles N.W. of Delhi.

GEHARCONDA, a town of Hindooſtan, in Candeiſh, on the river Oodah Ootale; 50 miles E. of Burhanpour.

GEHENNA, Γεεννα, a ſcripture term, which has given ſome perplexity to the critics. It occurs in St. Matthew, v. 22. 29, 30. x. 28. xviii. 9. xxiii. 15. 33. Mark, ix. 43. 45. 47. Luke, xii. 5. James, iii. 6.

The authors of the Louvain and Geneva verſions retain the word *gehenna*, as it ſtands in the Greek; the like do M. Simon and the Latin tranſlators; but the Engliſh tranſlators render it by *hell* and *hell-fire*; and the like do the tranſlators of Mons, and father Bohours: but it is indiſputable, that it is employed in the New Teſtament to denote the place of future puniſhment; whereas in the Old Teſtament we do not find this place mentioned in the ſame manner. Accordingly, the word γεεννα does not occur in the Septuagint; and as it is not a Greek word, it is not to be found in the Greek claſſics. It is originally a compound of the two Hebrew words גיא הנם; *ge hinnom*, the valley of Hinnom, a place near Jeruſalem, firſt mentioned in the book of Joſhua, (ch. xv. 8.) It was there that the cruel ſacrifices of children were made, by cauſing them to paſs through fire, to Moloch, the Ammonitiſh idol (2 Chron. xxxiii. 6.) It was alſo called "Tophet," (2 Kings, xxiii. 10.), as it is ſuppoſed, from the noiſe of drums (Toph ſignifying a drum), a noiſe produced on purpoſe to drown the cries of the helpleſs infants. King Joſiah, to render this place for ever abominable, made a cloaca, or common ſewer thereof, where all the filth and carcaſes in the city were caſt.

The Jews obſerve farther, that there was a continual fire kept up there, to burn and conſume thoſe carcaſes; for which reaſon, as they had no proper term in their language to ſignify *hell*, they made uſe of that of *gehenna*, or *gehinnom*, to denote a fire inextinguiſhable.

As this place was, in proceſs of time, conſidered as an emblem of hell, or the place of torment reſerved for the puniſhment of the wicked in a future ſtate, the name "Tophet" came gradually to be uſed in this ſenſe, and at length to be confined to it. This is the ſenſe, as Dr. Campbell (Prel. Diſſ. to the Four Goſpels) conceives, in which gehenna, a ſynonymous term, is always to be underſtood in the New Teſtament, where it occurs twelve times. In ten of theſe there can be no doubt; in the other two the expreſſion is figurative; but the figure is taken, without queſtion, from that ſtate of miſery which awaits the impenitent. Thus, the Phariſees are ſaid to make the proſelyte, whom they compaſs ſea and land to gain, two-fold more a child of hell, υιος γεεννης, than themſelves (Matt. xxiii. 15); an expreſſion both ſimilar in form, and equivalent in ſignification to υιος Διαβολου, ſon of the devil, and υιος της απολειας, ſon of perdition. In the other paſſage (James, iii. 6.) an unruly tongue is ſaid to be ſet on fire of hell, φλογιζομενη υπο της γεεννης.

GEHMEN, in *Geography*, a town of Germany, and capital of a lordſhip in the circle of Weſtphalia, ſituated on the Aa, within the biſhopric of Munſter. The inhabitants are Lutherans and Calviniſts, each of whom have a church; 16 miles N.E. of Weſel. N. lat. 51° 55'. E. long. 6° 45'.

GE-HO, a town of Chineſe Tartary; 100 miles N.E. of Pekin. N. lat 41° 3'. E. long. 117° 32'.

GE-HOFEN, a town of Germany, in the county of Mansfeld.

GEHRDEN, a town of Germany, in the principality of Calenberg; 6 miles W.S.W. of Hanover.

GEHREN, a town of Germany, in the county of Schwartzburg; 10 miles S. of Arnſtadt.

GEIBENHEIM, a town of France, in the department of the Upper Rhine; 12 miles N E. of Beforte.

GEJER, MARTIN, in *Biography*, a learned German, was born at Leipſic in the year 1614, where he was regularly educated. He was created a doctor in divinity, profeſſor of Hebrew, miniſter of St. Thomas's, and afterwards preacher, confeſſor, and member of the eccleſiaſtical council of the elector of Saxony. He died at the age of ſixty-ſeven in the year 1681. He was author of Commentaries on the books of Pſalms, Proverbs, Eccleſiaſtes, and Daniel, and many other works abounding in erudition. Theſe were afterwards collected and printed in two vols. folio. Moreri.

GEIHOUN, in *Geography*, a river of Syria, which runs into the bay of Alexandretta. N. lat. 36° 40'.

GEIKIN, a river of Perſia, which ſeparates the province of Kerman from Mecran, and runs into the Indian ſea; 60 miles S.W. of cape Jaſques.

GEIL, a river which riſes in the county of Tyrol, paſſes through Upper Carinthia, and joins the Drave, near Villach.

GEILENKIRCHEN, a town of France, in the department of the Roer, and chief place of a canton, in the diſtrict of Aix-la-Chapelle. The place contains 431, and the canton 12,245 inhabitants, in 46 communes: 8 miles N.W. of Juliers. N. lat. 50° 57′. E. long. 6° 10′.

GEILGARBEN, a town of Pruſſia, in Samland; 15 miles N.E. of Konigſberg.

GEILSDORF, a town of Saxony, in the Vogtland; 5 miles S.S.W. of Plauen.

GEILSTATT, a town of Germany, in the biſhopric of Bamberg; 3 miles N. of Bamberg.

GEILZHEIM, a town of Germany, in the principality of Anſpach.

GEIRA, a town of Aſiatic Turkey, in Natolia, anciently *Aphrodiſias*, a city of Caria; 60 miles E.S.E. of Guzelhiſar.

GEISEL, a river of Saxony, which runs into the Saale; 5 miles S. of Halle.

GEISELAND, a town of Germany, in the county of Schwarzenburg; 16 miles N. of Schainfeld.

GEISELWINDEN, a town of Germany, in the county of Schwarzenburg; 8 miles E. of Schainfeld.

GEISENFELD, a town of Bavaria; 9 miles S.E. of Ingolſtadt.

GEISENHEIM, a town of Germany, in the circle of the Lower Rhine; 17 miles W. of Mentz.

GEISING, a town of Saxony, in the margraviate of Meiſſen; 20 miles S. of Dreſden.

GEISINGEN, a town of Germany, in the principality of Furſtenberg; 14 miles N. of Schaffhauſen.

GEISLEDE, a river of Germany, which runs into the Leine, near Heiligenſtadt, in the territory of Eichsfeld.

GEISLINGEN, a town of Germany, in the circle of Swabia, on the Kocher, containing two churches; 12 miles W. of Ulm. N. lat. 48° 34′. E. long. 9° 50′.

GEISMAS, a town of Germany, in the principality of Heſſe; 22 miles W. of Gottingen. N. lat. 51° 20′. E. long. 9° 24′.

GEISON. See GISON.

GELSPOLCHEIM, a town of France, in the department of the Lower Rhine, and chief place of a canton, in the diſtrict of Straſbourg; 6 miles S.S.W. of Straſbourg. The place contains 2086, and the canton 11,683 inhabitants, on a territory of 135 kiliometres, in 14 communes.

GEISSELBORING, a town of Bavaria; 9 miles S.W of Straubing.

GEISSERN, a town of the archbiſhopric of Salzburg; 32 miles S. of Salzburg.

GEISSING SEE, a lake of Carinthia; 12 miles N. of Feitkirchen.

GEISSORRHIZA, in *Botany*, from γεισσον, a *penthouſe*, and ῥιζα, a *root*, alluding to the imbricated ſcales which clothe that part. Gawler in Curt. Mag. v. 18. t. 672. Sim's and Konig's Annals of Botany, v. 1. 223. A genus formed by Mr. Gawler, (now Ker Bellenden), out of *Ixia*, from which, according to him, it differs in having inclined ſtamens. Examples of it, beſides the plate above quoted, are *Ixia Rochenſis*, Curt. Mag. t. 598; *ſecunda*, t. 597; and *exciſa*, t. 584.

GEISTOL, in *Geography*, a river of Stiria, which runs into the Kainach, near Moſkirchen.

GEITHAYN, or GEITHEN, a town of Saxony, in the circle of Leipzig; 20 miles S.S.E. of Leipzig. N. lat. 51° 2′. E. long. 12° 39′.

GEKELEMUEKPECHUENK, a town of America, belonging to the Delaware Indians, on a creek of the ſame name, a head-water of the Muſkingum. This was the northernmoſt Moravian ſettlement of Muſkingum river. It lies 12 miles N.E. by N. from Salem, and 78 N. weſterly from Pittſburg.

GEKKO, and GEKKONES. See LACERTA.

GELA, in *Ancient Geography*, a town of Sicily, ſituated on the ſouthern coaſt at a little diſtance from the ſea, near the river Gela. This city was built by Antiphemus of Rhodes and Entimus of Crete, 713 years before the Chriſtian era. The ruin is now called "Fiume di Terre Nuova."

GELÆOPACHIA, in *Natural Hiſtory*, the name of a claſs of mineral fluids, which are inflammable, and of ſomewhat thick texture, and opake. The word is derived from the Greek γη, the *earth*, ελαιον, *oil*, and παχυς, *thick*. The bodies of this claſs are the Barbadoes tar, oil of earth, and the common piſſaſphaltum of the ſhops; which ſee under their ſeveral heads.

GELÆOPSILA, the name of a claſs of foſſils. The word is derived from the Greek γη, *earth*, ελαιον, *oil*, and ψιλος, *thin*, and expreſſes a thin oily ſubſtance naturally found in the earth. Theſe are thin and pellucid inflammable liquid ſubſtances, commonly known by the name of liquid bitumens, but by that denomination confounded with the thicker and coarſer kinds. The only bodies of this claſs are thoſe commonly diſtinguiſhed by the names of naphtha and petroleum.

GELALEAN CALENDAR. See CALENDAR.

GELANDRI, in *Ancient Geography*, a town ſituated on the bank and to the right of the river Danapris (the Dnieper), near the fourth cataract of this river.

GELASANI DENTES, a term uſed by ſome authors to expreſs the four middle fore-teeth, both of the upper and under jaw. They have their name from the Greek, γελος, *laughter*, becauſe they are ſhewn when people laugh.

GELASIUS I., in *Biography*, an African by birth, was admitted to the papal dignity in the year 492, on the death of Felix III., to whom he had been ſecretary. He was, almoſt immediately after his inſtallation, engaged in a diſpute with Euphemius, patriarch of Conſtantinople, reſpecting the name of Acacius being eraſed from the ſacred diptychs, or regiſters. Euphemius contended that the people and clergy would not and ought not to ſubmit to ſuch an indignity on the memory of their patriarch. To this repreſentation, Gelaſius replied in a moſt arrogant ſtyle, and declared his fixed reſolution not to be reconciled to the church of Conſtantinople while the name of Acacius was kept in the diptychs. This obſtinacy of the pope gave great uneaſineſs to the Catholic biſhops of the Eaſt, who were ſenſible of the advantage which the Eutychian party would derive from the continuance of the breach between them and Rome; and they applied to the ambaſſador, Fauſtus, who wrote to the pope, appriſing him of the fatal conſequences which they apprehended to their cauſe, if he ſhould perſiſt in his reſolution. The pope was, however, inflexible, till at length the eaſtern biſhops ſeparated themſelves from the communion of Rome, ſtruck out the name of Gelaſius from the diptychs, and unanimouſly reſolved neither to communicate with him, nor with any perſon who ſhould do ſo. Thus the pope loſt the moſt favourable opportunity of healing the ſchiſm which ſubſiſted between the eaſtern and weſtern churches. The breach was, indeed, during his pontificate, made much wider.

In 494, Gelaſius wrote letters to the biſhops of Dalmatia, and afterwards to thoſe of Dardania, juſtifying his own conduct in the buſineſs of Acacius; and urging them to oppoſe with vigour the Eutychians and Pelagians, and to treat them as enemies to the church, and rebels to St. Peter. In the year 495, he held a council of forty-ſix biſhops at Rome, at which was re-admitted to the communion of the church, and to his epiſcopal rank and ſee, Miſenus, biſhop of Cumæ, who had been depoſed and excommunicated under the pontificate of Felix III. for communicating with Acacius. Before, however, ſentence of abſolution was pronounced in favour of Miſenus, he was obliged ſolemnly to declare that he condemned, anathematized, and for ever execrated all who held communion with Acacius, or lived in communion with his ſucceſſors and abettors. During the papacy of Gelaſius, the Manichæan ſect began to revive at Rome, on which occaſion he iſſued a decree, by which all perſons who embraced their ſentiments were condemned to baniſhment, and their books burnt: and as it was cuſtomary with thoſe who were tinctured with their opinions to receive only the bread at the celebration of the Sacrament of the Lord's Supper, but to refuſe the wine, he condemned that practice in the ſtrongeſt terms, and ordered thoſe who refuſed the communion in both kinds, to be excluded from either, "becauſe," ſaid he "one and the ſame myſtery cannot be divided without ſacrilege." Gelaſius died in the year 496, having filled the high office of pope almoſt five years. He was author of many works, ſome of which were written avowedly in juſtification of his own conduct in ſuppreſſing hereſies, and in the abſolution of Miſenus. His moſt celebrated piece is "A Treatiſe againſt Eutyches and Neſtorius, concerning the two natures of Chriſt. As many of his other productions were inſerted in the "Collectio Conciliorum," ſo this was inſerted in the eighth volume of the Biblioth. Patrum. Gelaſius is thought to have been the author of the "Codex Sacramentarius," which is a collection of ſuch forms of public prayers and adminiſtrations of the ſacraments as were in uſe in the church of Rome in his time, digeſted in a new order, and including many additional forms of his own. The manuſcript of this codex was unnoticed for many ages, till, at the diſperſion of the Florentine library, it fell into the hands of Paul Petau, by whoſe ſon it was placed in the library of Chriſtina, queen of Sweden; at her deſire it was printed, for the firſt time, at Rome, in 1680. Moreri. Bower.

GELASIUS II. pope, was born of an illuſtrious family at Gaeta, in Campania. In early life he embraced the monaſtic ſtate among the Benedictines, applied himſelf with great diligence to his ſtudies, and acquired a high character for learning, abilities, and virtue. Pope Urban II. made him his ſecretary, and in the year 1088 preferred him to the dignity of cardinal deacon. Not long after this he was appointed chancellor of the Roman church. Upon the death of pope Paſchal, in 1118, he was unanimouſly choſen his ſucceſſor by the cardinals and Roman clergy, when he, who had been known before by the name of John of Gaeta, on account of the place of his birth, aſſumed the title of Gelaſius II. The imperial party at Rome were ſo enraged at this choice, which had been made without their conſent or knowledge, that Frangipani, one of the moſt powerful of the Roman nobility, aſſembled a body of armed men, broke into the church of the Benedictine monaſtery, while the cardinals were performing the ceremony of the adoration, and after cruelly beating theſe defenceleſs men, Frangipani ordered the new pope, who was already covered with blood, to be put into irons and taken to his houſe, where he was thrown into a dark dungeon. This act did not go unrevenged: the oppoſite party ſurrounded the houſe of Frangipani, with the prefect of the city, and others of the nobility at their head, threatened to ſet fire to it, and to put him and his family to death, if the pope were not immediately releaſed. This threat produced the deſired effect, the pope was liberated, and immediately after crowned with due ſolemnity. The emperor next took a violent part againſt him, and cauſed the archbiſhop of Braga to be choſen to the pontifical chair, who took the name of Gregory VIII. and was acknowledged lawful pope by all the imperial party at Rome. At firſt Gelaſius was obliged to leave the papal city, and to ſeek refuge at Gaeta, his native place, where he was received with loud acclamations, and had ambaſſadors ſent to him by the Norman princes, who declared themſelves ready to ſupport him to the utmoſt of their power. Upon the emperor's retreat, Gelaſius returned privately to Rome, where he ſuppoſed his party was ſufficiently ſtrong to drive his rival from the throne. But, during the firſt public performance of maſs, Frangipani forced his way into the church, accompanied by a large body of troops, intending to ſeize on Gelaſius, and ſend him priſoner to the emperor. The pope, however, eſcaped, and, his friends flocking together from all parts, a civil war commenced in Rome, in which numbers of lives were loſt on both ſides. The imperial party at length prevailed, and Gelaſius, deſpairing of being ever able to expel his rival, quitted Italy, and embarked for France, where he arrived in November 1118. Here he was received with all poſſible marks of reſpect and eſteem, and ſupplied by the clergy and nobility with large ſums of money, in order to ſupport him in his rank and dignity. The reigning monarch, Louis the Groſs, ſent him the moſt magnificent preſents, with aſſurances of his protection, and aſſiſtance in fixing him again on his throne. He died, however, in January 1119, having firſt viſited ſeveral cities, in the exerciſe of his pontifical functions, and appointed a council to meet at Rheims to conſult about the correction of the ſtate of eccleſiaſtical diſcipline in the Gallican churches. He was diſtinguiſhed for piety and the moſt exemplary moral virtues. In the Collectio Conciliorum are ten letters written by this pope. He was author of the "Life of Eraſmus," biſhop of Gaeta, and alſo of the "Lives of Anatolia and Cæſaria:" the firſt was written in proſe, the others in verſe. Moreri. Bower.

GELASIUS, biſhop of Cæſarea, was choſen to that high office in the year 380. He is claſſed, by St. Jerome and others, among the eccleſiaſtical writers of his age. He wrote ſeveral works, which have been commended for the correctneſs and purity of their ſtyle, but which he would not publiſh. Some fragments of the writings of this prelate, explanatory of the apoſtles' creed, and of the traditions of the church, are to be met with in the Greek collection of teſtimonies, under the name of John Damaſcenus, in the Codex Claromont. He died in 394.

GELASIUS, ſurnamed *Cyzicenus*, from the place of his birth, was ſon of a preſbyter of the church at Cyzicum, and flouriſhed about the year 476. When young, he found in his father's poſſeſſion a MS. containing an account of the proceedings of the council of Nice. As the Catholics were at this period perſecuted by the Eutychians, under the countenance of the emperor Baſiliſcus, and as that ſect boaſted that the decrees of the council of Nice were favourable to their principles, Gelaſius determined to draw up a new hiſtory of that council, with a view of confuting their repreſentations. He divided his work into three books; of which the two firſt contain the hiſtory of the council, and the third only three letters of the emperor Conſtantine,

This hiſtory, which is, in fact, nothing more than a collection of treatiſes, was publiſhed at Paris, by Robert Balfour, a Scotchman, in Greek and Latin, in 1559. It is inſerted in the ſecond volume of the Collectio Conciliorum. But Dupin ſays, that "There is neither order in his narrative, nor correctneſs in his obſervations, nor elegance in his expreſſions, nor judgment in his choice of matter; ſo that he muſt be pronounced a bad compiler who has collected, without any diſcrimination, whatever he found relating to the council of Nice, whether good or bad, not examining even whether it were true or falſe." Moreri. Dupin.

GELATIN, or ANIMAL JELLY, in *Chemiſtry*, a principle that abounds in various parts of animals, and forms one of the elementary conſtituents of animal organization. This principle is copiouſly contained in ſkin, in moſt of the ſoft and white parts, in bone, horns, and membrane, and in a ſmaller proportion in the blood, and alſo in many ſhells. From theſe ſubſtances it may be extracted by boiling in water. The watery ſolution is nearly tranſparent and colourleſs, and when allowed to evaporate and cool, it aſſumes the conſiſtence of *jelly*, which is well known. (See JELLY.) By further evaporation, this watery ſolution becomes hard and brittle, and forms *glue* or *ſize*, which ſee reſpectively.

The chemiſt is very much indebted to Mr. Hatchett's valuable experiments on gelatin, and the ſubſtances from which it is obtained. For curious and uſeful information on this ſubject, (ſee Phil. Tranſ. vol. xc.) Pure gelatin is inſipid, tranſparent, inodorous, and nearly colourleſs, or only exhibiting a ſhade of yellow. When dry gelatin is thrown into water, it abſorbs the water, ſwells, ſoftens, and becomes very elaſtic. It is not diſſolved whilſt cold, and if it be again expoſed to a warm dry air, it ſhrinks and regains its former conſiſtence. But by the application of heat to gelatin, when it is thus ſwelled by ſoaking and immerſed in more water, it forms a ſolution, exactly reſembling in chemical qualities the liquor from which the dry gelatin was prepared, of the ſame denſity, and again glutinous by cooling. It appears therefore to be an inherent and a very characteriſtic property of gelatin, that it is ſoluble in water and recoverable from the ſolution by evaporation, unaltered for an indefinite number of times, even after long application of boiling heat. In this reſpect it eſſentially differs from the ſolution of albumen, which coagulates by heat, and does not again return to its ſoluble ſtate. See ALBUMEN.

Gelatin of every kind is ſoluble in all the acids; and as the nitric acts upon it with particular energy, it may thus be ſeparated from the condenſed albumen, which is often naturally combined with it. The nitric ſolution of gelatin (*e. g.* of iſinglaſs) is of a pale yellow colour, which becomes deeper by evaporation. When much concentrated, the acid, acting at firſt merely as a ſolvent, is decompoſed by the gelatin, and gives out nitrous gas, ſometimes attended with ſparks or flame. This mutual decompoſition of nitric acid and gelatin produces alſo a quantity of the oxalic and malic acids, which may be detected in the liquor, if the concentration has not proceeded ſo far as again to decompoſe theſe new products. The acid ſolutions of gelatin give no precipitate when ſaturated with any of the alkalies or earths.

The muriatic acid diſſolves gelatin in the cold with great eaſe, and, like the nitric, ſeparates it from the denſe albumen of organized bodies, with which it is naturally combined:—and the muriatic ſolution will remain unchanged for many months.

The cauſtic fixed alkalies very eaſily diſſolve gelatin, and form a browniſh viſcid ſubſtance; giving out no ammonia during the ſolution. This viſcid alkaline ſolution, as Mr. Hatchett obſerves, does not poſſeſs the properties of ſoap, for it does not form a permanent lather when ſhaken with water, and when ſaturated with acid it affords no precipitate. This circumſtance, according to Mr. Hatchett, affords a very characteriſtic property, diſtinguiſhing pure gelatin from albumen, fibrin, and moſt other ſoft parts of animals; all of which latter form a true ſoap with alkalies, that curdles and precipitates on ſaturation with an acid.

Gelatin is inſoluble in pure alcohol, and when this ſpirit is poured into a watery ſolution of gelatin, the mixture becomes milky, and part of its gelatin ſeparates, as is the caſe with vegetable mucilages and alcohol; but unleſs a very large quantity of ſpirit is added, the mixture again becomes clear.

Hard and dry gelatin will remain unchanged for a long time; but when liquid, or in the thin gelatinous ſtate, it ſoon putrefies, becoming firſt ſour by the generation of acetic acid, then mouldy and fetid, and at laſt exhaling ammonia.

When dry gelatin is very much heated, it curls and becomes puffy, and yields an oily ammoniacal liquor, like all other ſoft parts of animals. In cloſe veſſels it leaves at laſt a bulky ſoft coal, the proportion of which, determined by Mr. Hatchett, is 56 grains from 500 of iſinglaſs. This by incineration in open air burns away entirely, except 1.5 gr. of earthy reſidue, which appears to be the phoſphats of ſoda and lime. Hence it appears that the quantity of earthy and ſaline matter is extremely ſmall, compared with that of the other ſoft parts. The ſame chemiſt alſo obſerved a kind of artificial converſion of condenſed albumen into gelatin by long digeſtion in dilute nitric acid; the albumen thereby becoming perfectly ſoluble in water, and forming a gelatinizing ſolution when reduced by evaporation.

The moſt ſingular combination of gelatin, and that which is moſt uſeful as a chemical teſt, is with tan. If a ſolution of gelatin, *e. g.* of glue or of iſinglaſs, be added to an infuſion of oak-bark, galls, catechu, or any other vegetable that contains the tanning principle, a copious white precipitate ſeparates, which, after the concentration of the liquors, may be very eaſily collected by the fingers, and forms a ſingular grey ductile maſs, ſmelling like tanned leather, and which runs into a dark brown brittle maſs, appearing like reſin, inſoluble in water, and incapable of putrefaction. For a further account of this combination, ſee TAN. The power of infuſion of tan as a teſt of gelatin is very extenſive. Dr. Boſtock found (Edinb. Med. and Phyſ. Journ.) a copious and immediate precipitate on adding a moderately ſtrong infuſion of galls to water, holding only $\frac{1}{100}$ of iſinglaſs, and a very conſiderable precipitate when the gelatin was only $\frac{1}{5000}$. The ſolutions of albumen alſo give a precipitate with tan, after ſtanding together ſome hours; and therefore, when uſed as a teſt, an immediate precipitate with tan may be conſidered as a pretty certain indication of gelatin.

The nitro-muriate of tin produces alſo a white precipitate with gelatin; but unleſs the ſolution of the latter is pretty ſtrong, the effect is only a white cloud, after ſome hours ſtanding. Nearly the ſame effect is produced with the ſolutions of albumen.

Mr. Hatchett obſerves, that the difference in the degree of viſcidity and tenacity of the varieties of gelatin is an inherent quality, and not cauſed by the degree of mere inſpiſſation; otherwiſe, when each variety was perfectly dry, they would each make a glue or cement of exactly the ſame degree of tenacity, which is known not to be the caſe. On the contrary, the tenacity depends partly on the age of the animal, the old giving a much ſtronger glue, *cæteris paribus*, than the young; and partly on the ſubſtances that furniſh it,

the glue from the ſkin being much ſtronger than the ſolid gelatin from the horns, ſinews, or any other part. In proportion as the glue is more adheſive, it becomes leſs eaſily ſoluble in water, and abſorbs a larger portion before it comes to the ſtate of tremulous jelly. Mr. Hatchett alſo found, that the force of adheſion of glue from ſkin was generally proportionate to the toughneſs of the ſkin: the ſoft flexible ſkins yielding a thinner gelatin than the hard bony ſkins, and with much more eaſe. Phil. Tranſ. ubi ſupra. Aikin's Dictionary of Chemiſtry, &c. See GLUE, JELLY, ISINGLASS, and SIZE.

GELATINOUS, is applied to any thing approaching the glutinous conſiſtence of a jelly.

GELATIO, properly ſignifies freezing, but is alſo uſed for that rigidity of the body and limbs, which comes on in the catalepſis, and other diſorders of that kind.

GELBFREUTH, in *Geography*, a town of Germany, in the principality of Culmbach; 10 miles S.S.W. from Culmbach.

GELBUM, a name given by the Hungarian miners to a ſort of marcaſite or mundic, which contains a conſiderable quantity of ſilver.

GELD, or GILD, in our *Ancient Cuſtoms*, a mulct, or compenſation for a crime or delinquency. See GILD.

Hence *wergild* was anciently uſed for the value or price of a man ſlain; and *orfgild*, of a beaſt, &c.

"Et ſint quieti de Geldis, & Danegeldis, Horngeldis, & Fortgeldis, & de Blodwita, & Fliwita, & Leirwita, & Heingwita, & Fremineſeuda, & Werdpens, & Averpeni, & Hundrepeni, & Tolingpeni." Charta Ric. II. Priorat. de Hatland, in Devon.

GELD *foot*, *Geld horn*, and *Geld wood*, ſee the ſubſtantives.

GELDA, in *Ancient Geography*, a town of Aſia, in Albania, between the mouths of the rivers Gherrus and Caſius, in the Caſpian ſea. Ptol.

GELDENHAUR, GERARD, in *Biography*, was born at Nimeguen in 1482. He was educated partly at Daventer, and partly at Louvain, where he contracted an intimacy with Eraſmus. When he had left the college, he was recommended to Charles V. who appointed him his reader and hiſtorian; after this he accepted the poſt of Latin ſecretary, and private reader to Philip biſhop of Utrecht, which he held till the death of that prelate. In 1526, he was ſent by Maximilian of Burgundy to examine the ſchools of Wittemburg. He now openly joined the Lutheran party, went to Worms, was married and undertook the education of youth. Eraſmus was diſpleaſed with his change of religion, and wrote againſt him. Geldenhaur removed firſt to Augſburg, and then to Marburg, where he was the firſt profeſſor of hiſtory, and afterwards of theology. He died in 1542. He was author of ſome pieces in controverſial theology; he publiſhed likewiſe Latin poems, orations, and epiſtles, and ſome hiſtorical works, of which the principal are "Hiſtoriæ Batavicæ;" "Hiſtoriæ ſuæ Ætatis, lib. vii." "Germanicarum Hiſtor. Illuſtratio;" "Deſcriptio Inſulæ Batavorum;" "De viris illuſtribus Inferioris Germaniæ." Moreri. Bayle.

GELDER, ARNOLD DE, a painter who was born at Dort in 1645. He firſt became a diſciple of Hoogſtraten, but afterwards ſtudied under Rembrandt, and made very conſiderable progreſs in the imitation of that maſter's manner; having a mind inclined to the ſame mode of obſerving and thinking. He remained two years with him, but did not, like the generality of ſtudents, attach himſelf to the ſtudy of the maſter's pictures only; he adopted his mode of ſtudying from nature, and, like him, made a collection of a large ſtock of thoſe articles his taſte led him to wiſh to imitate: ſuch as arms, and draperies of all ſorts; covering his walls with them, and conſtantly employing them in his backgrounds and on his figures. His principal work is a ſeries of twenty-two pictures of the ſufferings of Chriſt, which are famed for excellent chiaro-ſcuro and expreſſion. He died in 1727, aged 82.

GELDER-*Roſe*, in *Botany*. See VIBURNUM.

GELDER-*roſe*, *currant-leaved*, and *Virginian*. See SPIRÆA.

GELDING, in *Rural Economy*, a term by which young caſtrated horſes are frequently known. The term is ſeldom applied to them after they have attained the age of three years. See CANTHERII and next article.

GELDING, the operation of cutting or caſtrating any ſort of animal. The age of the animal and ſeaſon of the year ſhould be well attended to in the execution of this buſineſs. Colt-foals and tup-lambs may be gelded with advantage in moſt caſes at a very early period of their age, as at a fortnight or three weeks after they are dropped, though ſome prefer a later period for both theſe, but eſpecially for male-foals. In general, however, where the operation is performed early, the animal ſooner recovers its growth, and ſuffers much leſs check. In horſes it may however be executed at almoſt any age, where a due degree of care is afterwards taken of the animals.

In reſpect to ſeaſon, the beſt is, when a little inclined to be cool, as in the beginning of the ſpring and in the autumn.

The uſual method of proceeding in the performance of the buſineſs, is, with foals and ſtallions, firſt to caſt them upon ſome ſoft place, then to take the *teſtes* between the foremoſt and the great finger, ſlitting open the ſcrotum or bag with a ſharp knife for the purpoſe, and forcing them forward, in order that they may be laid hold of by the fingers, or a pair of ſmall nippers made for this uſe, and by that means be cut away; the ſpermatic veſſels being properly ſecured by ſtrong waxed thread ligatures. The old method was to ſear them off by a thin red hot cauterizing iron. The only thing neceſſary afterwards in the firſt mode is, merely to keep the ſides of the ſcrotum in contact. But in the old way a compoſition of roſin, wax, and turpentine, well melted together, is uſually laid over the parts by means of the hot iron. While under this treatment the animal ſhould be kept looſe in a moderately warm ſtable, in order that he may have proper exerciſe in walking about in it. In caſes where there is much appearance of inflammation, it may ſometimes be neceſſary to take away a little blood. And if the ſheath and belly ſhould become ſwollen, diſcutient fomentations ſhould be frequently applied.

In the gelding of animals of the ſheep kind, leſs trouble is commonly neceſſary, the ſhepherd moſtly performing the buſineſs. See CASTRATION.

Pliny informs us, that the Romans uſed to geld their horſes, eſpecially thoſe which they employed upon common and domeſtic occaſions; and geldings, called *Cantherii*, (which ſee,) were preferred, on account of their calmneſs of temper, to other horſes. The nations of Africa, and of Aſia, except the Chineſe, never geld their horſes; and ſome kingdoms of Europe have not yet adopted the practice. Caſtration deprives the animal of a conſiderable part of his ſtrength, ſpirit, and courage; robs him, (ſays Berenger, Hiſtory of Horſemanſhip, vol. i. p. 138.) in part, of his very *ſoul*, and leaves him a mutilated, daſtardly, and unnatural creature; but, at the ſame time, makes him mild, patient, more obedient, and conſequently fitter for many purpoſes, and more agreeable to many riders. To this purpoſe Strabo obſerves, (l. 7.) that caſtration, which, indeed,

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was practiſed long before he wrote, was a cuſtom more peculiarly belonging to the Scythians and Sarmatians than any other nations; and they performed this operation on their horſes, for the better management of them: for though they were but ſmall, they were nevertheleſs mettleſome, and difficult to be governed. The practice of gelding horſes, which is now ſo frequent, ſeems to have been introduced by the Turkiſh or Hungarian nations, who took poſſeſſion of ancient Pannonia. The French, it is obſerved, call a gelding "un cheval Ongre," that is, an Hungarian horſe, which ſeems to indicate, that the Franks firſt learned the art and cuſtom of caſtration from the Hungarians: and it is remarkable, that to this day many Hungarians travel every year into Germany and Poland, in order to caſtrate any animal that is offered to them, which they do for a ſmall reward. It is ſaid, that they come as far as the Baltic every ſummer, and that they are very expert in their buſineſs.

GELDUM, a name given by ſome to the philoſopher's ſtone.

GELE'E Claude, in *Biography*, a landſcape painter, whoſe works entitle him to the foremoſt rank in his claſs. He was a native of Lorraine, and hence bore the name of Claude de Lorraine, by which he is better known than by his own. Notwithſtanding the extraordinary brilliancy of his talent, when devoted to painting, and fully developed in proceſs of time by continued induſtry, and proved by the grandeur and correctneſs with which he ſelected and imitated the works of nature, he appears to have been with difficulty brought forward at firſt in the art. His original eſſays of ingenuity were in the habit of a paſtry-cook, to which occupation he ſerved an apprenticeſhip. How he emerged thence, and what led him to think of painting, is not at preſent known.

Claude received ſome inſtructions from Agoſtino Taſſi, who, ſo far from finding him an apt ſcholar, with difficulty taught him the firſt rudiments of perſpective and drawing. When once, however, he began to feel their truth and force, his native ſtrength of intellect ſoon carried him beyond the ſphere of his maſter. His mind, expanding in the courſe of his ſtudies, was a ſpur to his induſtrious purſuit of the beauties of the goddeſs he adored; and never painter more truly may be ſaid to have unveiled thoſe beauties. By no one has nature been more happily pourtrayed than by this great maſter, in the art of painting.

His courſe of ſtudy was the moſt rational and uſeful that can be adopted. He conſtantly had recourſe to nature herſelf. His continual examination of her effects, and their cauſes, is the genuine ſource of that excellence to which he arrived. The open canopy of heaven was his ſtudy. It was there he conſtantly wrought, ſketching whatever was beautiful or grand; exploring the forms of natural objects, and noting their colours as they varied with the changes of light and ſhade; of combination with others, and ſeen with reflections from ſurrounding objects; or when alone, and tranſmitting the pure ethereal ray tinged with their own peculiar hues. For this purpoſe he frequently continued abroad from ſun-riſe, till the darkneſs of night compelled him, unwillingly to withdraw from his contemplations.

Sandrart ſays of him, that he was philoſophically informed; that he not only was capable of repreſenting the ever-varying productions of nature, but of reaſoning upon them, and explaining the cauſes of their different appearances; whether ariſing from diſtance, from dews and vapours, the evening or the morning light, or from differing reflections and refractions of light; and that he would do this with the clearneſs and preciſion of a man of ſcience.

The earneſtneſs with which he ſought to perfect his pictures, is evident in the labour he beſtowed upon them. To produce the ſurface they bear, numerous repetitions of colour are neceſſary; and that will only be done by thoſe who have their minds fraught with objects, which their hands do not readily perfect the reſemblance of. Their perception of truth is too ſtrong for their knowledge of the means of imitation; and therefore frequent reviſals and retouchings are neceſſary to ſatisfy them in purſuit after the actual repreſentation of nature. Claude felt all this, and brought his pictures accordingly to a high degree of perfection, by conſtantly ſuperviſing his labours with a ſtrong remembrance of the real objects; and not unfrequently altering his deſigns, and repainting them, till they perfectly correſponded with the images in his mind.

His deſigns are, for the moſt part, very agreeable, often grand, and entirely differing from the taſte of any one who had preceded him in landſcape painting. Titian and the Carracci had given a grandeur of ſubject generally derived from the more rugged ſcenes of nature. Claude, on the other hand, ſelected and united the beautiful with the grand; and aſſociated art and nature together, by the introduction of buildings into his pictures, with the greateſt propriety and richneſs of effect. The former, in their landſcapes, have not always preſerved the character of nature: there is much of the artificial apparent in them, either to command the attention of the obſerver by the force of colour, or from ſome error in the ſyſtem of art they uſed. Claude, on the contrary, never had recourſe to it; a cloſe imitation of the effect of nature was his object; and a perfect harmony of colour, of courſe the means he employed. No one, except it be our own Wilſon and Turner, have ſo completely given the effect of atmoſphere, ſo enveloped his objects with air, and relieved them ſo truly without apparent artifice from each other. Regarding a picture painted by him, is the ſame as looking into nature; his diſtances are duly kept, with ſo full, yet ſo tender an indication of the objects in the remote parts, as completely to dazzle the underſtanding when ſeen under favourable circumſtances. His colouring is of the moſt ſubtle nature, being the reſult of repetition of one colour, or layer of colour, over another; not of the tones mixed upon the pallette; and completely baffles all attempts to imitate it, except by the ſame means; which renders him extremely difficult to copy. It is not eaſy to ſay whether the luſtre which is ſo pre-eminent in his pictures be effected by the oppoſition of light and dark he uſes, the purity of his hues, or the breadth of his chiaro-ſcuro. His ſkies appear to poſſeſs an inherent light, reflecting and diſpenſing it upon the eyes of the beholders, as well as on the objects in the pictures.

The compoſitions of his larger works are principally combinations of the ſcenery ſurrounding Rome, and other places where he reſided. He took great care in the forms of his trees. As to what is ſaid by Pilkington, of his nicety of diſcrimination in repreſenting the various characters of the plants and trees he introduced; it does not appear to have been his practice in his beſt works. There is difference enough to give the appearance of nature; a fir tree grows differently from an oak, or a ſycamore, &c.; this he has marked occaſionally; but in general, his trees have one character ſelected from nature, as conveying the impreſſion of grandeur and beauty in the vegetable creation: and ſameneſs of form is rather imputed to him by ignorant obſervers. His choice, however, is perfectly juſtifiable, upon the ſame principle as that of the hiſtorical painter, who ſelects a general, rather than a peculiar, form of the human figure for his imitation.

The figures of men and animals which he introduced into his

his pictures, exhibit the effect of his unfortunate commencement in art, by their total want of drawing, and freedom of action. The idea which governs their introduction almoſt invariably excels their execution, notwithſtanding he took much pains to learn to draw in the academy at Rome, after ſtatues and living models. He was himſelf conſcious of his deficiency on this head, and frequently engaged other artiſts, ſuch as Felippo Lauri, and Courtois, to paint them for him, particularly his men and women.

In order to prevent copies of his works being ſold as his painting, and thus becoming injurious to his reputation, and to avoid frequent repetition of the ſame ſubjects; he drew, in a book prepared for the purpoſe, the deſigns of thoſe pictures he tranſmitted to different countries, and wrote upon the back of the drawings the name of the perſon to whom the original picture was ſold. This book is now in the poſſeſſion of the duke of Devonſhire, who has kindly allowed it to be engraved by Earlom, in a manner cloſely imitating the appearance of the drawings, and it is publiſhed under the title of "Liber Veritatis."

We have many of the fineſt works of this great maſter in this country, beſides an infinity of minor productions from his pencil. The principal ones here, are one in poſſeſſion of the earl of Egremont, wherein the ſtory of Jacob, Laban, and his daughters is introduced, and which has been engraved by Woollett. Another in poſſeſſion of Mr. Angerſtein, of the ſtory of the queen of Sheba's departure to viſit Solomon; and a third in poſſeſſion of Mr. Davis brought from the Altieri palace in Rome, and which has been valued at 7000 guineas. Theſe are maſter-pieces of their kind, for grandeur, richneſs, and variety of imagination in their different compoſitions; and for brilliancy, luxuriancy, and truth in their colour. He died in 1682, aged 82. "When ſhall we look upon his like again!!"

GELEITSTEIN, in *Geography*, a town of Germany, in the principality of Wurzburg; 10 miles S. of Gemunden.

GELEMAR, a town of Hindooſtan, in Oude; 26 miles S.W. of Gooracpour.

GELENAU, a town of Saxony, in the circle of Erzgeburg; 5 miles W.N.W. of Greiffenſtein.

GELFUM, or Gelbum, an Hungarian name for a kind of mundic, which contains ſilver.

GELIGONDA, in *Geography*, a town of Hindooſtan, in the Carnatic; 50 miles S.W. of Ongole.

GELISE, a river of France, which runs into the Baiſe at Lavardac.

GELLA, in *Ancient Geography*, a town of Hiſpania Tarragonenſis, in the country of the Vaccæans; ſuppoſed to be the *Tela* of Antonine's Itinerary.

GELLAH, or Collah, or *Galleh ad Snaan*, a town of Algiers, in the province of Conſtantina, near the river Serratt; built upon the eminence of a mountain, and having only one narrow road leading to it. This place is a kind of convenient aſylum for the rebels of both this and the neighbouring kingdom, where they are hoſpitably entertained, till their friends have procured their pardon, or compounded for their crimes; 86 miles E. of Conſtantina.

Gellah, a town of Africa, in the kingdom of Tunis, ſituated on a rugged promontory, to which it gives name, near the river Mejerdah: it was near this place that Publius Cornelius Scipio fixed his winter-quarters, which gave it the name of "Caſtra Corneliana;" 18 miles N. of Tunis.

GELLE', a town of Africa, in Dar-Fûr, at a ſmall diſtance N.W. of Cubcabia, and 40 miles N.W. of Cobbé. N. lat. 14° 24'. E. long. 27° 28'. Gellé, ſays Mr. Brown, (Travels in Africa, &c. p. 240.) was eſteemed leſs flouriſhing than moſt other towns of Dar-Fûr, being under the galling tyranny of a prieſt, a native of the place, and upon whom the inhabitants were dependent. His unfated avarice left them neither apparel nor a mat upon which to lie; and his malice perſecuted them, becauſe they had nothing more which he could plunder.

GELLERT, Christian Furchtegott, in *Biography*, was born in July 1715, near Freyburg, where his father was a clergyman. He received a good education in the ſchools, and in 1734 ſtudied theology at Leipſic. At the end of four years he returned home, and commenced preacher, but making no figure as an orator, he undertook the office of a private tutor. At this period he exhibited a poetical taſte, but his firſt attempts as an author were entitled, "Amuſements of Reaſon and Wit," which procured him a great deal of reſpect, as well for the agreeableneſs of his ſtyle, as for the excellence of diſpoſition which his work every where diſplayed. As an inſtructor of youth, he endeavoured not only to enrich the minds of his pupils with uſeful knowledge, but to form their taſte, improve their hearts, and inſpire them with ſentiments of religion and virtue. In 1744, he publiſhed the firſt volume of his fables, ſome plays, and the firſt original German romance worth any notice. The ſecond volume of his fables was publiſhed in 1748. He had always laboured under much ill health, and was ſubject to hypochondriacal affections, and, in 1751, he accepted the office of extraordinary profeſſor of philoſophy. He had not enjoyed the emoluments of his ſituation many months, when his complaint degenerated into inſuperable lowneſs of ſpirits, and confirmed melancholy, which embittered all the joys of life. In this ſtate, beloved by all, on account of his patience and Chriſtian reſignation, he continued to linger out a miſerable exiſtence till December 1769. The loſs of him was ſincerely and deeply lamented by his countrymen, to whom he had been a general inſtructor. "Every perſon," ſays his biographer, "who was capable of holding a pen, ſuddenly turned writer in his praiſe." His works were very numerous, and were publiſhed in ten volumes octavo, in the year 1766, and after his death a more complete edition was publiſhed at Leipſic, in eight volumes, with engravings. Kutner has celebrated his various excellencies; he ſays, "a century will perhaps elapſe, before we have another poet capable of exciting the love and admiration of his contemporaries, in ſo eminent a degree as Gellert, and of exerciſing ſo powerful an influence on the taſte and way of thinking of all ranks." Though not a genius of the firſt claſs he was an agreeable and fertile writer; the poet of religion and virtue; an able reformer of public morals, who preferred reproof to puniſhment, and ſeemed more inclined to adminiſter conſolation, than to plunge into deſpair. In his fables and ſpiritual ſongs he has diſplayed the whole force of his genius. In the former, he ſucceſsfully imitates La Fontaine, and ſhews the ſame delicate vein of humour, the ſame livelineſs and eaſe united to the keeneſt ſatire. In his tales properly ſo called, he ſeems fond of the ſerious, didactic ſtyle, and ſometimes of the tragic. His ridicule always appears in the garb of innocence, while the irony is concealed under the fineſt veil; his verſes are exceedingly ſoft and harmonious, and it may be eaſily ſeen that many of them are the fruit of long ſtudy and meditation. His proſe is not deſtitute of elegance, but it is inferior in ſtrength and fire to his more juvenile productions. No literary man was ever readier to allow the ſuperior merit of others. He ſet a great value on talents which he himſelf did not poſſeſs, and preferred learning to genius. As he required only a ſmall portion of the pleaſures or indulgences which money can procure,

procure, a ſmall income was more than ſufficient to ſupply all his wants, and he devoted a conſiderable part of it to acts of beneficence. As long as the Germans ſhall underſtand their preſent language, will the works of Gellert be read; and his character will be honoured while virtue is known and reſpected." Gen. Biog.

GELLHEIM, in *Geography*, a town of France, in the department of Mont Tonnerre; 13 miles W. of Worms.

GELLI, GIAMBATISTA, in *Biography*, an Italian poet, was born at Florence in 1498, of mean parents, who brought him up to the mechanical trade of a ſhoemaker. They had, however, given him the beſt education which their circumſtances could afford, and he became diſtinguiſhed for literature, and was, in the end, one of the chief ornaments of the academy Degli Umidi. He wrote two comedies, entitled "La Sporta" and "L'Errore," which were accounted the beſt compoſitions of the kind then in the language. He tranſlated the Hecuba of Euripides, from the Greek into the Italian. He was author of ſeveral other works, ſome on phyſical ſubjects; Diſſertations upon the poems of Dante and Petrarch; Tranſlations and Remarks on the difficulty of reducing the Italian language to rule, &c. Gelli died in 1563. Moreri.

GELLIBRAND, HENRY, was born in London in the year 1597. Having paſſed through the elementary parts of education, he was admitted a commoner of Trinity college, in the univerſity of Oxford, where, in the year 1619, he took his degree of B. A. Upon accidentally hearing one of ſir Henry Saville's lectures on mathematics, he conceived a ſtrong inclination for the ſtudy of the ſciences, and devoted himſelf to the purſuit with ſo much vigour, that, in 1623, he attracted the notice and friendſhip of ſeveral able mathematicians, particularly of Mr. Briggs, by whoſe patronage he obtained in 1626, the profeſſorſhip of aſtronomy in Greſham college. From this time he lived in cloſe intimacy with Mr. Briggs, who entruſted to him the taſk of completing his Britiſh Trigonometry, which he did not himſelf live to finiſh: to this he added a preface, and the application of the logarithms to plain and ſpherical trigonometry. During the time he was preparing this work for the preſs, he was cited into the high commiſſion court by Dr. Laud, then biſhop of London, on account of an almanack which he had publiſhed, and in which he had omitted the names of the popiſh ſaints, and inſerted thoſe of ſome of the martyrs celebrated in Fox's Acts and Monuments of the church. Upon trial, he was acquitted by the whole court, with the exception of archbiſhop Laud only, which was made an article of accuſation againſt the prelate himſelf at his own trial. Mr. Gellibrand contributed ſome pieces to the improvement of navigation: his ſituation at Greſham college, and his intercourſe with many able mathematicians, would probably have enabled him to have rendered more important ſervices to this ſcience, ſo important to the welfare of the country, had he not been immaturely carried off by a fever in 1636, when only in his fortieth year. He left behind him many valuable treatiſes in the mixed mathematics, and was highly praiſed by his contemporaries, for unwearied zeal in the inveſtigation and improvement of practical ſcience. It has been juſtly doubted whether he had a comprehenſive mind, as he could not admit the evidence which Galileo produced in defence of the Copernican ſyſtem. Biog. Britan.

GELLIVARE, in *Geography*, a town of Sweden, in the lapmark of Lulea; 98 miles N. N. W. of Lulea. N. lat. 67° 7'. E. long. 20° 24'.

GELLOSIA, in *Natural Hiſtory*, a name by which ſome of the writers of the middle ages call the chalazias.

GELMAH, or KALMAH, in *Geography*, a town of Africa, in the country of Algiers; 50 miles E. of Conſtantina. This, ſays Shaw, (Travels, p. 64.) is undoubtedly the "Calama" ſo much wanted in the Old geography, which was placed by St. Auſtin, in an indeterminate manner, betwixt Hippo and Conſtantina.

GELMAII, ancient called "Cilma," or "Oppidum Cilmanenſe," a town of Africa, in the kingdom of Tunis. This appears to have been formerly a large city, and the area of a temple is ſtill remaining; 84 miles S.S.W. of Tunis. N. lat. 35° 18'. E. long. 9° 20'.

GELMON, or GELON, or *Gilon*, in *Ancient Geography*, a city of Judah, the birth-place of Ahitophel. 2 Sam. xxiii. 34.

GELMUDEN, or GELMUYEN, or *Genemuyden*, a town of Holland, in the ſtate of Overyſſel, ſituated on the ſouth ſide of the Vecht, near the Zuyder ſee; 6 miles E.N.E. of Campen. N. lat. 52° 40'. E. long. 5° 57'.

GELNHAUSEN, a town of Germany, in the county of Hanau Munzenburg, on the Kintzig; given, in 1802, to the landgrave of Heſſe Caſſel; 12 miles E. of Hanau. N. lat. 50° 17'. E. long. 8° 15'.

GELON, in *Biography*, king of Syracuſe, was deſcended from an ancient family ſettled in the city of Gela. He firſt diſtinguiſhed himſelf in arms under Hippocrates tyrant of Gela, in whoſe employ he defeated the Syracuſans, in a battle on the banks of the Helorus. At the death of this prince he ſeized the ſovereignty of Gela, and quickly made himſelf maſter of Syracuſe by means of ſome exiles. In the year 480 B. C. when Xerxes invaded Greece, the Carthaginians ſent a very formidable army into Sicily, under Hamilcar, with a view of recovering all the places they had formerly poſſeſſed in that iſland; but while they were engaged in the ſiege of Himera, they were attacked by Gelon and entirely defeated, with the deſtruction as well of their fleet, which had been drawn up on the beach, as of their land army. The Carthaginians ſued for peace, which Gelon granted them upon certain conditions, one of which was, that they ſhould henceforth abſtain from human ſacrifices. Gelon had hitherto governed Syracuſe under the title of prætor alone, but upon this ſignal ſucceſs, the people with one voice hailed him as king, and paſſed a decree, ſettling the crown, after his death, upon his brothers Hiero and Thraſybulus. Upon his elevation to the throne, he conferred the rights of citizenſhip upon ten thouſand foreigners who had ſerved under him, and he employed the remainder of his life in anxious and laudable cares to promote the proſperity of his people. He died univerſally regretted about the year 478. He was a man of mild diſpoſition, and appears to have ruled, in general, with much lenity. The people were gratified with the confidence which he manifeſted in their affections by coming to the aſſembly, without arms and guards, and affecting to ſubmit his conduct to their free deciſion. They cauſed a ſtatue of him to be erected in the ſimple garb of a citizen, which had the ſingular fate of being ſpared at the time when all the other ſtatues of the Syracuſan kings were condemned to be melted down, at the recovery of liberty under Timoleon. Univer. Hiſt.

GELONI, in *Ancient Geography*, a people of Sarmatia, near the Boryſthenes, according to Pliny. Herodotus ſays, that the Geloni were of Greek origin, and that having been driven from their commercial cities, they ſettled in the country of the Budini. He adds, that their language was a mixture of Greek and Scythian; that they had wooden temples, like thoſe of the Greeks, adorned with ſtatues and altars of wood; and that every three years they celebrated feaſts in honour of Bacchus. They tilled the earth, lived on corn, and cultivated gardens.

GELONUM, a town of European Sarmatia, ſuppoſed by Ortelius to be different from *Gelonus*.

GELONUS, a town of Sarmatia, in the country of the Budini, which, according to Herodotus, was altogether built of wood: its walls, which were high, and on each ſide 30 ſtadia in length, were conſtructed of wood, as were alſo its houſes and temples.

GELOS, a port of Aſia, in Caria.

GELOSCOPY, GELOSCOPIA, of γελως, *laughter*, and σκοπεω, *I conſider*, a kind of divination, drawn from laughter; or a knowledge of any perſon's character and qualities, acquired from the conſideration of his laughter.

GELSEMIUM, in *Botany*, a barbarous name, corrupted from *Gelſeminum*, which is itſelf taken from *Gelſemino*, the Italian word for jaſmine. Juſs. 150. This is a genus of Juſſieu, formed of the Linnæan *Bignonia ſempervirens*, Willd. Sp. Pl. v. 3. 291, which he conſiders as akin to his order of *Apocineæ*, and which is very probably diſtinct from *Bignonia;* but we have not, any more than himſelf, ſufficient materials to make out its full characters. It is figured in Cateſby's Carolina, v. 1. t. 53, and is an elegant climbing ſhrub, with ſmooth, lanceolate, ſimple *leaves*, and axillary, funnel-ſhaped, yellow flowers. See BIGNONIA, n. 3.

GELT, in *Geography*, a river of England, which runs into the Irting; about a mile S.E. of Brampton, in Cumberland.

GELUDA, a town of Hindooſtan, in the circar of Kotta; 40 miles E. of Kotta.

GELVES, an iſland in the Mediterranean, near the coaſt of Tripoli; ſo called by the Spaniards. See GERBA.

GELUS, in *Ancient Geography*, a river of Italy, in Apulia.

GELZO, in *Geography*, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 69° 30'.

GEMS, a word which, in its large acceptation, denotes not only all ſuch ſtones as are valued for their ſcarcity, weight, tranſparency, luſtre, hardneſs, and conſequent durability, but has been extended to ſeveral ſoft and opaque ſtones, and even to ſubſtances not belonging to the mineral kingdom, ſuch as pearls, mother-of-pearl, coral, &c.; nor has it been unuſual, both in ancient and modern times, to apply it, without any epithet, to engraved ſtones. (See GEMS, *Engraved*.) Pliny uſes this word ſometimes in the latter ſenſe, but principally in that which is conveyed by the Greek term of λιθοι τιμιοι, or *precious ſtones;* but neither that celebrated cyclopædiſt of antiquity, nor, indeed, any of the numerous writers on this ſubject, from Theophraſtus to Anſelmus Boëtius, have furniſhed us with materials for aſcertaining to what ſpecies in the mineralogical ſyſtems of the preſent day ſeveral of thoſe precious ſtones are to be referred. The ancients would often apply the ſame name to mineral ſubſtances of different nature, and ſtill more frequently diſtinguiſh one and the ſame ſtone by many names, according as ſlight differences in colour, an additional ſpot, &c. ſuggeſted to its owner the conveniency of introducing a new denomination. Pliny undertook to collect all theſe names, and every word that has been ſaid before him on the mineral ſubſtances to which they were applied; a taſk which he performed with more induſtry than judgment and critical acumen: whence, to mention only one inſtance among many, he was led to combine all that Plato had mentioned of an iron ore, called *adamas*, with his own, ſufficiently fabulous, account of the true diamond, which latter happened to be known by the ſame appellation. But independently of this confuſion of names and ideas, both Pliny's account of gems, and that of his commentators, and of the earlier writers on this ſubject, are a tiſſue of fable and ſuperſtition; and though their ridiculous notions of the occult qualities and miraculous power with which all precious ſtones are endowed, may afford momentary amuſement, this is ſoon diſturbed by the reflection that ſuperſtition is one of the moſt odious frailties of the human mind. In juſtice to Pliny's good ſenſe, however, it muſt be ſaid that he appears to have been leſs impreſſed with a conviction of the truth of what he relates on the authority of others, than moſt of thoſe who have written on the ſame ſubject after him. There are, beſides, ſome good hints given by him to diſtinguiſh falſe from real gems: he points out external characters to be found by the feel, and derives others from tranſparency, weight, &c. and even ſhews that the faculty poſſeſſed by ſome precious ſtones of attracting, when rubbed, ſmall particles of ſtraw or paper, was not altogether unknown to him.—After Pliny, from the time of St. Epiphanias, (who wrote "De XII. gemmis in Veſte Aaronis") to the beginning of the 18th century, the writers in this department of natural hiſtory appear to have had no other object, next to that of extolling the virtues of gems in general, than to explain the nature of the twelve precious ſtones that adorned the breaſt-plate of the ephod of the Hebrew high-prieſt. It is needleſs to add, that they have thrown but little light upon the ſubject; and the ſame may be ſaid of thoſe who afterwards endeavoured to prove that the great medicinal effects to be derived from the internal uſe of precious ſtones is by no means chimerical. Among the latter was no leſs eminent a philoſopher than Boyle, who publiſhed a treatiſe on the origin and virtues of gems, the object of which is to ſhew that thoſe ſtones were originally in a fluid ſtate, or made up of ſuch ſubſtances as were formerly fluid; that many of their general virtues are derived from the mixture of metalline and other mineral ſubſtances uſually incorporated with them; while the great variety, and the particular efficacy of their virtues, ariſe from ſome happy concurrent circumſtance of their commixture, ſuch as the peculiar nature of the impregnating liquor, the proportion in which it is mixed with the petreſcent juice, &c. To ſupport his hypotheſis of the virtues of gems, Boyle ſhews, that ſeveral of them are not ſimple concretions of any petreſcent liquors, but that they conſiſt alſo of other mineral adventitious parts; which he argues from the ſeparableneſs of ſuch ſubſtances in ſome ſtones, the ſpecific gravity in others, and the different waters or tinctures to be met with in gems of the ſame ſpecies, as rubies, ſapphires, garnets, and even diamonds; of which laſt ſome are yellow, ſome of other colours. Theſe and other reaſons, ſpecious, no doubt, at the time they were given, would not, probably, in the preſent advanced ſtate of chemical knowledge, be of ſufficient force to re-introduce into practice the *Electuarium e gemmis*, *confectio de hyacinthis*, or any other of the many celebrated compoſitions of this kind with which the opulent among our forefathers endeavoured to ward off the ſtroke of death.

But what muſt appear particularly inconſequent is, that in the very period when every thing that is great and good was aſcribed to gems, the ſcientific knowledge which the beſt among the naturaliſts and phyſicians poſſeſſed of precious ſtone was ſo very ſlight, that the moſts heterogeneous mineral ſubſtances were confounded by them; and though it may have been perfectly indifferent whether a doſe of garnet, ſpinel, or ruby was adminiſtered to a patient, it cannot be ſuppoſed to have been equally ſo, when in the room of lapis lazuli (ranked among the gems) blue carbonate of

copper was ſubſtituted; which, from the reſults on record, and from the places where the ſuppoſed lapis lazuli was found, we are induced to believe did frequently happen.

At the time when mineralogy emerged from the obſcurity in which it had but too long been involved, the claſs of gems, alſo diſtinguiſhed by the appellations of *precious*, *hard ſtones*, *pierres fines*, *nobles*, *precieuſes*, *edel-ſteine*, attracted of courſe the principal notice of the ſyſtematic writers; they were, as far as the ſcientific knowledge of that period would allow it, freed of extraneous ſubſtances; theſe ſubſtances were more carefully examined, and ſeveral attempts made to define and arrange them. According to Baumer's definition, gems are the hardeſt, heavieſt, tranſparent ſtones; according to that of Wallerius, they are hard, polygonal cryſtals, infuſible, or fuſed with difficulty, particularly heavy, and of peculiar luſtre. Moſt of the writers of that period claſs them with the lapides vitreſcentes (to which moſt of the foſſils belonged that are now comprized by Werner under his flint-genus); but Linnæus, original in all his proceedings, conſidering the ſalts as the generators of cryſtallization, incorporated the different gems according to their form, as far as he was acquainted with it, among thoſe ſalts of which they reſpectively appeared to exhibit the cryſtallization. Thus the diamond, becauſe it cryſtallizes in the manner of alum, is called by him *alumen adamas*; after him Wallerius applies the term of *gemmæ pretioſiſſimæ* to thoſe precious ſtones that affect the cryſtal-form of alum; referring to them not only the diamond and ſpinel-ruby, but alſo the ſapphire and oriental amethyſt which he could certainly never have ſeen in that form; and the term of *minus pretioſæ* to thoſe that have priſmatic truncated cryſtals, and are leſs hard and ſplendid; and among theſe he has the emerald, beryl, topaze, and what he calls chryſolite and true hyacinth. Daubenton undertook to arrange the precious ſtones according to their colour, taking the ſolar ſpectre for a ſtandard, and divided them into three claſſes, *viz.* diamonds, oriental and occidental ſtones. The ſeven principal priſmatic colours formed the genera in each claſs, while the different ſhades conſtituted the ſpecies. This thought, when firſt conceived, muſt have appeared a happy one; for except in the diamond, it is the colour heightened by the luſtre of the gem which principally ſtrikes the beholder; but having formed his ideas chiefly from ſtones cut and poliſhed, that excellent man was not aware that the ſapphire alone exhibits almoſt all the varieties of colour obſerved in other gems. The chevalier Baillou appears to have been the firſt who had correct ideas reſpecting the arrangement of the precious ſtones; for in the proſpectus of a work deſcriptive of his collection, but which, unfortunately for ſcience, was never publiſhed, he ſhews that the colour is one of the moſt caſual and variable characters of thoſe ſubſtances, and that much more conſtant ones may be derived from ſpecific gravity, cryſtallization, and hardneſs, for determining which he mentions ſeveral machines of his own invention, without, however, deſcribing them. His paper was printed in the Memorie della Societa Columbaria Fiorentina 1747. Romé de l'Iſle is, we ſuppoſe, the laſt ſyſtematic mineralogical writer who introduces the gems or precious ſtones as a particular claſs of mineral ſubſtances. He divides them into gems ſtrictly ſpeaking, and into gems of the ſecond order. To the former claſs he refers, 1. The diamond. 2. The oriental ruby, ſapphire, and topaze (which three latter were firſt aſcertained by this celebrated cryſtallographer to be one and the ſame ſubſtance differently coloured). 3. The ſpinel. 4. The Braziſian ruby, ſapphire and topaze (which are all three true topazes.) 5. The emerald, Siberian beryl, and Brazilian chryſolite. 6. Saxon topaze and chryſolite. 7. The chryſolite properly ſpeaking (theſe are the apatite and aſparagus ſtone, or phoſphate of lime). 8. The hyacinth (Zircon, Haüy). To the gems of the ſecond order, are referred by him the garnet, tourmaline, and peridot of Ceylon (the latter is a yelloviſh-green variety of tourmalin), opaque rhomboidal ſchorl (ſchorl and baſaltic hornblende), together with what he calls ſchorl argileux, and ſchorl cruciforme (chiaſtolite or croſs-ſtone).

Neither of the two prevalent ſyſtems of the preſent day conſider the gems or precious ſtones as a ſeparate claſs; that of Werner, however, not profeſſing to pay great attention to their reſpective conſtituent parts, places almoſt all of them, together with ſeveral others that are not diſtinguiſhed by the name of precious ſtones, into the flint-genus, and this becauſe their more apparent characters beſpeak them rather of the ſiliceous than any other claſs of foſſils. In Hauy's ſyſtem they occupy different places of the firſt claſs "ſubſtances terreuſes," with the exception of the diamond and topaze, the former of which is claſſed with the "ſubſtances combuſtibles non metalliques," the latter, under the appellation of "ſilice fluatée alumineuſe," with the "ſubſtances acidifères."

Though, owing to a great diſſimilarity in their characters, the ſtones called *precious*, or *gems*, cannot, according to any found principles of claſſification, be made to form a ſub-diviſion in a ſyſtem of oryctognoſy; yet a certain aſſemblage of ſtones, poſſeſſed of a ſuperior weight, luſtre, and hardneſs united to comparative ſcarcity, remains ſtill, by general conſent, in the poſſeſſion of that title, and it would be affectation to refuſe acknowledging it. Nor can ſuch a diſtinction, unſcientific as it may appear, be conſidered as altogether uſeleſs. The principal department of mineralogy is undoubtedly that which deſcribes and arranges foſſil ſubſtances in ſuch a manner as to enable the ſtudent to determine the name and relations of any given unknown mineral; but this is no reaſon why we ſhould neglect other points of view in which thoſe ſubſtances may be conſidered. Thus economical mineralogy may well be allowed to arrange its materials in a manner different from that which the ſyſtematic writer would chooſe to adopt; and an aſſemblage of mineral ſubſtances, particularly valued as articles of ornament and luxury, may with propriety be made to form a ſubdiviſion in ſuch an arrangement. But though ſuperior hardneſs, luſtre, and value are ſaid to conſtitute the chief characters of the ſubſtances in queſtion, it is no eaſy matter to draw the line where the juſt mentioned properties are ſufficiently leſſened to render the epithet of *precious* inapplicable. We ſhall in this article conſider as gems or precious ſtones all thoſe apparently ſiliceous ſubſtances that, with more or leſs tranſparency, have greater hardneſs than quartz, and the ſpecific gravity of which is above 3. Their ſucceſſion is as follows: diamond, ſapphire and oriental ruby, chryſoberyl, ſpinel, hyacinth and jargon, emerald and beryl, topaze, garnet, chryſopraſe, opal, veſuvian, and chryſolite. The two laſt are precious ſtones by courteſy only. The hardneſs of chryſolite is ſcarcely that of quartz. As to the opal, though the abſence of two of the above characters would exclude it from this aſſemblage; yet it is by common conſent pronounced a firſt rate gem, often equal in value to a diamond of the ſame ſize, and muſt therefore remain with the precious ſtones.

Diamond.—Of this moſt precious of all the gems a ſufficiently detailed account has been given under that word, to which we refer, but add in this place ſome remarks more particularly connected with the ſubject of this article.

It is well known that brown, browniſh-yellow, and other

ſpots

ſpots conſiderably leſſen the value of diamonds, and that perſons concerned in their ſale endeavour to free them from theſe defects by expoſure to a certain degree of heat. This is ſometimes effected in ſmall porcelain crucibles, ſometimes by ſubjecting the diamond to the heat of the blow-pipe, in which latter caſe borax is added to prevent their acquiring a fine cruſt, which takes away the luſtre. In theſe operations care ſhould be taken that the heat be applied by ſlow degrees, and as gradually diſcontinued; ſince, in the contrary caſe, if the ſtone ſhould happen to have any incipient flaws or feathers, theſe will generally be found conſiderably to increaſe. This proceſs, however, has not conſtantly the deſired effect; for ſometimes the ſpecks will encreaſe in ſize, or exchange their colour for one perhaps ſtill leſs deſirable. Sometimes a browniſh colour is converted into red by the action of fire. Bruckmann ſaw a diamond, with a large brown ſpot before the blow-pipe in borax, aſſume a beautiful and equally diffuſed red, like that of the ballas ruby, and it was ſold with great profit as a red diamond. Another, however, with a ſpeck apparently of the ſame kind, when expoſed to the flame of the blow-pipe, became blackiſh throughout, by which change of colour its value was of courſe conſiderably diminiſhed. As to the choice of rough diamonds, (we tranſcribe what Mr. Allen has ſaid on this ſubject in a paper inſerted in the Philoſophical Magazine,) great care ſhould be taken in regard to their colour, their being free from extraneous matter, and their ſhape. The moſt perfect are cryſtalline and reſembling a drop of clear ſpring water, in the middle of which you will perceive a ſtrong light playing with a great deal of ſpirit. If the coat be ſmooth and bright, with a little tincture of green in it, it is not the worſe, and ſeldom proves bad; but if there be a mixture of yellow with green, then beware of it; it is a ſoft greaſy ſtone, and will prove bad.

If a ſtone has a rough coat that you can hardly ſee through it, and the coat be white, and look as if it was rough by art, and clear of flaws or veins, and no blueiſh caſt in the body of the ſtone, which may be diſcovered by holding it againſt the light, the ſtone will prove good.

It often happens that a ſtone ſhall appear of a reddiſh hue on the outward coat, not unlike the colour of ruſty iron, yet, by looking through it againſt the light, you may obſerve the heart of the ſtone to be white; and if there be any black ſpots, or flaws or veins in it, which by a true eye may be diſcovered, although the coat of the ſtone be opaque, ſuch ſtones are generally good.

If a diamond appear of a greeniſh bright coat, reſembling a piece of green glaſs inclining to black, it generally proves hard and ſeldom bad; ſuch ſtones have been known to be of the firſt water, but if any tincture of yellow ſeems to run within it you may depend upon its being a bad ſtone.

All ſtones of a milky coat, whether the coat be bright or dull, if ever ſo little inclining to the blueiſh caſt, are naturally ſoft, and in danger of being flawed in the cutting; and though they ſhould have the good fortune to eſcape, yet they will prove dead and milky. All diamonds of a cinnamon-coloured coat are very dubious: but if of a bright mixed with a little green, then they are certainly bad, and are accounted amongſt the worſt of colours.

The greateſt care muſt be taken to avoid beamy ſtones; and this requires greater ſkill and practice than many jewellers are equal to. By beamy ſtones are meant ſuch as look fair to the eye, and yet are ſo full of veins to the centre, that no art or labour can poliſh them; they run through ſeveral parts of the ſtone, and ſometimes through all: when they appear on the outſide, they ſhow themſelves like protuberant excreſcences, from whence run innumerable ſmall veins, obliquely croſſing each other, and ſhooting into the body of the ſtone: the ſtone itſelf will appear a very bright coat and ſhining, and the veins looking like a very ſmall poliſhed ſteel needle; ſometimes the knot of the veins will be in the centre, and fibres ſhoot outward, and the ſmall end terminate in the coat of the diamond. Stones having theſe properties are difficultly cut, and will never take a good poliſh.

Some ſyſtematic writers have given the name of *red diamond* to the ſpinel-ruby, probably on account of ſimilarity in their cryſtallization. The ſmall cryſtallized ſparkling varieties of pure rock cryſtal are frequently dignified with the name of *diamond*; thus, we have Briſtol, Corniſh, Bohemian, Tartarian, Hungarian, Sileſian, Canadian, Aſturian diamonds, diamond of Baffa, of Alençon, Dauphiny, &c.

Sapphire.—The gem next in hardneſs to the diamond is the ſapphire, compriſing, as varieties, all thoſe precious ſtones that are known by the name of oriental gems: namely, the oriental ruby, the oriental topaze, the oriental emerald. All theſe, taken together, form a ſub-diviſion of that aſſemblage of hard ſtones denominated *corundum*; which barbarous name might have been conveniently exchanged for one better adapted to European ears. The propriety of uniting the adamantine ſpar and corundum with the ſapphires, firſt occurred to Romé de l'Iſle, and his idea was afterwards followed up, with much acuteneſs of obſervation, by count Bournon, who divides the corundum, according to the two different ſtates in which it exhibits itſelf, into *perfect* and *imperfect* corundum: the former of them, conſiſting of all the above mentioned precious ſtones, was before called by Haüy *teleſie* (*i. e.* perfect body); but having followed M. de Bournon in uniting the common corundum and diamond ſpar with his teleſie, that mineralogiſt now diſtinguiſhes this latter by the name of *corindon hyalin*.

In general the name of ſapphire is given to the blue variety, which is either of a deep indigo blue, (now and then called the *male ſapphire* by lapidaries,) or of various lighter tints, ſeveral of which are ſometimes to be ſeen in one and the ſame cryſtal: the paleſt are ſometimes called *female*, or *water ſapphires*, which latter denomination is alſo applied to a blue variety of quartz. The ſapphire, more frequently than the red variety, or ruby, gradually paſſes into perfectly white or colourleſs, which, when cut, may almoſt paſs for a diamond.

A good ſapphire of ten carats is valued at 50 guineas. If it weigh twenty carats, its value is 200 guineas; but under ten carats, it may be valued by multiplying the carat at 10 ſhillings and ſixpence into the ſquare of its weight.

The red variety of ſapphire is called *oriental ruby*. Its colour is generally between a vivid cochineal and crimſon red; the latter, by an admixture of a portion of blue paſſing into violet, when it obtains the name of *oriental amethyſt*; which, without conſulting other characters, is immediately known from amethyſt quartz by its ſuperior luſtre.

A perfect ruby, above $3\frac{1}{2}$ carats, is more valuable than a diamond of the ſame weight. If it weighs one carat it is worth 10 guineas; two carats, 40 guineas; three carats, 150 guineas; ſix carats, above 1000 guineas. A deep coloured ruby, exceeding twenty carats weight, is generally called carbuncle. Of theſe 108 are ſaid to be in the throne of the great mogul, from 100 to 200 carats each.

Sapphire alſo occurs of a yellow colour, and is known as ſuch by the name of the *oriental topaze*. Its tint is generally between the dark yellow of the Brazilian, and the pale yellow of the Saxon topaze. An admixture of blue to this colour

produces the ſcarce green variety of ſapphire, called the *oriental emerald.*

Specimens, exhibiting ſeveral of theſe colours, are highly valued, both on account of their ſcarcity, and as inconteſtable proofs that difference of colour alone is not ſufficient to ſeparate ſubſtances ſo perfectly ſimilar in all other reſpects.

Beſides theſe different colours, two other properties, with reſpect to light, are obſervable in the ſapphire, which, though they proceed from an imperfection in the ſtructure of the cryſtal, are, nevertheleſs, much eſteemed. The firſt is that particular reflection obſerved in mother-of-pearl, called *chatoyement.* The other is that kind of reflection which produces the appearance of a bright ſtar with ſix rays, and which has procured the ſapphires that poſſeſs it the names of *aſterias* and *ſtar-ſtone*, and, among French lapidaries, that of *ſaphir de chat.* This beautiful variety is more frequent in the blue ſapphires than in the others. It is never ſeen in perfectly tranſparent ſtones, but is alſo obſervable in ſome of the leſs opaque cryſtals of common corundum.

The principal regular cryſtalline forms of all the ſapphires are the perfect ſix-ſided priſm, and the more or leſs acute-angled double and ſingle ſix-ſided pyramid, often deeply truncated and otherwiſe modified: they are all derived from a ſlightly acute rhomboid, which is the original or primitive cryſtal of this ſubſtance. But the rough ſapphires of commerce are generally rounded pieces, owing their form to rolling in the water, &c. In hardneſs the different varieties of ſapphire yield only to the diamond; the blue variety is ſuperior, in this reſpect, to the red, or the oriental ruby. The ſpecific gravity of blue ſapphire is from 3.907 to 4.161; that of the ruby from 3.933 to 4.087, according to Bournon.

Sapphires are found in the ſand of the rivers, at the foot of granite and trapp-rocks, particularly in Ceylon and Pegu; and they are likewiſe met with in the rivulet Rioupezouliou, at Expailly, in France. They are accompanied in Ceylon by ſpinel-ruby, tourmalin, ceylanite, and zircon. At Expailly, where they occur with iron ſand and ſmall fragments of hyacinth, they are gathered at the time when the rivulet happens to be nearly dry. The men employed in this kind of fiſhery, furniſhed with a kind of ſmall tray, with a linen bag, go up the bed of the rivulet till they arrive at ſmall depreſſions where the water has remained ſtationary: they enter them and fill their trays with the ſand of the bottom; this they waſh and ſtir with their hands under water, by which the lighter particles are carried off, while the fragments of ſapphire, &c. remain.

The ſapphires (alſo by way of excellence called *oriental gems*) claim the firſt rank after the diamond, and indeed the colourleſs variety may be conſidered as the beſt ſubſtitute for the latter. Lapidaries will often expoſe the light blue variety to the action of the fire in order to render them white and more brilliant. Brongniard obſerves, however, that the ſapphires from Expailly, inſtead of becoming colourleſs in the fire, acquire a greater intenſity of colour. Mr. Brard was aſſured by M. Picherot, a lapidary, that having left an Indian ſapphire for too great a ſpace of time expoſed to the fire, he was ſurpriſed by finding it melted into a convex ſtone (*en cabochon*) with even ſurface, though it had been cut with facets before the operation. Theſe ſtones are cut in Europe with the diamond-powder, and poliſhed with emery, a variety of the common corundum.

With regard to the above-mentioned variety, called *ſtar-ſtone*, we find it obſerved by count Bournon, that the manner of cutting it to exhibit this kind of reflection is generally, on the part of the lapidary, the reſult of chance; hence, in the greater number of the ſtones that have this property, the point from whence the ſtarry reflection proceeds, inſtead of being in the middle of the ſtone, is obſerved to be ſituated in a part more or leſs near to its baſe, by which the beauty of the ſtar-ſtone is conſiderably diminiſhed. The ſame author adds, that when an oriental ruby, or a ſapphire, which has the qualities neceſſary for the purpoſe, is intended by the lapidary to be formed into a ſtar-ſtone, he ought to make his ſection paſs below that part of the ſtone which he has found to correſpond with the ſummit of the primitive rhomboid; and as the kind of cutting moſt proper to produce this effect, is that *en cabochon* with as high an ellipſis as poſſible, the lapidary ought, at the ſame time, to take great care that the ſummit of this ellipſis be ſituated exactly under the point which correſponds with the ſummit of the rhomboid.

One of the moſt beautiful blue ſapphires is that preſerved in the collection of the Muſeum of Natural Hiſtory at Paris: it has the form of an oblique angular parallelopipedum; its weight is 132½ carats. Haüy thinks it had been cut and poliſhed; but Patrin is of the contrary opinion, becauſe no lapidary would have ever taken it into his head to give to a precious ſtone of ſuch value, a form ſo unuſual and ſo ungrateful in its effect upon the eye as the rhomboidal form. It is probable that this beautiful ſtone was really a primitive cryſtal of ſapphire, the ſides of which were afterwards poliſhed by art.

Formerly it was the cuſtom with ſome lapidaries to place the blue part of a peacock's feather under blue ſapphires, inſtead of common foil.

The ſapphire of moſt of the ancient writers appears to have been the lapis lazuli.

What is commonly called *water ſapphire*, or *falſe ſapphire*, is a blue variety of quartz; the *Brazilian ſapphire* of lapidaries is ſometimes a variety of topaze or beryl, ſometimes a blueiſh-green variety of tourmaline; and blue fluor-ſpar is now and then mentioned under the name of falſe ſapphire.

The accounts of ſmall blue and red ſapphires having been melted into beautiful large ones, by means of phoſphoric acid, &c. appear to be altogether fabulous.

Chryſoberyl.—*Chryſoberyl* of Werner, *Cymophane* of Haüy, is the ſame with the *opaleſcent* or *oriental chryſolite* of lapidaries; a precious ſtone, nearly as hard as ſapphire, and harder than topaze. Its ſpecific gravity is from 3.600 to 3.720. Its principal colour is aſparagus green; but it is only valued by the lapidary when exhibiting that kind of opaleſcence which repreſents a ſmall blueiſh-white light, undulating, as it were, in the interior of the ſtone, and changing its ſituation according to the poſition in which it preſents itſelf to the eye. There are alſo opaleſcent chryſolites, in which this kind of luſtre expands over great part of the ſurface of the ſtone, without ſhewing ſcarcely any locomotion. See CHRYSOBERYL.

This ſtone, which is alſo ſometimes called *gold-beryl*, is not frequently ſeen as an article of jewellery. Its *chatoyement* is ſometimes like that of the adularia and cats-eye; but from either of theſe ſubſtances it is eaſily diſtinguiſhed by its ſuperior hardneſs. It appears to have been confounded with the yellowiſh green beryl by thoſe writers who mention Siberia as one of the native places of this ſubſtance.

Spinelle.—The ſpinelle, both of the German and French mineralogiſts, is that precious ſtone to which the name of ruby more particularly applies: it is the ruby-ſpinel and ballas ruby of the lapidaries and jewellers. It ſcratches quartz with eaſe, but is itſelf ſcratched by ſapphire. Specific gravity about 3.7. It colour is principally red, carmine, crimſon and cherry red; from carmine it paſſes through roſe

roſe into reddiſh-white, and from cherry and crimſon-red into blueiſh-red and purple. The two laſt of theſe varieties were formerly called almandine, a name now given by Karſten and others to the noble garnet and pyrope. The cryſtal form of the ſpinel, as we ſee it in commerce, is generally that of more or leſs regular octahedra and rounded pieces. For a fuller account, ſee SPINELLE.

It is found in Ceylon and Pegu, in the ſand of rivers, accompanied with zircon, hyacinth, &c. Though it is inferior in luſtre and richneſs of colour to the oriental ruby, or red ſapphire, yet when of a certain ſize, it is much eſteemed as a gem. We are told that when the weight of a ſpinel exceeds four carats (ſixteen grains) it is valued at half the price of a diamond of the ſame weight. Mr. Brard has ſeen one at Paris of 215 grains.

It is extremely difficult, or, perhaps, impoſſible, to ſettle the ſynonomy of the ſpinel and the oriental ruby; and, indeed, ſome varieties of either of theſe ſubſtances are ſo very like one another, with regard to external characters, that, where the cryſtallization cannot be obſerved, the beſt connoiſſeurs are frequently at a loſs to diſtinguiſh them. The ſubſtances moſt commonly confounded with it are, the pyrope and noble garnet (*Barbary ruby*; *rubino di rocca* of the Italians); and the red topaze, which has obtained the name of *Brazilian ruby*, and is frequently called ballas ruby. Ignorance has alſo given the name of ruby to red fluor ſpar, and to red quartz; and it is probable that to the latter are to be referred the twelve pale rubies mentioned in Volkman's Journey through Italy, as having been preſented to the city of Venice, by the emperor John Cantacuzenus, in 1343, and each of which is ſaid to be of the weight of ſeven ounces.

Hyacinth and *Jargon* (*Zircon* of mineralogiſts). The Wernerian ſyſtem diſtinguiſhes hyacinth and jargon as ſpecies of the ſame genus; Haüy conſiders them as varieties of one and the ſame ſpecies: theſe great mineralogiſts conſequently keep both ſubſtances cloſe together. Their hardneſs is not much greater than that of the emerald; but their ſpecific gravity generally exceeds 4.4. The ſecondary form in which it uſually occurs is the four-ſided priſm, ſhorter or longer, terminated by four planes of acumination ſet on the lateral planes; or, in conſequence of a truncation of the ſolid angles of the baſe of the primitive octahedror, on the lateral edges. (See ZIRCON.) In commerce it is generally ſeen in irregularly rounded pieces.

The principal colour of the hyacinth, ſtrictly ſpeaking, is that particular yellowiſh-red, well known by the name of hyacinth red, which paſſes on one ſide into orange-yellow, on the other into reddiſh-brown. Many are the ſubſtances that have been confounded with it: the *oriental hyacinth* is the orange-coloured ſapphire; the *occidental* is a deep coloured, and the *hyacinthe miellée*, a honey-coloured variety of topaze; the *hyacinthe la belle*, and the *hyacinth of Diſſentis*, are deep orange-coloured varieties of the noble and common garnet; the *volcanic hyacinth* is the Veſuvian or Idocraſe. Moſt of theſe ſubſtances are generally ſuperior in brilliancy and value to the real hyacinth, which is the leſs eſteemed, as it ſeldom occurs of a moderate ſize without being impure and faulty.

The name of *jargon*, a corruption of zircon, is generally given to thoſe varieties of hyacinth which are nearly colourleſs, greeniſh, blueiſh-grey, and alſo browniſh-red. The firſt of theſe are moſt eſteemed; whence art imitates them by expoſing light-coloured varieties to the action of fire, which renders them colourleſs. In this ſtate (whether produced by art or nature) they are improperly called *diamans bruts* by French jewellers, and often ſold for real diamonds of inferior quality. But as very ſmall brilliants, it is often difficult to diſtinguiſh the beſt ſort from real diamonds: whence they are frequently employed for ornamenting watch-caſes, &c. The other varieties are not ſo much eſteemed. Emmerling ſays they are principally uſed as an ornament in mourning dreſs.

The hyacinth and jargons are brought from Ceylon, and other parts of India. Hyacinths in ſmall cryſtals and fragments, ſome of them fit to be cut, are alſo found in the rivulet Rioupezouliou, in Italy, &c. but thoſe of Spain, deſcribed by Bowles and others, are nothing but quartz cryſtals, vulgarly called in Spaniſh *jacintos de Compoſtella*.

Topaze.—This gem, to diſtinguiſh it from the yellow variety of ſapphire, is ſometimes called *occidental topaze*; though this name is alſo given to a variety of rock cryſtal. It is inferior to ſpinelle in hardneſs, but it is harder than emerald. Born ſtates its hardneſs compared with that of the diamond, to be as ſeven to one. Its ſpecific gravity is 3.5.

It occurs colourleſs, like pure rock cryſtal, yellow, red, and blue. Among the colourleſs variety, the Siberian appears to be the beſt; but it is alſo found of very fine luſtre in the Brazils and in New Holland, where it has been lately diſcovered occurring chiefly as rolled pieces.

The yellow is the uſual and characteriſtic colour of this ſtone; it occurs as pale wine and ſtraw colour in the Saxon topazes; it is ſometimes ſo very faint, that the cryſtals appear almoſt colourleſs. In the Brazilian yellow variety, it is generally of a deep wine colour, which paſſes through orange mixed with red into a pretty pure fleſh red. This red colour or pink is ſaid to be often artificially produced by heating the cryſtals to a certain degree, and it is ſuppoſed that the gems ſold for *Brazil rubies* are nothing but topazes, thus altered by heat. They go alſo by the name of *rubicelle* or *rubacelle*, but not by that of *rubaſſe*, which is common rock cryſtal, heated and coloured red by the abſorption of a red ſolution.

The white Brazilian topazes have often a tinge of blue, which is ſometimes ſufficiently intenſe to procure it the appellation of *oriental aquamarine*; in the ſame manner as the Saxon topaze, when ſhewing a faint admixture of green, is ſometimes called *Saxon* or *occidental chryſolite*. It is now and then ſeen of a pale lilac blue, but frequently what is exhibited as topaze of this colour, turns out to be nothing but a very pure variety of amethyſt-quartz.

The croſs fracture of all varieties of topazes is perfectly ſtraight foliated.

The ſecondary cryſtalline forms, more frequently occurring among the topazes of commerce, are four, eight, and ſix-ſided oblique priſms, generally with longitudinal ſtreaks, and eſpecially in the Brazilian, terminated by a low four-ſided pyramid, which is now and then deeply truncated. The white Siberian topaze is often found in very large cryſtals, which are, however, in general leſs pure than the middle-ſized and ſmall ones: when heated they give ſigns of electricity.

The Brazil topazes are ſaid to be found imbedded in clay; but they are brought to Europe in detached cryſtals, generally acuminated on both extremities, one of which, when heated, exhibits poſitive, the other negative electricity. The Saxon topaze, which is moſtly ſeen in cryſtals broken on one extremity, or ſtill attached to its matrix, which is generally a particular rock called topaze-rock, becomes electric by friction. For a more complete deſcription, ſee TOPAZE.

The topazes are not ſufficiently ſcarce to be much valued by the jeweller and lapidary; the deep yellow variety from the Brazils is in general preferred to the pale ſort, though the latter is often ſuperior to the former, both in fire and hardneſs. From Hawkeſworth's account of Cook's firſt voyage,

voyage, we ſee that there were at that time three ſorts, of different value, ſold at Rio de Janeiro, and diſtinguiſhed by the names of *Pinga d'Agua qualidade primeira*, *Pinga d'Agua qualidade ſegunda*, and *criſtallos amarellos:* they were then ſold, large and ſmall, good and bad together, by octavos or eighth parts of an ounce, the beſt at 4*s.* 9*d.* The *Pinga d'Agua* are probably the white ones, a fine ſort of which is now called *da mina nova*.

The above-mentioned topaze-rock, of Schneckenſtein, is a mixture of quartz, ſhorl, topaze, and lithomarge, and its powder is uſed for poliſhing the topazes it contains. Another mode of poliſhing the Saxon topaze, as mentioned by Mr. Kern, is that on a diſk of copper, by means of tripoli, with the addition of ſpirits of wine.

The name of this gem is ſaid to be derived from that of an iſland in the Red ſea, where the topaze was firſt diſcovered by the Greeks. The topaze of the ancients, however, does not appear to have been the ſame with our's: it is deſcribed as of a green colour, and ſeems to anſwer to the chryſolite of the preſent day.

Subſtances, to which the name of topaze is improperly applied, are the *oriental topaze*, which is the yellow ſapphire; the *Bohemian topaze*, ſometimes called *occidental topaze*, is a yellow, and the *ſmoaky topaze*, a blackiſh variety of rock cryſtal, called alſo cairn-gorum. The yellow variety of Siberian beryl is likewiſe improperly diſtinguiſhed by the name of *topaze*, as is a variety of hyacinth or zircon, and of olivine; the yellow variety of fluor-ſpar is called *falſe topaze*.

Emerald and Beryl.—Theſe two are ſo nearly allied both in external and other characters, that moſt ſyſtematic mineralogical writers have thought proper to unite them as varieties or ſub-ſpecies of one and the ſame ſpecies. Karſten calls the former *ſmooth*, the latter *ſtriated emerald*. Their hardneſs is rather greater than that of quartz, which they ſcratch with difficulty. Specific gravity 2.7. See EMERALD.

In common life that variety only is denominated *emerald*, which exhibits the beautiful pure priſmatic green, without any apparent predominance of either yellow or blue. Of that intenſe colour it has only been found in Peru, where it occurs in the valley of Tunia or Tomana, near New Carthagena, between the mountains of Granada and Popayan. Such emeralds are alſo brought to Europe from many parts of the Peruvian coaſt, from point St. Helena, up to the bay Bonaventura. The largeſt emerald on record is that deſcribed by Garcilaſſo de la Vega, as having been of the ſize of an oſtrich's egg; it was in the poſſeſſion of the inhabitants of the valley of Manta in Peru, where, when the Spaniards arrived, it was worſhipped under the name of the goddeſs or *mother* of emeralds; and the ſmall ones that were brought as offerings, the prieſts diſtinguiſhed by the name of the *daughters*.

The large emerald, of the weight of twenty-eight pounds and three quarters, at Reichenau, a monaſtery on an iſland of the lake of Coſtanz, is ſtated to be *green fluor* by Mr. Coxe, on whoſe authority, ſince the treaſure is no longer exhibited, every writer on this ſubject pronounces it to be fluate of lime. But long before that gentleman, Mr. Von Beroldingen had examined the ſubſtance, and found it to be *glaſs*. Which of the two travellers is in the right? If it be the latter, it would appear that Mr. Coxe has been miſled by the German word *fluſs*, which is generally applied to fluor, but likewiſe denotes flux, in the ſenſe in which enamellers uſe it.

Mr. Buſching aſſerts, that the emerald cauſes much labour to the lapidary to cut it; but this appears to be contrary to experience, and we know that the emerald is one of the ſofteſt of the precious ſtones. It is generally cut in thick tables with ſmall facets ſurrounding the border. Emeralds of the firſt quality require no foil, but are, like diamonds, placed on a black ground; thoſe of inferior luſtre receive a green gold foil, in the room of which a gloſſy green ſattin was now and then ſubſtituted in former times.

What the ancients meant by *ſmaragdus*, is a queſtion which has engaged the attention of a great number of antiquaries, and many opinions have been formed, of which the moſt plauſible is, that the Greeks and Romans dignified by that name all fine ſtones of a green colour both tranſparent and opaque. The emerald of the preſent day may have been among the ſubſtances called ſmaragdus; and, indeed, the deſcription given by Pliny of that of Scythia, Bactria, and Æthiopia, agrees very well with it. If ſo, it is clear that the green emerald, which we ſuppoſe confined to Peru, has formerly been found alſo in the old world.

The precious ſtone, called *oriental emerald*, is the green and ſcarce variety of ſapphire; the *Brazil emerald* is a green tourmalin; the *Carthagena emeralds* are nothing but green fluor ſpar, as are thoſe (according to Haüy) called *emeraudes morillons* and *nègres-cartes*; of the two latter, however, Patrin obſerves that they are real American emeralds, but of inferior quality.

The *beryl*, alſo vulgarly known by the name of *aquamarin* (more vulgarly *egg* or *eagle-marin*), is generally ranked among the gems: its cryſtals are of a more obviouſly lamellar ſtructure, much larger than the green emeralds, and though their blue colour often paſſes into green, this is never of a vivid kind, but generally oil and mountain-green and greeniſh-yellow. (See EMERALD, *Beryl.*) When of honey or wine-yellow, the beryl is called *honey-emerald*, or *emeraude miellée*.

A greeniſh variety of quartz, the apatite, and cyanite, are ſometimes confounded with beryl; and the London lapidaries give this name to fine pellucid carnelians. (See GEMS, *Engraved.*)

There ſeems to be no doubt that our beryl is the ſame with ſome of the ſtones thus named by the ancients.

Beryls are cut with emery on a leaden diſk, and poliſhed on a pewter diſk with tripoli.

The deep greeniſh aquamarins are ſet with a ſteel-coloured or greeniſh-blue foil; the pale ones are either placed, like the diamond, on a black ground, or, what has a better effect, on a ſilvery foil.

Garnet.—Blood and cherry-red, blueiſh-red, yellowiſh and hyacinth red. Hardneſs greater than that of quartz. Spec. grav. 3.4—4.3.—Werner, and ſome other modern mineralogiſts, have ſeparated from the noble garnet, the Bohemian or that variety which is found only in rounded pieces, calling it *pyrope*; and Karſten has given the name of *almandine* to that variety which is often called *oriental* or *Sorian garnet*. If ſubdiviſions of a mineral ſubſtance are required, thoſe that make them ſhould be cautious in applying to them ancient vague denominations, or names already given in common life to ſubſtances different from thoſe that are to be thus diſtinguiſhed. Neither of the juſt-mentioned writers is able to prove, or even to render it probable, that the ancients underſtood by thoſe appellations the precious garnet; *pyropus*, *carbunculus*, *carbo*, *anthrax*, were, with them, names for all ſorts of red ſtones endowed with a certain degree of luſtre, but principally for the pure red ſapphire and ſpinelle; and, on the other hand, the names both of pyrope and almandine are ſometimes given by modern lapidaries to the blueiſh-red variety of ſapphire, called alſo the oriental amethyſt.

The only diſtinction made by jewellers, with regard to garnets, is that they call *oriental* thoſe of a richer deep blood red, whatever be the part of the world from which they come,

come, and *Syrian* (meant for *ſorian* or *ſirien*), thoſe that ſhew an admixture of blue; though this latter name is given by Boetius to a yellowiſh-red variety. Garnets, in which the yellow predominates, are by the Italians called *jacinto guarnacino*, to which alſo the *iacinthe la belle* appears to belong.

Even the fineſt of the noble garnets have a ſombre appearance if compared with the ruby, whence lapidaries, to remedy this defect in ſome meaſure, will often cut the ſtones with a conſiderable concavity on one ſide; in which ſtate they are called *garnet cups*.

The deep red variety of the noble garnet, from Greenland, which occurs only maſſive, in curved lamellar concretions, appears to be worthy to be employed for ornamental purpoſes.

Chryſopras.—This ſemi-tranſparent ſtone, of a beautifully apple-green paſſing into graſs-green, deſerves to be ranked with the gems or precious ſtones, as well on account of its hardneſs, which far exceeds that of quartz, its ſpecific gravity, which is 3.25, and on account of its value as an article of jewellery, in all which reſpects it ſurpaſſes the true varieties of quartz, to which ſpecies it is referred by the French ſchool under the name of *praſe*: but Werner's praſe is a dark-green variety of true quartz. It is much eſteemed as a gem; a ring ſtone of the pure uniformly apple-coloured, nearly tranſparent variety, that ſhews no paler ſpots, has often been ſold for twenty guineas and upwards.

The oxyd to which the Sileſian chryſopraſe owes its pleaſing colour, is that of nickel; we ſhould therefore ſuppoſe it to be permanent; but the fact is, that the colour of chryſopraſe is very changeable; it is altered both by being expoſed to moiſture and to heat. Lapidaries even pretend that great care ſhould be taken in poliſhing it; for if, for want of ſufficient moiſture, or by the too rapid motion of the wheel, it be over-heated in the act of poliſhing it, it is ſaid to become whitiſh or turbid. Bruckmann placed a poliſhed, but not perfectly pure, chryſopraſe on the heated ſtove in his room, and after ſome weeks found it quite opaque, of a dirty dark-green colour, and full of black flaws.

Jewellers formerly uſed to place a gold foil under the more tranſparent Sileſian chryſopraſes.

Its comparatively high price has produced excellent imitations in paſte; but they are eaſily known by their inferior hardneſs and greater ſpecific gravity, the metallic oxyd with which the glaſs is coloured being probably lead.

The *Opal*, or *noble opal*, to diſtinguiſh it from the common and ſemi-opal that have no vivid colours, is a very brittle ſtone, and its ſpecific gravity ſeldom exceeds 2; but the beautiful play of colours ariſing out of theſe very imperfections, the brilliant blue, green, red, and yellow-coloured ſpots, variouſly mixed and modified, have, notwithſtanding its inferior hardneſs, procured it a diſtinguiſhed place among the gems. In modern times fine opals of moderate bulk have been frequently ſold at the price of diamonds of the ſame ſize; the Turks are uncommonly partial to it; but the eſtimation in which it was held by the ancients (who alſo called it *pæderos*, or child beautiful as love), ſurpaſſes belief; indeed, Nonius, the Roman ſenator, preferred baniſhment to parting with his favorite opal which was coveted by Marc Antony. But it is very probable that many of the ſtones deſcribed by ancient and modern writers as beautiful opals of great hardneſs were opaleſcent ſapphires. In modern times, too, many fine glaſs paſtes have been ſold at enormous prices for *oriental opals*; for this is the name given to the moſt brilliant varieties, though none of them are known to be found out of Europe, the moſt brilliant coming from Hungary. The lapidaries, who generally cut the opal ſimply *en cabochon*, which form is the moſt advantageous for its play of colours, diſtinguiſh ſeveral varieties of this ſtone, ſome of them belonging to the ſub-ſpecies, called common and ſemi-opal by Werner. That in which the colours appear as ſpecks or ſpangles, the French jewellers call *opale à paillettes*, that with flakes, or lengthened ſpots, is known by the name of *opale à flammes*: they farther diſtinguiſh the *yellow opal*, which is eſteemed only when it is of a brilliant gold yellow; the *blackiſh opal*, with faint, particularly reddiſh or violet colours, appearing ſometimes in the manner of burning nearly extinguiſhed charcoal; the *wine-opal*, in which, when held between the eye and the light, the yellowiſh-red predominates; if it appear quite red when viewed in this poſition, it is called *giraſol*, which name is alſo given to the corundum-ſtar ſtone; the *milk-opal*, milky white, ſometimes but imperfectly tranſparent, appearing blueiſh and reddiſh blue when held againſt the light, and offering here and there ſmall ſpecks of green and purple. The matrix of the opal, a dark grey diſintegrated porphyry, with brilliant particles of opal diſſeminated, is likewiſe ſeen cut into ring ſtones, &c. If this porphyritic ſubſtance is found to be perfectly black, (in which caſe the diſſeminated noble opal appears to ſtill greater advantage,) the black colour is in general artificially produced by ſoaking the ſtone in oil, and ſubjecting it to the action of the fire; the carbonaceous matter thus produced remains in the pores of the matrix, while the diſſeminated grains of opal, provided the heat had not been too intenſe, retain their original brilliancy.

The variety of ſemi-opal, called *oculus mundi*, or *hydrophane* (becauſe it becomes tranſparent and often even irideſcent when immerſed in water, but returns to its original ſtate of opacity as ſoon as the abſorbed moiſture is again evaporated), is ſometimes ſet in rings *au jour*, and the rate at which even the ſmalleſt of theſe ſtones were formerly ſold is truly ridiculous; at preſent their price is conſiderably lowered, though they ſtill continue to be objects of curioſity. It is found in Hungary, Iceland, and Hubertſburgh, &c.: many that come from the two laſt mentioned places acquire both tranſparency and irideſcence by imbibing water. See HYDROPHANE.

Two or three other ſubſtances that rank by courteſy among the gems, but are ſcarcely of the ſame hardneſs with quartz, are the Veſuvian (idocraſe of the French ſchool), and the chryſolite and olivine, united by Haüy under the name of peridot.

Veſuvian, (*idocraſe* of Haüy,) known alſo by the name of *hyacinthine*, or *brown volcanic hyacinth*, is ſufficiently hard to ſcratch quartz; its ſpecific gravity is about 3.4; it is ſenſibly double-refracting; its colour is generally reddiſh-brown, often approaching to hyacinth red, but likewiſe olive-green of various depth and even blackiſh-green. Its fracture is vitreous, uneven: the primitive form of its cryſtals, which have a poliſhed ſhining ſurface, is a very ſhort priſm with ſquare baſe; the ſecondary cryſtals are formed by the truncation of all the edges. (See VESUVIAN.) It is often difficult to diſtinguiſh it in its natural ſtate from common garnet; Sauſſure, deſcribing a yellowiſh-red variety of the latter found at Diſſentis, was miſled to conſider it as the ſame with Veſuvian. Its ſpecific gravity and hardneſs are inferior to thoſe of garnet. It is often very difficult to diſtinguiſh it from chryſolite when cut and poliſhed: for both agree in ſpecific gravity and double refraction, ſo that no diſtinctive character remains except a ſlight difference in colour, which is generally of a lighter olive-green in the chryſolite than in the Veſuvian, and in the latter is commonly obſcured by an admixture of black.

black. From the Braſilian tourmaline it is eaſily diſtinguiſhed by not being electric except by friction, while the tourmaline becomes electric by heat.

The more tranſparent varieties of the Veſuvian or idocraſe are cut and poliſhed by the Neapolitan lapidaries, who ſell them to travellers as objects of curioſity, under the name of *Veſuvian gems*; but they are of little value and ſeldom employed as articles of jewellery. Dr. Bonvoiſin has lately deſcribed a beautiful variety of this ſubſtance, under the name of *peridot-idocraſe*: it is found in the ſerpentine rock Teſta-Ciarva, in Piedmont, in cryſtals of a delicate green colour, paſſing ſometimes into yellowiſh-red, or wine colour.

Chryſolite, or Peridot.—Its uſual colour is a high piſtachio-green, approaching ſometimes to olive-green, more rarely to graſs-green: it is alſo found paſſing into reddiſh-clove brown, but this variety is no object of jewellery. The general form of its cryſtals is that of a flattened priſm of from four to eight lateral planes, with a pyramidal or cuneiform ſummit, which is often truncated. It has conſiderable double refraction. Its geognoſtic ſituation is not well known, nor even the country from which it comes: that which is more particularly an article of commerce is brought to Europe from the Levant.

The colours of the chryſolite, though not vivid, are chaſte and pleaſing; but the hardneſs of this ſtone is ſo inconſiderable that it ſoon becomes dull and unſightly when uſed for ornament; hence it has never been much valued, for, indeed, according to a ſaying among French lapidaries,

"Qui a deux péridots
En a un de trop."

What is not eſteemed is generally neglected, and conſequently confounded with other things it may reſemble: thus the chryſolite (which name was probably given by the ancients to our topaze), has been jumbled together with the following ſubſtances, ſome of them more, others leſs precious than itſelf: 1. *Chryſoberil*, either ſimply or with the epithets of *oriental* and *opaleſcent*; 2. Light-green *zircon*, from Ceylon; 3. Yellowiſh-green *topaze*, from Saxony; 4. Yellowiſh-green *beryl*, from Siberia; 5. Piſtachio-green *tourmaline*, from Braſil; 6. *Prehnite*, from the Cape; 7. Tranſparent yellowiſh-green *garnet*, from Saxony; 8. Light-green var. of *Veſuvian*, (idocraſe, Haüy); 9. *Augite*, (pyroxène, Haüy); 10. Olive-green *quartz*, from Glatz, &c.; 11. *Aſparagus-ſtone*, from Caprera, near Cape Gate, in Murcia, Spain; 12. Piſtachio-green *apatite*; 13. *Fluor-ſpar*; not to mention the *olivine* with which the chryſolite is united by the French ſchool of mineralogy.

Olivine, though ſometimes found in large rounded maſſes, in baſalt, &c. being ſtill ſofter and leſs ſightly than the real chryſolite, has, for aught we know, never been employed for purpoſes of ornament.

The *art of imitating gems*, or precious ſtones, is intereſting as a branch of experimental chemiſtry, and (though fraud and vanity may have been the principal cauſes that brought it to early perfection) venerable on account of its remote antiquity. The Egyptians were undoubtedly in poſſeſſion of this art, as ſeveral valuable relics have ſufficiently proved. Pliny tells us, that the Greeks and his countrymen were equally ſkilful in imitating emeralds and other tranſparent ſtones, by colouring cryſtals; they alſo manufactured onyx and ſardonyx, by cementing red and dark coloured to a white layer of chalcedony. Their paſtes or impreſſions of engraved gems, their cubes, &c. for moſaic pavement, their beautiful vaſes with figures in bas relief, are ſtill ſubjects of admiration to the curious. But alſo at this preſent day we are in full poſſeſſion of the art of counterfeiting precious ſtones; indeed, there is none, except the noble opal, which has been found too difficult for imitation. It is no eaſy matter, by mere inſpection, to diſtinguiſh the better kind of factitious ſtones or paſtes from the real gems, for which they are ſubſtituted; and the difficulty of diſcriminating them increaſes in proportion as it becomes impracticable to examine into thoſe external and phyſical characters by which they were eaſily diſtinguiſhed before they had paſſed through the hands of art. But a deficiency in luſtre, a low degree of hardneſs, yielding, even in the moſt perfect paſtes, to the edge of a knife, and their ſpecific gravity ſeldom exceeding that of common glaſs, are among the ſureſt criteria by which theſe artificial productions may be diſtinguiſhed. With regard to the laſt of theſe characters, however, it ſhould be obſerved, that what has been ſaid above, of the ſuperiority of the artificial over the true chryſopras, in point of ſpecific gravity, may paſs for an exception.

Coloured glaſſes, deſtined to imitate the diamond and other precious ſtones, do not differ from enamel except in their being tranſparent. Enamel loſes this tranſparency on account of the oxyd of tin which generally forms the baſe, and which is very difficult to vitrify. (See ENAMEL.) The coloured glaſſes, on the contrary, preſerve their tranſparency, becauſe the metallic ſubſtances uſed for colouring them undergo a complete vitrification, and intimately combine with the molecules of the glaſs. The requiſites of good artificial precious ſtones conſiſt in their being as hard as poſſible, without veſicles, of a perfect tranſparency; and in the brilliancy and equality of the colours. The laſt-mentioned quality depends on the exact mixture before fuſion. The longer the coloured glaſſes are expoſed to the action of the fire, the harder they become, and the more they are freed from veſicles. But this long continued action of the fire deſtroys and volatilizes the colouring matter, with the exception of the blue colour made of cobalt, which reſiſts the ſtrongeſt fire, and with which, therefore, artificial glaſſes of a high degree of hardneſs can be prepared. It is this impoſſibility of fixing the other colours, which renders the art in queſtion ſo difficult, and obliges moſt artiſts to be ſatisfied with ſoft glaſs, which loſes its poliſh by the ſlighteſt rubbing.

Neri's work, on the art of glaſs making, contains a great number of proceſſes to colour both glaſs and cryſtal; but thoſe who have repeated the experiments of this writer have not in all caſes been ſatisfied with the reſults they obtained. Kunkel, the commentator on Neri's work, has likewiſe deſcribed various methods of making artificial gems; he has been copied by all authors who have ſince written upon the mode of colouring glaſs, and great encomiums have been beſtowed on him by the adepts in this art. But a more modern writer on this ſubject is M. Fontanieu, who has given, in the Journal de Phyſique, an account of his experiments, which are ſaid to have been frequently repeated with the beſt ſucceſs, and to deſerve more attention than thoſe of others.

The firſt object of M. Fontanieu's reſearches, was to produce a perfectly colourleſs cryſtal, proper to take the colour intended for it, and this he calls *fondant* or baſe. They are five in number.

Firſt Baſe.—Two parts and a half of lead in ſcales, one part and a half of rock cryſtal or prepared flints, half a part of nitre, the ſame quantity of borax, and a quarter part of glaſs of arſenic, (by "parts" the author means eight ounces, hence in this caſe the quantity of the ingredients is, lead in ſcales 20℥, rock-cryſtal 12℥, nitre 4℥, borax 4℥, arſenic 2℥) being well pulverized and mixed, form the compoſition

of

of the firſt baſe. This mixture being put into a Heſſian crucible, and ſubmitted to the fire, is converted into frit. When perfectly melted it is poured into cold water; after which it is melted a ſecond and a third time, always in a new crucible, and care is taken that the water for each renewal of the proceſs be perfectly clear, and that the lead which may happen to be revived be ſeparated from it.

Second Baſe.—Two parts and a half of white ceruſe, one part of prepared flints, half a part of ſalt of tartar, and a quarter part of calcined borax. This mixture is melted in a Heſſian crucible, and poured into cold water; it is then to be melted again, and waſhed a ſecond and third time, as in the former proceſs.

Third Baſe.—Two parts of minium, one part of rock-cryſtal, half part of nitre, and as much ſalt of tartar, being well mixed and melted, are poured in cold water, in the ſame manner as the former.

Fourth Baſe.—Three parts of calcined borax, one part of prepared rock-cryſtal, and one part of ſalt of tartar, are well mixed and melted, and poured into luke-warm water. After being dried the maſs is mixed with an equal quantity of minium, melted and waſhed ſeveral times, as directed above.

Fifth Baſe, or Mayence Baſe.—This is one of the fineſt cryſtalline compoſitions our author is acquainted with. Three parts of ſalt of tartar, and one part of prepared rock-cryſtal, are mixed and made into frit, on which, after it has cooled in the crucible, warm water is poured to diſſolve it. This ſolution being decanted into a ſtone-ware pan, aquafortis is gradually poured into it, until it ceaſes to effervеſce. The water is again decanted, and the frit is waſhed in luke-warm water, until it has no longer any taſte. The frit is then dried, and mixed with one part and a half of fine ceruſe, or white lead in ſcales; this mixture muſt be well levigated, being beſprinkled at the ſame time with diſtilled water. To one part and a half (12 ounces) of this powder dried, add an ounce of calcined borax; let the whole be well mixed in a marble mortar, then melted and poured into cold water, as the other baſes already deſcribed. Theſe fuſions and lotions having been repeated, you mix with the whole powdered compoſition a twelfth part of nitre. This new mixture being melted for the laſt time, you will find in the crucible a beautiful cryſtalline maſs, poſſeſſing, as the author expreſſes himſelf, much of the *Orient.*

It ſhould have been obſerved before, that Mr. Fontanieu begins his operation with preparing the ſiliceous ſubſtances he employed for the proceſſes juſt deſcribed; he places them in a degree of heat capable of making the maſs red hot, after which he pours it into cold water, next he decants the water, and having dried the flinty maſs, he pounds it, and ſifts the coarſe powder through a ſilk ſieve; he then digeſts it during ſome hours with muriatic acid, which diſſolves the heterogeneous matter often mixed with the ſand; he then pours off the acid, waſhes the ſand ſeveral times to take away the acid remains; dries it, and paſſes it a ſecond time through the ſieve.

The ſubſtances employed for colouring factitious gems are metallic oxyds; and on the proper preparation of theſe oxyds depends the vividneſs of the colours.

1. From *Gold.*—To obtain the purple colour known by the name of precipitate of Caſſius, Mr. Fontanieu employs three different proceſſes, of which the following, as he acquaints us, is by far the beſt.

Diſtil in a glaſs retort, placed in a bath of aſhes, ſome gold diſſolved in aqua regia, made with three parts of nitrous, and one part muriatic acid; when the acid is paſſed over, and the gold contained in the retort appears dry, leave the veſſel to cool, then pour it into ſome new aqua regia and proceed to diſtil as before. Replace the aqua regia twice upon the gold, and diſtil the ſame. After theſe four operations, pour by little and little into the retort ſome oil of tartar per deliquium, which will occaſion a briſk effervеſcence; when this ceaſes, diſtil the mixture till it becomes dry, and then put ſome warm water into the retort. Shake the whole, and put it into a cucurbit, when a precipitate is depoſited, the colour of which is ſometimes brown and ſometimes yellow. After having waſhed this precipitate, dry it. The mineral purple thus prepared is ſaid to be much ſuperior to that of the two other proceſſes propoſed by M. Fontanieu, ſince two grains of it only are ſufficient to an ounce of the baſe, whilſt it requires of the other two a twentieth part of the baſe. The ſame author found alſo the means of exalting the colour of the precipitate of Caſſius by putting to it a ſixth part of its weight of glaſs of antimony finely powdered, and of nitre in the proportion of a drachm to eight ounces of the baſe.

2. From *Silver.*—The oxyd of ſilver being vitrified, produces a yellowiſh-grey colour. This oxyd enters only into the compoſition of the yellow artificial diamond and opal. Mr. Fontanieu introduces it into the baſe in the form of horn ſilver (*luna cornea*). In order to prepare it, he diſſolves the ſilver in nitrous acid, and afterwards pours into it a ſolution of ſea ſalt: a white precipitate is obtained, which, being waſhed and dried, melts very readily in the fire, and is ſoon volatilized, if not mixed with vitrifiable matter.

3. From *Copper.*—The oxyd of copper imparts to white glaſs the fineſt green colour; but if this metal be not exactly in a ſtate of oxydation it produces a browniſh-red colour. Mountain blue verdigris, and the reſidue of its diſtillation, are the preparations of copper which M. Fontanieu employs to make the artificial emerald.

4. From *Iron.*—Though it is commonly believed that the oxyds of iron communicate a very fine tranſparent red colour to white glaſs, our author could only obtain from it a pale red, a little opaque. The oxyd of iron he employed was in the proportion of the twentieth part of the baſe. There are various ways of preparing the oxyd of iron called crocus Martis, or ſaffron of Mars. In general it is neceſſary that this metal be ſo far oxydated that the magnet ceaſes to attract it. Thus one may uſe the ſcales of iron found upon the bars of furnaces, which ſerve to diſtil aquafortis. By digeſting filings of ſteel with diſtilled vinegar, then evaporating and replacing the vinegar ten or twelve times upon theſe filings, and drying them alternately, an oxyd of iron is obtained, which muſt be ſifted through a ſilk ſieve, and then calcined. The oxyd of iron, thus obtained by the vinegar, our author ſays, only introduced into his baſes a green colour inclining to yellow. By the following proceſs one of the fineſt red colours is obtained: Let an ounce of iron-filings be diſſolved in nitrous acid in a glaſs retort, and diſtilled over a ſand-bath to dryneſs. After having replaced the acid or the dry oxyd, and re-diſtilled it a ſecond and a third time, it is then edulcorated with ſpirits of wine, and afterwards waſhed with diſtilled water.

5. From the *Magnet*—It is neceſſary to calcine the magnet before it be introduced into the vitrifications; having, therefore, torrefied the magnet during two hours, it muſt be waſhed and dried. It is only employed in the compoſition of the common opal.

6. From *Cobalt.*—The oxyd of cobalt is made uſe of for introducing a blue colour into glaſs: but as this metal is rarely free from iron and biſmuth, it is firſt neceſſary to ſeparate them from it; which is done by calcining the cobalt ore in order to diſengage the arſenic; and next diſtilling the oxyd in a retort with ſal ammoniac, when the iron and the

biſmuth are found ſublimed with this ſalt. The diſtillation muſt be repeated with the ſal ammoniac till this ſalt is no longer coloured yellow. The cobalt which remains in the cornute is then calcined in a potſherd, and becomes a very pure oxyd, which being introduced into the baſe, in the proportion of a 900th part, gives it a very fine blue colour; the intenſity of which may be encreaſed at diſcretion by the addition of oxyd of cobalt.

7. From *Tin*.—The oxyd of tin, which is of a white colour, renders opaque the glaſs with which it is melted, and forms white enamel. For this purpoſe calcine the putty of tin; then waſh and dry it, and ſift it through a ſilk ſieve. Take ſix pounds of the ſecond baſe, the ſame quantity of the calcined putty of tin, and forty-eight grains of manganeſe.

8. From *Antimony*. Antimony is only ſuſceptible of vitrification in a certain ſtate of oxydation, and then it produces a reddiſh hyacinth-coloured glaſs; but if the antimony be in a ſtate of abſolute calx, ſuch as the diaphoretic antimony, then it is no longer vitrifiable, and may be ſubſtituted for oxyd of tin, to make white enamel. M. Fontanieu makes uſe of it in the compoſition of artificial topazes.

9. From *Manganeſe*.—Employed in a ſmall quantity, this metallic ſubſtance renders the glaſs whiter; a larger quantity produces a very fine violet colour, and a ſtill larger doſe renders the glaſs black and opaque. There are two ways of preparing manganeſe. The moſt ſimple conſiſts in expoſing it to a red heat, and then quenching it with diſtilled vinegar: it is afterwards dried and powdered, in order to paſs it through a ſilk ſieve. The other method, of preparing the manganeſe proper to furniſh a red colour, is deſcribed by Haudiquer de Blancourt, who calls it "fuſible manganeſe." Take of manganeſe of Piedmont one pound; torrefy and pulverize it; then mix it with a pound of nitre, and calcine the mixture during twenty-four hours; afterwards waſh it repeatedly in warm water, till the water of the leys has no longer any taſte; dry the manganeſe, and mix with it an equal weight of ſal ammoniac; levigate this mixture on a ſlab of porphyry with ſulphuric acid, diluted with water to the ſtrength of vinegar. Dry the mixture, and introduce it into a cornute; diſtil by a graduated fire; and when the ſal ammoniac is ſublimed, weigh it, and add to the mixture an equal quantity. Then diſtil and ſublime as before, and repeat the operation ſix times, being careful at each time to mix the ſal ammoniac and the manganeſe upon the porphyry with diluted ſulphuric acid.

At Turnhault, in Bohemia, a fuſible glaſs is ſold of a yellow colour, very like that of the Brazil topaze: which, when expoſed to a degree of fire in a cupel ſufficient to redden it, becomes of a very fine ruby colour, more or leſs deep, according to the degree of fire to which it has been expoſed. Fontanieu, who aſſayed this glaſs, found it to contain a great deal of lead; but was not able to diſcover any gold in it.

M. Fontanieu obſerves, that there are three *degrees of fire for factitious gems*, very different in their energy. The fire kept up in the wind furnaces in the laboratory of chemiſts, is leſs active than that whoſe effect is accelerated by means of bellows; and a fire ſupported by wood, and kept up during ſixty hours without interruption, produces ſingular effects in vitrification, and renders the glaſs finer and leſs alterable. When recourſe is had to the forge, in order to operate a vitrification, it is neceſſary to turn about the crucible from time to time, that the maſs may melt equally. Some coal alſo ſhould be replaced in proportion as it conſumes towards the nozle of the bellows; for without this precaution we ſhould run the riſk of cooling the crucible oppoſite to the flame, and probably of cracking it. Though this is the readieſt way of melting, it ſhould not be employed out of choice; for the crucible often breaks, or coals get into it, which may reduce the lead to the metallic ſtate. The wind furnace is either ſquare or round. A ſmall cake of baked clay or brick, of the thickneſs of an inch, is placed upon the grate, and upon this cake is placed the crucible, ſurrounded with coals. The degree of heat produced by this furnace is much leſs than that of the forge; but in order to ſucceed in the vitrification, M. Fontanieu recommends the uſe of a furnace deſcribed by Kunkel, of which the interior part is ſo diſpoſed, that we may place crucibles at three different heights; and the name of "chambers" is given to thoſe ſteps on which the crucibles are placed. It is obvious that the degree of heat cannot be equal in theſe three chambers. In the firſt, or loweſt, the heat is greateſt; it is leſs in the ſecond, and ſtill leſs in the third or higheſt. We ſhould begin by placing the crucibles according to their ſize in theſe different chambers; by which means the beſt effect in vitrification is produced. In order to conduct the fire well, only three billets of wood ſhould be put into the furnace at a time for the firſt twenty hours; four billets at a time for the next twenty hours; and ſix billets for the laſt twenty hours; in all ſixty hours. The furnace is then left to cool, care being taken to ſtop the air holes with ſome lute; and in about forty-eight hours after, when the kiln is quite cold, the crucible is to be withdrawn.

Compoſitions.—To make the *white diamond*, take the above fifth, or baſe of Mayence. This baſe is very pure, and has no colour.

This is ſimilar to the beautiful white paſte, ſo generally known by the appellation of "Straſs," which was the name of its inventor.

For the *yellow diamond*.—To an ounce of the fourth baſe add, for colour, 24 grains of horn ſilver, or ten grains of glaſs of antimony.

For the *ſapphire*.—To 24 ounces of the Mayence baſe add, for colour, two drachms, 46 grains of the calx of cobalt.

For the *oriental ruby*.—1. To 16 ounces of the Mayence baſe, add, for colour, a mixture of 2 drachms 48 grains of the precipitate of Caſſius, the ſame quantity of crocus martis prepared in aquafortis, the ſame of golden ſulphur of antimony and of fuſible manganeſe, with the addition of two ounces of rock cryſtal: or, 2. To 20 ounces of the baſe made with flint, add half an ounce of fuſible manganeſe, and two ounces of rock cryſtal.

For the *Balas ruby*.—1. To 16 ounces of the Mayence baſe, add the above colouring powder, but diminiſhed a fourth part: or, 2. To 20 ounces of the baſe made with flints, add the ſame colouring powder, but with a fourth leſs of the manganeſe.

For the *oriental topaze*.—To 24 ounces of the firſt or third baſe, add for colour five drachms of glaſs of antimony.

For the *Brazil topaze*.—To 24 ounces of the ſecond or third baſe, add for colour 1 ounce 24 grains of the glaſs of antimony, and 8 grains of the precipitate of Caſſius.

For the *Saxon topaze*.—To 24 ounces of the firſt or third baſe, add, for colour, ſix drachms of the glaſs of antimony.

For the *hyacinth*.—To 24 ounces of the baſe made with rock cryſtal, add, for colour, 2 drachms 48 grains of glaſs of antimony.

For the *amethyſt*.—To 24 ounces of the Mayence baſe, add, for colour, four drachms of prepared manganeſe and four grains of precipitate of Caſſius.

For the *emerald*.—1. To 15 ounces of either of the baſes, add, for colour, one drachm of mountain blue, and ſix grains of glaſs of antimony; or, 2. To an ounce of the ſecond baſe, add, for colour, 20 grains of glaſs of antimony, and 3 grains of calx of cobalt.

For the *beryl*.—To 24 ounces of the third baſe, add, for colour, 96 grains of glaſs of antimony, and 4 grains of calx of cobalt.

For the *common opal*.—To an ounce of the third baſe add, for colour, ten grains of horn-ſilver, two grains of magnet, and 26 grains of an abſorbent earth.

GEMS. *Engraved gems, engraved ſtones; pierres gravées, gemmes*, Fr.; *gemme, gemme antiche figurate*, Ital.; *geſchnittene ſteine, gemmen*, Germ.; *gemmæ, gemmæ cælatæ*, Lat.; names given to the productions of an art which was held in great eſtimation by the ancients, and has alſo in modern times maintained its rank among the fine arts dependent on deſign. It would be fruitleſs to attempt tracing the hiſtory of the origin of the *Glyptic Art*, (for this is the name which modern writers have given to the art of engraving figures on hard and precious ſtones—the Γλυπτικη of the Greeks,) to thoſe remote periods of which ſcarcely any records remain; but the numerous engraved ſtones ſtill extant enable us, with tolerable exactneſs, to mark the principal eras through which that art has paſſed. Upon the whole, it appears, that its origin is coeval with that of the ſiſter arts, in which the ancients excelled; that, like them, it had its zenith of perfection; was, with them, buried under the ruins of the Roman empire, and revived towards the end of the fifteenth century.

From the moſt ancient records we poſſeſs, the holy ſcriptures, it appears that the glyptic art was practiſed as early as the time of Moſes, who mentions the artiſts that were employed to engrave in onyx the names of the twelve tribes. But from ſome apparently very ancient engraved gems diſcovered in India, with Shanſcrit inſcriptions, Raſpe and others have inferred, that Aſia has a fair claim to the honour of having been in the poſſeſſion of that art even before Egypt: but their mode of reaſoning does not appear altogether concluſive. The mechanical part of the art of engraving was carried to a high pitch of perfection by the Egyptians, but they can ſcarcely be ſaid in any inſtance to have elevated their minds to the conception of ideal beauty. They firſt employed this art for engraving hieroglyphic figures on baſalt and granite, and afterwards extended it to thoſe hard ſtones of which we find moſt of their ſeals and ſcarabæi are formed, ſome of which are of admirable workmanſhip.

The exact period when this art was introduced into Greece cannot eaſily be determined. Pliny ſuppoſes that rings were not known at the time of the Trojan war; but Plutarch is of a contrary opinion, for, according to him, Polygnotes had repreſented Ulyſſes with a ring on one of his fingers. Winkelmann ſuppoſes, that one of the moſt ancient gems of Grecian workmanſhip we know, namely, that on which the dying Othryades is repreſented, dates as far back as the time of Anacreon. The firſt name of any engraver mentioned by the writers of antiquity, is that of Theodorus of Samos, who is ſaid to have engraved, 740 years before Chriſt, that famous emerald which Polycrates threw into the ſea.

The Greeks were the moſt paſſionate lovers of rings and engraved ſtones. Of the Cyrenians it is ſaid, that the moſt parſimonious among the higher claſſes were ſeen to wear rings of the value of ten minæ. They were a moſt eſſential ornament on the fingers of flute players and other muſical performers. In Greece, the art had arrived at the higheſt pitch of perfection at the time of Alexander the Great. It appears, that under the Roman emperors, ſome excellent engravers of gems repaired to Rome, to practiſe their art; but it is uncertain whether they actually introduced it: all we know is, that the Latin tongue had no term to render that of Δακτυλιογλυφες, and that among the many Greek names perpetuated on ancient gems, there are but few that appear to have belonged to Roman artiſts. The glyptic art maintained a tolerable degree of excellence till the time of Septimius Severus, when, together with the other arts, it begun gradually to decay. From Rome it ſpread almoſt over the whole weſt of Europe; but at the time of the laſt emperors nothing remained except the mechanical part: the genius and ſpirit of the art, the correctneſs of deſign and taſte, the nobleneſs of expreſſion, and even many of the practical advantages of which the ancient maſters had availed themſelves for conveying their grand ideas on the ſtone, were all vaniſhed together. But, from the decline of the Roman empire, during the darkneſs of thoſe ages, in which all the arts and ſciences hovered on the very brink of perdition, the mechanical part of the art was ſtill, in ſome meaſure, preſerved, both in Italy and the provinces of the Greek empire. Many gems, eſpecially in relief, called cameos, were manufactured as well for ornamenting holy veſſels, as prayer, and other religious books. Nor was the uſe of ſeals and ſeal-rings altogether diſcontinued. In the royal library at Berlin were preſerved ſeveral litany and pſalm-books of the 9th and following century, richly ornamented with engraved ſtones of the ſame periods, and ſome of them, according to Sulzer, were not without merit. In the ſame manner the author of the "Memorie degli intagliotori moderni," mentions an engraved gem of the fourteenth century, he ſaw at Bologna, which was very well executed (molto ben fatto). From this it would appear, that the art has, in ſome meaſure, maintained itſelf in Italy and Germany, as well as in the provinces of the eaſtern empire; and it was in the former, where, in the fifteenth century, it again roſe to endeavour to reſume its former ſplendour. Giulianelli, the author of the above-mentioned "Memorie," appears to judge right, in obſerving, that the principal cauſe of the revival of the glyptic art in Italy, under the popes Martin V. and Paul II. was the then prevailing taſte for collecting the numerous remains of ancient art; and the engraved gems were naturally the firſt objects that engaged the attention of the lovers of the antique. But with redoubled vigour it began to thrive in the ſecond half of the fifteenth century, under the foſtering care of that great patron of arts and ſciences Lorenzo de' Medici, who not only formed a conſiderable collection of antique gems, but moſt munificently encouraged the artiſts of the time to the imitation of the maſterpieces of antiquity. But that this art was not entirely new at that period, and that it was not Florence in particular where it was reſtored to life, appears from the contemporary productions of Domenichino, a Milaneſe, who, on account of his ſkill in executing raiſed work, was ſurnamed *Da Camei*. When the art of engraving on hard ſtones was thus encouraged, and again cultivated with zeal, by artiſts of genius, it could not fail to make rapid ſtrides towards perfection. Before the conqueſt of Rome, in 1527, a great number of excellent artiſts reſided in that capital, and ſome of them imitated the works of excellent maſters with ſuch ſucceſs, that the greateſt *cognoſcenti* of thoſe times were not unfrequently deceived by them. From this ſecond native land of the arts and ſciences, the art of engraving on ſtones ſpread over other

countries of Europe. Sandrart mentions an engraver of ſtones at Nuremberg, of the name of Engelhard, as a friend of Albert Durer. France owes the introduction of this and all other arts to Francis I. who invited celebrated Italian artiſts to ſettle in that country. Spain had likewiſe ſome Italian maſters in the reign of Philip II.; and England, ever ſince the time of Elizabeth, can boaſt of artiſts, in every reſpect ſuperior to thoſe of the French ſchool.

The ſtudy of *antique* engraved gems has in all times engaged the attention, not only of the antiquary, but of men of ſcience in general, and principally of thoſe artiſts, who conſider taſte and claſſical knowledge as objects not unworthy of obtaining. It is needleſs to expatiate on the importance of which gems are to the hiſtorian and antiquary; ſuffice it to ſay, that the knowledge of a variety of ſigns and ſymbols, of ſubjects of mythology and hiſtory, ſuch as the images of gods, heroes, and celebrated men repreſented on them, cannot be derived from a ſource more authentic and ſatisfactory than they. Even thoſe ruder productions of early periods are intereſting, ſo far as they aſſiſt in tracing the progreſs of the arts dependent on deſign. But by far the greater part of antique gems that have reached modern times, (and indeed their ſuperior durability, and other favourable circumſtances, have fortunately preſerved a great number of maſter-pieces from the ravages of time and barbariſm,) may be conſidered as ſo many models for forming the taſte of the ſtudent of the fine arts, and for ſtoring his mind with correct ideas of what is truly beautiful.

In order to judge with preciſion of the merits of engraved ſtones, not only ſome taſte and acquaintance with the art of deſign are required, but likewiſe a competent knowledge of hiſtory and mythology, and of the hiſtory of the art in general, by which we are, in moſt caſes, enabled to aſcertain, whether a given gem be of Egyptian, Etruſcan, Grecian, or modern origin; nor is it leſs uſeful, for the above purpoſe, to be acquainted with the ſubſtances that have been employed both by ancient and modern engravers. The former of theſe requiſites conſtitute the object of particular ſciences; and with regard to the latter, it will ſuffice to give a ſhort enumeration of thoſe ſubſtances. Before we proceed, it may be proper to obſerve, that ſtones, convex on one ſide, are called *cabochons*, or cut *en cabochon*; *ſcarabæi* are oval engraved ſtones, with the upper ſurface cut in the ſhape of a beetle, or ſcarabæus, of which ſometimes only the engraved baſe is remaining; *grylli*, carricature heads, or heads with diſtorted features, ſo called from an Athenian of the name of Gryllus, famous for his uglineſs; *caprices*, or *ſymplegmata*, are heads grouped together in a fantaſtic manner, ſuch as the head of Meleager joined to that of a wild boar; *chimæras* are imaginary beings, produced by the monſtrous union of the members of ſeveral creatures into one; *joined* (*conjugata*) are heads repreſented together on the ſame profile; and *oppoſite* they are called if they face each other.

The *animal* and *vegetable* ſubſtances on which engravers of gems have exerciſed their ſkill ſcarcely merit to be mentioned in this place; nor did the ancients make uſe of any of the former for this purpoſe, except *ivory*, which they were fond of working (ſee IVORY); but none of the works in it that may be conſidered as cameos have eſcaped deſtruction. Shells have been uſed for engraving gems, but only by modern, eſpecially Italian and Dutch, artiſts: they employed the pearl-oyſter, (mytilus margaritiferus); the thick ſailor-ſhell (nautilus pompilius); ſeveral ſpecies of trochus, cardium, tellina, and cypræa. Of *vegetable* ſubſtances that may have been employed for this purpoſe by the ancients, nothing remains but ſome ſmall pieces of ſycamore wood of Egyptian origin, on which hieroglyphic characters are engraved.

Mineral ſubſtances, from their hardneſs and other uſeful qualities, are more fit for the purpoſes of the engraver; and none more ſo than thoſe belonging to the ſiliceous genus of the earthy claſs of minerals. That aſſemblage of ſtones, however, which is diſtinguiſhed by the name of *precious ſtones*, or *gems* in another ſenſe of the word (ſee the preceding article GEMS,) has ſcarcely ever been employed by the ancients for the purpoſe of engraving upon. Theſe ſcarce and ſplendid ſubſtances were conſidered ſufficiently valuable in themſelves, and the art of engraving was more judiciouſly employed to enhance the value of other leſs expenſive ſtones, which moreover poſſeſſed, in a ſuperior degree, all the properties requiſite for the niceſt execution. Leſſing has proved that what Pliny ſays of the luxury of the ancients, with regard to gems, does not apply, as ſeveral antiquaries have imagined, to engraved, but to precious ſtones, whoſe weight and luſtre they did not chooſe to impair by the engraver's tool; modern artiſts, however, have frequently employed them.

Diamond.—The ancients were ignorant of the art of cutting this gem. They ſet the diamonds in their rough ſtate, preferring thoſe which nature had cut for them in an octohedral form. Theſe, which the French call *à pointes naives*, we ſee in rings and other ancient jewellery prior to the year 1456, when Louis de Berquen invented the art of cutting and poliſhing this precious ſtone (ſee DIAMOND). The four diamonds in the claſp which belonged to the dreſs of Charlemagne, and which was preſerved at St. Denis, were of this deſcription. But it is probable that the ancient engravers made uſe of fragments of diamonds for finiſhing their work. Jacopo da Trezzo appears to have been the firſt who engraved on diamond; but Mariette ſuppoſes that Clement de Biragues executed this taſk in 1564, while others mention Ambroſe Charadoſſa as having, in 1500, engraved the portrait of a father of the church on a diamond, and ſold it for 22,500 crowns to pope Julius II. Natter and Coſtanzi have likewiſe engraved on diamonds; but neither to the advantage of the ſubſtance nor to that of the workmanſhip.

Sapphire and *Ruby*.—(See the article GEMS, *Sapphire*.) Neither of theſe two very hard ſtones has been engraved on by the ancients; and indeed the latter, which they called anthrax, or carbunculus, was ſuppoſed by them to melt the wax. The ſapphire has been mentioned by Raſpe and others as the ſtone on which the beautiful antique head of Julia is engraved, and which is in one of the public collections of Paris: but this is one of the groſs errors ſo common among antiquaries unacquainted with mineralogy; the ſtone in queſtion being nothing but the common beryl or aqua marine, or perhaps only a bluiſh rock-cryſtal. A few modern engravers, however, have employed both ſapphire and ruby. The cabinet of the duke of Orleans poſſeſſed a portrait of Henry IV. executed in ſapphire by the celebrated Coldoré. A German artiſt, Hoefler, has likewiſe exerciſed his ſkill on it.

Topaze.—It has been ſuppoſed, that the ancients did not engrave on this ſtone, which was the chryſolithus of the Greeks and Romans. (See GEMS, *Topaze*.) But Mellin informs us, that the beautiful intaglio, repreſenting an Indian Bacchus, (a gem figured by Buonarroti in his work on the medals of the cabinet Carpegna, and now in the cabinet of antiquities of the imperial library at Paris,) is a topaze; as alſo that the cabinet of the emperor of Ruſſia poſſeſſes

poſſeſſes ſeveral portraits of emperors and empreſſes on the ſame ſtone: but we are not told what kind of topaze they are. Of the works of modern artiſts on topaze, one of the beſt is that repreſenting the heads of Philip II. and Don Carlos, in the juſt mentioned cabinet: this is a whitiſh topaze, which, as the work is that of Trezzo, has for a long time been miſtaken for a diamond.

Emerald.—It appears that the ancients were acquainted with the pure green emerald, which is at preſent only found in the new world (ſee GEM, *Emerald*); but they held it in ſo great eſtimation that it was ſeldom uſed for engraving upon; and Pliny even aſſerts, that, for the above reaſon, it was never applied for that purpoſe; but this writer appears afterwards to contradict his own ſtatement. What we know for certain is, that ſcarcely any well authenticated antique engravings on emerald remain. The moderns have frequently engraved on this precious ſtone, the hardneſs of which does not much exceed that of rock-cryſtal. There is a head of Henry IV. and another of Louis XIV. on emerald, in one of the public collections at Paris. The *beryl*, or *aqua marin*, a variety of the green emerald (ſee GEM, *Beryl*), is well deſcribed by Pliny, but not frequently met with among the remains of ancient art. The muſeum of the imperial library at Paris poſſeſſes a head of Julia, daughter of Titus, engraved by Evodus, on a bluiſh tranſparent ſtone, which is probably a true beryl, though it may turn out to be rock-cryſtal: it is often difficult to diſtinguiſh theſe two ſubſtances when cut and poliſhed; but whatever the one juſt-mentioned may be, the engraving on it is, according to all accounts, a moſt beautiful work of art.

Hyacinth.—The hyacinth is mentioned among the ſtones which the ancients employed for engraving on, but on very uncertain authority; nor is it known what the ancients underſtood by their hyacinth. It was certainly different from ours, for it is deſcribed as of a violet colour, and may therefore be conſidered as mere amethyſt quartz. Modern artiſts have ſometimes engraved on our hyacinth and on jargon, but nothing of any importance is known to be executed in them.

Garnet.—The noble garnet, if we may truſt the accounts we find of engravings ſaid to be in garnet, has been often employed both by modern and ancient artiſts. A firſt rate production of the art, equally celebrated for high relief of the figure, and the ſuperior beauty of the work in general, is the dog Sirius with the name Γαιος on it (though Raſpe ſuſpects Natter to be the real artiſt); it is preſerved in the collection of the duke of Marlborough, and, in the work deſcriptive of that collection, called a garnet. In general the grain of the garnet is not ſuch as to render it a deſirable ſubſtance for engraving upon.

Rock-cryſtal—has been employed by the engravers of all times, both for intaglios and cameos. The coloured varieties have, in general, been preferred, eſpecially the violet, called *amethyſt*, and the browniſh or blackiſh, alſo known by the name of ſmoky topaze. (See ROCK *Cryſtal*). It is not, in all inſtances, eaſy to aſcertain what the ancients meant by *amethyſtus*; but there can be no doubt that all antique violet-coloured engraved gems at preſent extant in the cabinets are nothing but our common amethyſt quartz, alſo called by ſome lapidaries *prime d'amethyſte*, on the erroneous ſuppoſition that it is the matrix of the oriental amethyſt; which latter (being a violet variety of the ſapphire) was, for the reaſons above ſtated, not attempted by the engravers of antiquity.

Of ſemi-tranſparent ſtones belonging to the ſiliceous genus, ſeveral have been employed. The *praſe*, one of the ſubſtances confounded by the ancients with the emerald, is a quartzy ſubſtance of the colour of leek, whence it has obtained its name. (See PRASE.) *Plaſma* and *praſma* of Italian, and other modern lapidaries, are corruptions of *praſe*; as is the word *priſme* and *prime d'emeraude*, which latter corruption has given riſe to the erroneous idea that this ſubſtance is the matrix in which the true emerald is generated.

Chryſopraſe—a tranſlucid ſiliceous ſtone, of apple-green colour (ſee CHRYSOPRASE), which has been confounded both by lapidaries and mineralogiſts with the praſe. It has, for aught we know, been employed by modern engravers only; and, indeed, the true chryſopras has been hitherto found only in Sileſia.

Opal.—The noble opal was too highly eſteemed by the ancients as a precious ſtone to find its way into the hands of the engraver; nor were the common varieties, which do not reflect the vivid colours of the former, uſed for the purpoſe of engraving upon, on account of their ſoftneſs. Of modern productions of the art in opal, a cameo is mentioned repreſenting the portrait of Louis XIII. when a child.

Hydrophane—a variety of the opal, which has likewiſe been mentioned as a ſubſtance on which the ancients uſed to engrave, but this is not very probable, on account of the ſoftneſs of the ſtone, and becauſe the ancients, if they were really acquainted with it, as ſome writers ſuppoſe, muſt have valued it too highly to apply it to that purpoſe. Winkelmann, in his "Deſcription des Pierres gravées du Baron de Stoſch," p. 190, deſcribes a ſtone which he calls a ſardonyx, of three colours, repreſenting Apollo with the lyre: the lower white layer of this ſtone, he ſays, turns quite black, when the ring in which it is ſet is on the finger, but it ſoon recovers its original whiteneſs when not worn. The only way of accounting for this phenomenon, is to ſuppoſe that the white layer neareſt to the finger is a real hydrophane, which, when worn, becomes tranſparent by the moiſture of the finger, and conſequently ſhews the black ſtratum underneath, which makes the white tranſparent layer appear as if it were itſelf of a black colour.

Calcedony and *Carnelian* are, with regard to their ſubſtance, very nearly related, but they differ in colour: that of the former is generally milk and bluiſh white, ſometimes approaching to ſky blue; but it is alſo found of different tints of yellowiſh and reddiſh, when it paſſes into carnelian. The true calcedony is of a greyiſh white-colour, and when poliſhed and held between the eye and the light, always exhibits marks ſimilar to the ſcoopings made with a knife on wood; theſe marks are in the interior of the calcedony, and proceed from the diſtinct mamillary coneretions in which it is originally formed. The ancients obtained their beſt calcedony, by way of Carthage, from the mountains of the country of the Naſamones in Africa, and alſo from Thebes. There are many maſter-pieces of ancient glyptic art in calcedony extant; for inſtance, the celebrated Dyoniſiac bull by Hyllus. The calcedony is generally called *white carnelian* by the lapidaries.

The *carnelian* varies in its colour from deep cherry, and even blood red, to reddiſh white, and paſſes on one ſide into dark brown, and on the other into yellow of ſeveral degrees of intenſity; it has obtained various names according to the tints it exhibits, but all of them are vague and promiſcuouſly applied. A general term for this ſtone with the ancients appears to have been *Sarda*: what they called Indian *morion* is probably the very dark brown variety, forming the baſe of the Nicolo. The pureſt, and moſt tranſparent carnelians are found among the remains of ancient art, and, indeed, moſt of the antique engraved gems we ſee, are ſuperior to any of the modern. Natter, who did not overlook this circumſtance, ſuſpected that the ancients had a particular way of clarifying the leſs pure carnelians, and to give them a brighter and more uniform colour; a ſuſpicion which would have been converted

verted into conviction, had that artiſt known that the art of improving the colour of thoſe ſtones is practiſed at this very day. We have ſeen the yellow variety of little value, which is brought from India as beads and poliſhed pieces, tinged (apparently by a very ſimple proceſs) throughout, and in the moſt permanent manner, with the moſt vivid and uniformly diffuſed cherry red. The Japaneſe are likewiſe ſaid to poſſeſs the art of heightening the colour of carnelians; but, in order to keep up the high price of this article of trade, they, now and then only, throw in a few of the refined among a great number of ordinary carnelians, which they ſend to Europe. Pliny mentions the honey of Corſica as having the quality of clarifying carnelians, if kept in it for ſome time. Though this is undoubtedly fabulous, it appears from it, that in Pliny's time there was a notion of the practicability of ſuch a converſion; and it is probable that the proceſs was known to a few artiſts or lapidaries only. Nor is it improbable that the ancients obtained ſome of their carnelians from parts of Aſia or Africa, with which the intercourſe has ſince been diſcontinued: the diſtinction between *carnelians of the old rock*, and *carneltans of the new rock*, by which names the lapidaries on the continent denote thoſe of ſuperior and ordinary quality, appears to have originated in that belief. The ancients called carnelians of the beſt ſort *male*; and *female* thoſe of a dirty yellowiſh red, in ſhort the carnelians of the new rock of the modern. The Engliſh lapidaries give to the pure cherry-red variety, poſſeſſed of a certain degree of tranſparency, the name of *beryl*; a miſnomer as abſurd, as it is productive of confuſion, eſpecially if deſcribers of gems, as has been the caſe in ſome inſtances, will condeſcend to adopt it.

Carnelian is the ſtone which was moſt commonly employed by the greateſt artiſts of antiquity, and indeed its moderate hardneſs, combined with the exquiſite delicacy of its texture, which makes it ſuſceptible of the fineſt poliſh, will ever ſecure it a diſtinguiſhed rank among the ſtones moſt deſirable to the engraver of gems.

If the calcedony occurs with opaque ſtripes, of a pure white colour, it is, or ſhould be, called *onyx*. This appears to have been the original idea conveyed by the name onyx, which has ſince been given to many agates, jaſp-agates, &c. in which ſeveral ſtripes or zones of different colour are alternating with each other. The white opaque zones, which are wrought into raiſed figures on the ſemi-tranſparent ground, appear, in moſt inſtances, to be *cacholong*, or the reſult of decompoſition: but if ſo, it is difficult to account for the ſharpneſs with which theſe zones are ſeparated from each other, eſpecially in ſuch onyxes where there are two or three regular alternations.

The name of *ſardonyx* is ſtill more vague in its preſent application than that of onyx. Originally it appears to have meant a combination of zones of carnelian (ſarda) with others of calcedony, either freſh or in the ſtate of cacholong, or with both. Indeed, Pliny himſelf had no clear idea of its diſtinctive character; but much more confuſed than his, are the ideas of more modern writers, by whom almoſt every ſemi-pellucid ſtriped pebble is dignified with the appellation of ſardonyx. What lapidaries of the preſent day generally conſider as ſardonyx, are all thoſe calcedonic ſubſtances of a pale reddiſh grey, more or leſs mixed with ſhades of yellowiſh or brown, often intermixed with ſtraight or curved narrow whitiſh ſtripes. If without ſtripes, it may be conſidered as a mere browniſh-red calcedonic maſs, forming, by inſenſible degrees, a paſſage into carnelian.

The ſubſtance called by the Italians *nicolo*, (a corruption of the word onyx, of which *onicuus* was made, and afterwards *nicolo*,) belongs, properly ſpeaking, to the original ſardonyx: it is a zone of deep brown carnelian, appearing black, with a zone of bluiſh calcedony upon it; if this latter is cut away, ſo as to leave only a thin cruſt or film, the figures engraved on it, and even ſuperficial ſtrokes made by the graver, will pierce this delicate cruſt, and appear black, on a bluiſh-white ground; and in the ſame manner a ſlight facet round the margin of the ſtone will produce a black border. Veltheim and others have ſuppoſed theſe nicolos to be artificially compoſed of volcanic glaſs, or obſidian, and calcedony cemented together; but thoſe that we have had opportunities of examining were real productions of nature, reduced into a new form by the lapidary's wheel. The quarries from which this and moſt of the oriental ſardonyxes were obtained appear to be loſt, unleſs we ſuppoſe, with count Veltheim, that the mountains which Cteſias mentions as producing ſardonyx, are thoſe of the weſt coaſt of the peninſula of Hindooſtan.

Both onyx and ſardonyx, and other ſtriped calcedonic ſubſtances, have been employed by ancient and modern artiſts for executing thoſe gems in relief-work, called *cameos*; and it is pleaſing to ſee with what dexterity they have frequently availed themſelves of the different colours of the alternating zones to expreſs the different parts of a figure, ſuch as hair, garments, &c. In this manner, if a white ſemi-tranſparent zone be ſuperincumbent on a zone of carnelian, the red ground will impart a beautiful fleſh colour to the white face; and if the white be between red and brown, or any other colour, the latter may, with excellent effect, be converted into drapery, &c.; as we ſee it done in numerous antique and modern cameos. As celebrated productions of the ancients in this part of the art we mention the apotheoſis of Auguſtus, of two brown and two white layers, being an oval of eleven inches by nine; the apotheoſis of Germanicus, likewiſe of four zones; the celebrated Brunſwick vaſe, repreſenting Ceres in ſearch of Proſerpine; Germanicus and Agrippina in a car drawn by two dragons; Agrippina and her two children; Tiberius; the quarrel of Minerva with Neptune; head of Auguſtus, all of three layers, moſtly brown and white; Jupiter Agiocus, white and black zones, like the following two; Venus on a ſea-horſe, ſurrounded by cupids; a bull: all which maſter-pieces are *now* in the "Bibliotheque Imperiale" at Paris.

Of opaque ſiliceous ſtones, the following are frequently made uſe of by gem engavers; *heliotrope*, or *blood-ſtone*:—deep leek green, generally beſprinkled with blood-red ſpots, which are grains of red jaſper diſſeminated in the green baſe. This latter, according to Werner's opinion, is an intimate combination of calcedony with green earth. Indeed, we have ſpecimens before us which ſhew the gradual mixture of the two ſubſtances in a very diſtinct manner. Blood-ſtone is at preſent much uſed for ſeal ſtones; but alſo the ancients employed it for this purpoſe. It has a fine grain, and is moderately hard; but the grains of red jaſper will ſometimes crumble out when the ſtone is worked. The artiſts who have engraved on this ſtone have availed themſelves with advantage of the red ſpots: thus, among the modern works in blood-ſtone, there was in the royal collection at Paris a buſt of Chriſt under flagellation, in which the drops of blood were repreſented by the ſpots themſelves.

Jaſper.—This ſtone is found of a great variety of colours. (See JASPER.) It is neither ſo hard nor ſo fine-grained as the laſt-mentioned ſubſtances, whence it has not been frequently employed by the great maſters of antiquity. We ſhall mention a few of the varieties of the common jaſper, of which antique gems are known to be extant; the *dark green jaſper* is often ſeen in the form of Egyptian ſcarabæi, ſeldom as flat ſeal ſtones: beſides in Egypt, it is found

found in ſome parts of Italy and France; *yellow* jaſper, on which there are likewiſe found ſome Egyptian engravings; the *red* jaſper which takes a very fine poliſh: Marſyas flayed by Apollo, and other ſubjects, have been frequently repreſented on it. Beſides theſe, we now and then find ſtriped, and even party-coloured jaſpers with intaglios, which ſometimes appear ſo confuſed, that the ſubject of the engraving can ſcarcely be diſtinguiſhed on the ſtone. The difficulty of engraving on this kind of ſtones will ſcarcely be admitted as an apology for preferring them to others better calculated for the purpoſe. Modern engravers have ſometimes employed the Siberian jaſper with beautiful brown and green ſtripes.

Lapis lazuli, or *azure-ſtone*, very well known to yield the beautiful blue colour, called ultramarine. This ſtone is the *ſapphirus* of the ancients, but it is alſo mentioned by them under the name of *cyanus*: it takes a very good poliſh, and when free of pyrites and quartz, which it is ſometimes ſeen to contain in great quantity, is fit for the purpoſe of engraving upon, though its hardneſs is inconſiderable; whence ſcarcely any highly finiſhed work has been executed on it. Bad engravings on lapis lazuli are frequently ſeen.

None but the Egyptians have engraved ſmall objects on compound rocks, ſuch as granite and porphyry; of which we poſſeſs ſcarabæi bearing hieroglyphic figures.

A ſubſtance, which has been employed by ſome ancient, eſpecially Egyptian, engravers, is the *turquois*. This name has been given to foſſil teeth, or other hard bony ſubſtances, which, probably by infiltration of a ſolution of either copper or iron, have received a beautiful ſky-blue colour in the bowels of the earth. It was formerly held in great eſtimation as one of the opaque gems; and a diſtinction was made between the *oriental*, or thoſe of the old rock, and the *occidental*. In this caſe, the epithet of *oriental* is properly applied; for thoſe of the beſt quality certainly come to us from Turkey, Perſia, &c. The occidental are of a greeniſh-blue colour, and are often no true turquoiſes; malachite, and other greeniſh carbonates of copper, and alſo greeniſh-blue feldſpar, called Amazone-ſtone, being ſometimes ſold for turquoiſes. See TURQUOISE.

Of *metallic* ſubſtances that have been employed for gem-engraving, we mention the following:

Malachite, a well-known green carbonate of copper, much uſed for purpoſes of jewellery, but which has in a few inſtances only been tried by modern engravers: it is much too ſoft to be employed. Pliny, who recommended *malachites* for intaglios, muſt have alluded to a ſubſtance different from our malachite.

Magnetic Iron-ſtone, or *Magnet*, has been frequently made uſe of by ancient engravers, eſpecially by thoſe of Egypt and Perſia. The Perſian cylindrical ſeals were not ſeldom made of this metallic ſubſtance.

Hæmatite, another oxyd of iron, has often been uſed for ſcarabæi, and intaglios by the Egyptians: there is, among others, a fine horus on hæmatite in the principal public library at Paris.

Some intaglio and cameo engravings on *inflammable ſubſtances*, ſuch as amber, jet, and cannel-coal, have been executed both by ancient and modern artiſts; but they are of little importance, and the ſubſtances themſelves are ſo ſoft and brittle, that it is enough barely to mention them.

It has been before obſerved, that the honour of the invention, or at leaſt of a prior poſſeſſion of the glyptic art, is ſuppoſed by ſome to be due to India, from whence it is ſaid to have found its way into Egypt. Mr. Raſpe, who is of this opinion, chiefly grounds it on the circumſtance that there are ſeveral engraved gems of conſiderable finiſh, bearing inſcriptions in Shanſcrit, and which muſt, therefore, have been executed at a period much more remote than any of thoſe which produced the works of Egyptian art we are acquainted with. Mr. Raſpe, in ſupport of what he has advanced on this ſubject, refers to the Indian engraving on lapis lazuli belonging to Mr. Townley, which is in the ſtyle of the ancient Indian bas-reliefs found in the grottos of Salſetta and the iſland of Elephanta; as likewiſe to an emerald in the poſſeſſion of Dr. Wilkins, on which a lion is engraved with a Shanſcrit inſcription. But may not the former of theſe engravings be ſuppoſed a modern imitation of the Salſetta and Elephanta ſculptures? and, with regard to the latter, may it not be aſked, how came the ancient artiſt by the ſubſtance on which he engraved, when the part of the world, which alone is ſuppoſed to produce it, was not diſcovered? for that it is not the green variety of ſapphire which is ſometimes called *oriental* emerald, may be inferred from the omiſſion of this epithet in Mr. Raſpe's account of this intereſting gem. Of other Aſiatic remains of the glyptic art, but of a much more modern date than thoſe juſt mentioned are ſuppoſed to be, the Perſepolitan engraved cylinders deſerve to be mentioned in this place: they repreſent long ſlender figures of kings and prieſts, with griffins and various emblems and inſcriptions in Perſepolitan characters. Several of them are figured by Montfaucon, Raſpe, and others; they are of calcedony, magnetic iron-ſtone, jaſper, &c. There are alſo portraits of Parthian kings, with inſcriptions, ſome of which have been explained by Sylveſtre de Sacy; they are on amethyſts and carnelians. But to return to the Egyptian art.

There are far more intaglios to be found among Egyptian gems than cameos, and moſt of them are in the form of ſcarabæi. The figures are generally executed with great care, but the deſign is dry and ſtiff. There is a difference between the Egyptian and the Græco-Egyptian ſtyle, (the latter is eaſily diſcoverable where Egyptian ſubjects are executed by Greek maſters,) and the ſtyle of imitation at the time of Hadrian. The Egyptian ſtones repreſent the divinities of the country, and all the figures of repreſentative, ſymbolical, and hieroglyphic writing, either united or detached. We find among the detached hieroglyphics the eye, and ſeveral figures, the meaning of which is unknown. Among the ſymbolical figures are the perſea, lotus, cynocephalus, the hawk, the crocodile, ſphinx, &c. among the divinities, Iſis, Oſiris, Horus, Anubis, Harpocrates, &c. ſingle or together, often in a bark made of papyrus, and with various attributes, ſuch as the ſiſtrum, the ſcourge, &c. It has been maintained, that the Egyptians never engraved cameos, but this is a miſtaken notion; for though they are very rare, and none of them of high antiquity, yet we muſt conſider as cameos the upper part of the ſcarabæi, which is always relief-work. The Egyptian engraved gems are not very common. Cardinal Borgia poſſeſſed a conſiderable number of them, and ſeveral are preſerved in the Britiſh muſeum.

The ancient inhabitants of ſeveral parts of Africa were in poſſeſſion of the art of engraving, which they had probably received from the Egyptians. The Æthiopians, according to Herodotus, engraved ſeals: the ſtones of the rationale bore the names of tribes. The Mahometan religion does not permit the repreſentation of images; hence, the engraved Arabic and Turkiſh ſtones offer nothing but inſcriptions; we read on them either the name of the proprietor, or a paſſage from the Koran. Millin poſſeſſes, however, the impreſſion of a ſtone, on which the writing is diſpoſed in ſuch a manner, as to form the figure of a man on horſeback. We find alſo pieces of glaſs, with Arabic and Cuphic inſcriptions, which were firſt miſtaken for coin, but

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are now looked upon as *tesseræ*, for the distribution of money and corn.

The Etruscans appear to have received the mechanical part of engraving on hard stones from the Egyptians; but they practised it before the Greeks: they had, in the manner of the Egyptians, stones cut into scarabæi. But though they received this art from that ancient people, their engraved stones bear a particular character both with regard to the art and the subjects represented. Many stones considered as Etruscan, are of the earliest Greek workmanship; they have but little relief, and the subjects are generally taken from the religious system of Greece. Antiquaries have given, as characteristics of Etruscan style, the granular border which surrounds the engraving, the stiffness of the figures, the form of the letters, the mode of writing, the wings given to those deities which the Greeks represent without wings, and the figures being almost always accompanied by their names. But most of these supposed characters are also found on ancient productions of Grecian art. The principal stones in the oldest style, with inscriptions, are, Atalanta, published in Millin's "Monumens inédits;" Peleus dipping his hair into a water basin, which Winkelmann supposes to represent the river Sperchius, while, according to Heyne, Peleus purifies himself after having slain Actor. Tydeus rubbing his body with a strigilis: this is Visconti's explication, who considers it as a copy of the Apoxyomenos, a beautiful statue of Polycleta, representing a man in that attitude; Winkelmann, on the other hand, supposes Tydeus in the act of drawing a dart out of his foot. Capanæus thunderstruck on the walls of Thebes. Theseus in the prisons of Aidoneus, according to Buonarroti; Lanzi thinks that his attitude expresses his exile to Scyros, a short time before Lycomedes precipitated him from a rock. Perseus, holding in one hand the head of Medusa, and in the other, the sword with which he has cut it off. Achilles putting on his knemides, so often mentioned by Homer. Ajax carrying away the body of Patroclus. Hercules carrying off the tripod. Helena, with wings, as daughter of Nemesis.

The Greek engravers of gems, who, according to Millin, (the first author who has attempted to classify the engravers of antiquity, and whom we follow as the best guide in this part of the present article,) may be supposed to have flourished before the age of Alexander, are, Theodore of Samos, who, as mentioned before, is said to have engraved the famous emerald of Polycrates, and to whom Pliny attributes the invention of the lathe.—Mnesarius, father of Pythagoras; nothing remains of his works.—Heius (HEIOY); we possess of him a Diana Venatrix, dressed in a long robe. The dry manner, the stiffness and incoherence of the lines composing the figure, the border round the engraving, have induced baron Stosch to look upon Heius as a very ancient artist. Winkelmann considers the H as an aspiration. Visconti thinks the name is a trisyllable.—Phrygillus (ΦΡΥΓΥΛΛΟΣ) Cupid issued from an egg.—Thamytus (ΘΑΜΥΤΟΥ); Stosch supposes him to be a contemporary of Dioscorides, and perhaps his pupil: we possess of him a sphynx scratching his ear.

Among the engravers that flourished from the age of Alexander to that of Augustus, are Admon (ΑΔΜωΝ), a Hercules Bibax, formerly in the Verospi cabinet at Rome, from whence it went to the nuncio Molenari's; it is at present in the duke of Malborough's collection. Visconti mentions a beautiful head of a Hercules, with the letters ΑΔ. The letter ω in his name is of a form posterior to the age of Alexander. Raspe mentions a fine gem, representing Vulcan and Achilles, with Admon's name engraved on it, but it is modern, and probably the work of Natter.—Apollonides (ΑΠΟΛΛΩΝΙΔΟΥ): Pliny has quoted him as a great artist. Nothing remains of him except a fragment of a sardonyx, representing a cow lying. (Collect. of the duke of Devonshire.)—Polycletus of Sycion (ΠΟΛΥΚΛΕΙΤΟΥ), disciple of Agelades, one of the most eminent Greek statuaries, about the eighty-seventh olympiad. We have of him a Diomedes carrying off the palladium. This work is not exactly in the style of the age in which it is supposed to have been executed, and perhaps the name of this artist, as Millin conjectures, has been added only to indicate that this engraving is a copy of one of his statues.—Pyrgoteles (ΠΥΡΓΟΤΕΛΗΣ ΕΠΟΙΕΙ). Apelles alone was permitted to paint Alexander; Lysippus to cast his image in bronze; and Pyrgoteles had the privilege to engrave his portrait. We possess, under the name of Pyrgoteles, a head, said to be Alexander's, and another of Phocion; but these names appear to be conjectural. The name of Phocion, indeed, seems to belong to an engraver of a head which was taken for that of the celebrated Athenian; and afterward another hand has added the name of a master still more celebrated, namely, that of Pyrgoteles.—Tryphon (ΤΡΥΦΩΝ), author of the beautiful Cameo, in the Marlborough collection, representing the marriage of Cupid and Psyche. The age of this artist is well ascertained by an epigram of Adeus the poet, who flourished under the kings of Macedonia, successors of Alexander: the subject of the epigram was an intaglio of Tryphon in an oriental beryl.—Chronius (ΧΡΩΝΙΟΥ), Terpsichore standing; a figure which has been since repeated by Onesas and Allion. Pliny, by placing the name of this master between those of Pyrgoteles and Apollonides, has probably followed the chronological order; and this is all by which we may determine the period in which he flourished.

The masters of the age of Augustus are Quintus Alexa (—ΙΝΤΟC ΑΛΕΞΑΣΠΟΙΕΙ). Two legs only are remaining on a fragment, with the name of the artist. Vettori and Bracci have published this stone with the body restored. The Knemides, a kind of half-boots, with which the legs are furnished, has made those antiquaries conjecture that the figure was an Achilles.—Cœmus or Cœnus (ΚΟΙΜΟΥ, ΚΟΙΝΟΥ); we have, with this name, a naked Adonis and a faun celebrating the Bacchanals.—Agathopus (ΑΓΑΘΟΠΟΥC ΕΠΟΙΕΙ). He has engraved the head of an unknown Roman. (See Epitynchanus.)—Aulus (ΑΥΛΟΥ); Stosch has published five gems with this name; Bracci has given twelve, and there are a great number more, the name of Aulus being one of those which the impostors have made particularly free with. Raspe thinks that there are two Aulus; Bracci goes still farther, and acknowledges six different artists of that name. Among the engraved stones bearing the name, those considered as authentic are, a Roman knight running, a quadriga, a head of Diana, one of Æsculapius, a head given by Stosch, as that of Ptolemy Philopater, and by Bracci, as Abdolonymus, in the imperial library at Paris. These five are figured by Stosch. Seven others, added by Bracci, are Venus playing with Cupid, and balancing a wand on her finger; Cupid tied to a trophy; a winged Cupid fettered, digging the ground; the bust of a prancing horse. Visconti is of opinion that the differences of style observable in the works attributed to Aulus are owing to his name having been frequently put on engraved stones that were nothing but copies of his works. Indeed on comparing the Æsculapius of the Museo Strozzi with the other intaglios attributed to him, it is difficult to think that they were executed by the same hand.—Cnejus (ΓΝΑΙΟ); a man come out of the bath holding the strigilis; Diomedes carrying away the palladium; a young Hercules; an unknown head

of particular beauty, ſuppoſed by Bracci to be that of Cleopatra; an athlete rubbing himſelf with oil preparatory to the combat; a beautiful Juno; Lanuvina, or rather, according to Winkelmann, a Theſeus, having his head covered with the ſkin of the bull of Marathon, (or that of the lion, according to Winkelmann,) but the inſcription is ſuppoſed to be by the celebrated Pichler.—Dioſcorides (ΔΙΟΣΚΟΥΡΙΔΗΣ), Apollonides, Chronius, and Dioſcorides are, next to Pyrgoteles, the three moſt celebrated engravers mentioned by Pliny. Dioſcorides was under Auguſtus what Pyrgoteles was under Alexander. Several ſublime works remain of him, of which Stoſch has figured ſeven: two buſts of Auguſtus; an unknown head, ſaid by Baudelot to be the head of Mæcenas, but which Stoſch ſuppoſes to be that of Cicero; Mercury, as god of travellers, with his petaſus, caduceus, and penula (in the collection of lord Holderneſs, according to Winkelmann); Perſeus viewing the head of Meduſa. Bracci has added ſome; ſuch as the head of Io; Mercurius Criophorus, *i. e.* carrying a ram, all works of ſuperior beauty and excellence. The two laſt have been copied by Natter, Pichler, Sirletti, and other celebrated engravers. The name of this artiſt ſhould be written Dioſcorides, ſignifying the ſon of Jupiter. Viſconti does not believe that the Mercury attributed to Dioſcorides is the production of one and the ſame graver; and he conſiders his Io as one of the fineſt engravings in exiſtence. Another beautiful work of this artiſt is Demoſthenes, on an amethyſt, which Bracci and Winkelmann have looked upon as an unknown head. Viſconti has diſcovered the native country of Dioſcorides on an engraving of Eutyches his diſciple, or rather his ſon: it repreſents Minerva with the inſcription ΕΥΤΥΧΗC ΔΙΟCΚΟΥΡΙΔΟΥ ΑΙΓΑΙΘωC ΕΠ (Eutyches Dioſcoridis Ægæi faciebat); from which it appears that he was a native of Ægea, a town of Æolia, in Aſia Minor.—Epityncbanus (ΕΠΙΤΥΓΧΑ); a head of Sextus Pompejus. Gori conſiders this artiſt and Agathopus as manumitted ſervants of Livia, becauſe their names are found among the ſepulchres of the domeſtics of the houſe of Auguſtus: both have there the title "aurifex," goldſmith, whoſe art was often united with that of engraving on gems; but this is only conjectural. Viſconti alſo attributes to Epityncbanus a beautiful carnelian in the poſſeſſion of the Chevalier d'Azara, repreſenting Bellerophon mounted on the Pegaſus, with the inſcription ΕΠΙ.—Eutyches (ΕΥΤΥΧΗC ΔΙΟCΚΟΥΡΙΔΟΥ ΑΙΓΑΙΘωC ΕΠ) ſon or pupil of Dioſcorides, perhaps both.—Oneſidemus. M. Tortoli at Rome poſſeſſes a fine intaglio on ſardonyx, repreſenting Minerva, by this artiſt.—Solon (COΛωN ΕΠΟΙΕΙ; COΛωNOC). It is this engraver who has put his name to a head, ſaid to be that of Mæcenas or Cicero, which, at firſt, on account of the identity of the names, was ſuppoſed to be the portrait of the celebrated legiſlator. It was Baudelot who diſcovered the miſtake. Solon is alſo (among ſeveral other works attributed to him) the author of a fine head of Meduſa.

The engravers poſterior to Auguſtus, if nothing but the ſtyle were taken into conſideration, would with difficulty be ſeparated from thoſe under Auguſtus; but Millin places them accordingly as their works repreſent perſonages that flouriſhed in the particular reigns; thus, as contemporary of Tiberius, we have Ælius (ΑΕΛΙΟC), of whom we poſſeſs the head of that emperor, an excellent engraving, which, however, by ſome is conſidered as the portrait of Cajus Cæſar.

As contemporary with Caligula, Millin introduces Alpheus and Arethon (ΑΛΦΗΟΣ ΣΥΝ ΑΡΕΘΟΝΙ). There are examples of groups of ſtatues being the joint-works of two artiſts; but there are no gems engraved by two maſters, except in the preſent inſtance: one repreſents Germanicus and Agrippina, which Montfaucon, deceived by the ſimilarity of the names, conſidered as portraits of Germanicus and Agrippina, in the character of Alphæus and Arethuſa. The other of their joint production is the portrait of the ſon of Germanicus, the young Caligula. Alphæus has not conſtantly aſſociated himſelf in his works with Arethon: we poſſeſs of him a maſter-piece of the art, *viz.* the triumph of a barbarian king, drawn in a biga, and crowned by victory. Several other gems with the name of Alphæus are quoted; but their authenticity is not proved. Arethon has not left any work executed by himſelf alone.

The moſt eminent engravers of the *time of Titus* are Euodus (ΕΥοΔοC ΕΠοΙΕΙ). There are ſeveral artiſts of this name: the one here mentioned has engraved on a ſtone, which is ſuppoſed an aquamarin, (vide ſupra,) the portrait of Julia, daughter of Titus and Marcia, celebrated for her amours with Domitian. The ſize and beauty of the ſtone, the high finiſh of the work, the reſemblance of the features, and the ſingularity of the coſtume, render this gem very remarkable. It is in the collection of gems of the imperial library at Paris.—Nicander (ΝΙΚΑΝΔΡΟΥ): a head of Julia.

The engravers *of Hadrian's time* are: Antiochus (ΑΝΤΙοΧοΥ) a Minerva Bellatrix. A head, ſuppoſed to be that of Sabina, empreſs of Hadrian, is likewiſe attributed to him: though this may not be the caſe, yet it appears that it is a portrait of Hadrian's time.—Anteros (ΑΝΤΕΡωC), a Hercules buphagus, according to authors. Millin thinks it is a ſlave who carries a large calf for a ſacrifice. It is now in the collection of the duke of Devonſhire.—Hellen (ΕΛΛΗΝ) who has engraved an Antinous as Harpocrates.

Of the engravers of *Marc-Aurel's time* we know;—Aepolianus (ΑΕΡΟLΙΑΝΙ), who has produced a head of Marc-Aurel, which is in the collection of the duke of Devonſhire. M. de la Turbre poſſeſſes a firſt rate intaglio, repreſenting Bacchus intoxicated by the juice of the grape, with the Phrygian cup near him, ſuſpended from a tree. It is by an artiſt of the name of Aepolianus, but not the ſame with the preceding; for, from the letter ΦP added to his name, it would appear that he was a pupil, or ſon, of Phrynicus, or Phronymus: nor is it probable that this beautiful engraving ſhould be the work of the ſame artiſt who put his name in Roman characters on the buſt of Marc-Aurel.

Among the engravers of gems who lived at the *commencement of the decline* of the art, critics have placed a Gauranus Anicetus, who has produced the combat of a dog and a boar; but Millin ſuppoſes that Gauranus is the name of the dog, and that the inſcription ſignifies Gauranus the Invincible.

Artiſts, of whom the *period* in which they flouriſhed *cannot be aſcertained*, are the following:—Aetion (ΑΕΤΙωΝ), who engraved the beautiful head of Priam, in the collection of the duke of Devonſhire.—Agametheros (ΑΓΑΘΗΜΕΡΟC). Stoſch and Bracci have conſidered him as a contemporary of Polycletes. He has produced a fine head of Socrates, which is preſerved in the juſt mentioned collection. The form of the E not being in the manner of the C, renders the inſcription ſuſpicious.—Allion (ΑΛΛΙΩΝΟC and ΑΛΛΙΟΝ). He has engraved a female guitar-player: if this be intended for a muſe, as is the opinion of Bracci, it muſt be a Terpſichore: this will appear from a compariſon between it and the paintings of Herculaneum, and the ſtatues of the muſes, in the Muſeo Pio Clementino, now in the Muſée Napoleon, which are probably copied after the celebrated nine produced by Philiſcus; but as theſe chaſte goddeſſes always appear entirely in full drapery, or with a tunic of a ſingle ſleeve, Stoſch is inclined to take the juſt-mentioned figure of Allion, as alſo that of Chronius, and of Oneſas, for

copies of the ſtatue which repreſented Sparta. There is likewiſe a head of Apollo with the name of Allion. Mariette attributed to this artiſt the famous ſeal of Michael Angelo, but without any good reaſon for doing ſo.—Apollodotus (ΑΠΟΛΛΟ ΔΟΤΟΥ ΛΙΘΟ). The head of Minerva. This is the firſt engraver, as has been ſaid before, who added his profeſſion to his name. This inſcription, by dividing the name into two words, was firſt interpreted "Stone given to Apollo;" but it has ſince been aſcertained that this cannot be the caſe, and that it is the name of the artiſt. To him is alſo attributed a dying Othryades. His ſtyle, ſimple, although not excellent, renders it rather probable that he flouriſhed before the Auguſtan age.—Apollonius (ΑΠΟΛΛΩΝΙΟΥ); a Diana of the mountains (Montium Cuſtos), with a torch in her hand.—Aſpaſius (ΑCΠΑ ΙΟΥ); a head of Minerva. The conformity of the engraver's name with that of Aſpaſia, had, at firſt, induced a belief that this portrait repreſented this famous courteſan. This Minerva appears to be a copy from the buſt of the Minerva of Phidias: but the form of the letter C, together with the ſubſtance the artiſt has employed, namely, a common jaſper, is rather againſt placing him in one of the flouriſhing periods of the Roman empire. There are three engravings of him in the ſame red jaſper.—Athenion (ΑΘΗΝΙΩΝ); Jupiter thundering at two giants; a fine cameo.—Hyllus (ΥΛΛΟΥ), has engraved a beautiful Dionyſiac bull, a young Hercules, the head of a woman with a diadem, and that of an old man, likewiſe with a diadem and a long beard. The ſimilarity of the bull with that of the autonomic medals of Sybaris may place Hyllus before the age of Auguſtus.—Oneſas (ONHCAC), of whom we poſſeſs a Leda, a Muſe, and a Hercules crowned with olive.—Philemon (ΦΙΛΗΜΟΝΟC), has engraved a Theſeus, who, having ſlain the Minotaur, views the body of his enemy proſtrate at the entrance of the labyrinth.—Midius produced a fine (but now unfortunately broken) intaglio, preſerved in the Muſeum of Antiquities at Paris; the fragment repreſents the combat of a griffin and ſerpent.—Mith (MIΘ), perhaps Mithrane, or Mithridate; the head and neck of a horſe. The name is, no doubt, that of the artiſt; for to ſay that the figure repreſents the horſe of Mithridates, and that this gem belonged to his celebrated Dactyliotheca, is conjecturing rather too boldly.—Pamphilus (ΠΑΜΦΙΛΟΥ); his name is on an amethyſt in one of the public collections at Paris; it repreſents Achilles playing on the lyre, a ſubject which has been repeated by the ſame artiſt: one on a carnelian is in the collection of the duke of Devonſhire: an excellent ſculptor, a diſciple of Praxiteles, of the name of Pamphilus, is, by ſome, ſuppoſed to be the ſame who engraved this ſtone; but there is no foundation for this opinion.—Axeochus (ΑΞΕΟΧΟΣ ΕΠ), has engraved a fawn playing on the lyre, near a child holding a thyrſus, with a creſcent between the two figures.—Diphilus (DIPHILI); a vaſe with two maſks above the handle. The circumſtance that a Greek name is written in Roman characters makes Millin doubt the authenticity of this inſcription.—Myrton (MYPTΩN); a Leda.—Nicomachus; a fawn ſitting on a tiger's ſkin: in the collection of the duke of Marlborough: the ſame figure is ſeen on a medal of the family Petronia, and is probably a copy of a ſtatue.—Pergamus (ΠΕΡΓΑΜΟΥ); a young Bacchante.—Plotarchus (ΠΛΩΤΑΡΧΟΣ); Cupid with the lyre mounted on a lion: the manner of this artiſt renders it probable that he lived before Auguſtus.—Scylax (CKΥΛΑΚΟC); the head of an eagle; a Hercules Muſagetes, or conductor of the Muſes. Seleucus (CΕΛΕΥΚ); head of Silenus.—Softhenes (CωCOCN); a beautiful meduſa: Stoſch and Bracci read CωCOKΛЄ, Soſocles; but the inſcription is compoſed only of the above ſix letters, which, according to Millin, ſhould be interpreted CO(ΘЄN; the horizontal line of the Θ and Є frequently wanting in the inſcriptions.—Soſtratus (CωCTPATOΥ); a victory in a biga; a cupid guiding two lioneſſes drawing a car. There are ſeveral other gems with this name; but ſome are counterfeits.—Sotratus (CωTPATOΥ); Meleager preſenting Atalanta with the head of the Calydonian boar. Winkelmann conjectures that this and the preceding name may be the ſame, and the omiſſion of the letter C accidental.—Teucer (TEΥKPOΥ); Jole and Hercules: to judge from the ſtyle of this maſter, he might be placed before the Auguſtan age.—Apelles (ΑΠCΛΛΟΥ); a ſcenic maſk. Bracci has read Apſalus; but, according to Millin, at the period when the C was uſed for the common ſigma, it was not the cuſtom to write ΠC, which two letters were united into Φ. As to the horizontal daſh in Є, it is often either omitted by the engraver, or too ſlightly expreſſed to be viſible.—Carpus (KAPΠΟΥ): he has engraved a Bacchus and Ariadne, and a Hercules and Jole.—Euplus (ЄΥΠΛΟΥ); a cupid mounted on a dolphin. The Greek word, inſtead of being the name of the engraver, ſignifies, perhaps, nothing but "happy voyage."—Euthus (ЄΥΘΟΥ): of this engraver we poſſeſs a Silen ſitting amidſt little Cupids that play on the lyre and double flute. M. Millin has concluded his liſt of the principal engravers of Greece that flouriſhed at periods when they cultivated the art in their own country, and after their ſettlement in Rome, with ſome general obſervations on the Grecian productions of the glyptic art. It would be falling into an error to ſuppoſe all thoſe productions perfect works of art; for though talent was generally diffuſed over Greece, it does not follow that every artiſt of that country muſt have arrived at that pitch of excellence which we admire in many remains of Grecian genius; and, indeed, we poſſeſs ſeveral of their engravings that are even beneath mediocrity. Every one, too, appears to have had his peculiar talent; one artiſt was more ſucceſsful in the drapery, another in the repreſentation of the naked body; one excelled in the art of giving expreſſion and ſtrength, another in giving gracefulneſs to his figures; but the works of the great engravers of Greece, though in different branches of their art, are all ſtamped with a peculiar national character, which is better felt than deſcribed. Sometimes they gave conſiderable depth to their work; at other times we ſee their figures wrought in very ſlight relief, which latter ſtyle of engraving is extremely difficult, and its perfect execution conſtitutes one of the greateſt merits of Dioſcorides. In general, the Greeks applied themſelves more to the intaglio, than to the cameo engraving. They were unacquainted with perſpective, the place of which, however, they ſupplied in ſome meaſure, by the greater or leſs depth they gave to the different parts. They did not multiply their figures, or crowd them into a ſmall ſpace. They were ſkilful in repreſenting animals; they preferred to draw the naked body, and, indeed, moſt of the maſter-pieces of art produced in Greece are figures without drapery; while thoſe executed at Rome are generally richly decked with drapery; with the exception, however, of thoſe of Dioſcorides, who followed the taſte of his own nation in this reſpect, for all his figures, if we except his Mercury, are naked.

The engraved gems of Roman artiſts are, in general, very far from meriting the praiſe which we ſo willingly beſtow on thoſe of the Greeks; their figures, indeed, ſeldom treſpaſs againſt the rules of deſign; but they are deficient in elegance; they ſeldom beſpeak either genius or elevation of mind in the artiſt. The taſte for engraved ſtones was introduced into Rome with that for other monuments of art; it

maintained

maintained itſelf till the time of Septimius Severus, when it began gradually to decline. We ſtill find many heads of Antonius Pius, of Marc-Aurel, or Lucius Verus, but thoſe of Gordianus, Maximinus, and of Philip are very ſcarce. Lippert, however, mentions a pretty good head of Valerius Probus, and one of Conſtantine II.

Millin claſſes among the Roman artiſts, or at leaſt thoſe that were ſtrangers to Greece, all whoſe names appear to him not of Greek origin, or are written in Latin: the liſt is not a very conſiderable one.

Aquilas (AKYIAAC); Venus bathing; Cupid preſents a mirror to her.—Felix (KAAΠOYPNIOY CEOYEPOY ΦHAIΞ EΠOIEI); Diomedes carrying off the palladium. Felix was probably a manumitted ſervant of Calpurnius Severus. —Quintillus (KVINTIA.) has given a Neptune on a beryl, or aquamarin.—Rufus (POYΦOY, POYΦOC EΠOIEI); a figure of Ptolemy VIII. or Lathyrus; Aurora driving in a quadriga, and holding a torch in her right hand. The ſame ſubject is repreſented on a medal of the family Plautia, with a maſk on the reverſe, in memory of Plautus Rufus, who recalled to Rome the flute players that had withdrawn to Tibur. A great number of gems, with Roman names, are mentioned; but they are probably the names of the proprietors, not thoſe of the engravers of the ſtones.

The celebrated dog Sirius, attributed to Cajus (ΓAIOC) in the collection of the duke of Marlborough, is generally quoted as the work of a Roman artiſt; but Raſpe is of opinion, that the name is fictitious, and that this valuable gem is the work of Natter, who executed it at Florence, for Baron Stoſch. If ſo, this is one of the moſt remarkable inſtances of reſignation.

It has been aſſerted, that the engraver of the head of Marc-Aurel is the laſt who has added his name to his works; but, to judge from the execution, the form of the letters, the orthography, thoſe who have written their names on the following ſtones, have, according to M. Millin, probably flouriſhed in the Lower Empire.—Of Chæremon (XAIPHMΩN) we poſſeſs the head of a fawn.—Phocas (ΦOKAC); a pugiliſt with a veſſel at a diſtance.—Nicephorus (NIKHΦOPOC); a Mercury, with his uſual attributes, and carrying on his right hand the eagle of Jupiter. One of the more remarkable works of this period, is the ſtone called the *ſapphire of Conſtance,* which formerly belonged to the muſeum of France, and was not long ſince in the collection of the marquis Fulci-Rimiccini at Florence: it repreſents the emperor Conſtance attacking a wild boar, near Cæſarea, in Cappadocia.—Amphoterus (AMΦOTEPOY): we have of him a head ſaid to be that of Rhoemetalces, king of Thrace, but the ſuppoſed reſemblance has not been proved.—Ammonius (AMMONIOY); a head of a fawn, an excellent engraving.

Of the ſcanty production of art, during the middle ages, ſeveral Greek works have been preſerved, repreſenting various ſubjects of the Old and New Teſtament, with long Greek inſcriptions: ſuch is the ſardonyx publiſhed by Gori as a frontiſpiece to his "Theſaurus veterum Dyptichorum." Several gems of this time are diſtinguiſhed for the ſize of the onyx in which they are engraved. We find, particularly in the Eaſt, at Conſtantinople, engravings very near the period of the greateſt barbariſm; an advantage it owed to the art of coining, which could not be practiſed without the aſſiſtance of that of engraving. But in the Weſt, the latter diſappeared at an early period, ſo that ſcarcely a trace of it remained. The Chriſtian religion having ſpread all over Europe, the ancient engraved ſtones were no longer ſought after, as repreſenting objects of worſhip; they were only occaſionally uſed as ſeals. Pepin ſealed with an Indian Bacchus; Charlemagne with a Serapis. Soon after their uſe for ſealing was diſcontinued; they were no longer ſet in rings, they diſappeared, were diſperſed, buried; they were employed for ornamenting the ſhrines in the churches, and it was in this manner that many of the highly valuable antique gems were preſerved to poſterity.

The engravings on ſtone, of thoſe times, offer ſcarcely any thing except pious ſubjects, images of Chriſt, or the Virgin, or ſimply their monograms. Sometimes we ſee on them a ſmall fiſh, called in the Greek language, IXΘYΣ, a word, the letters of which become the initials of Ιησους Χριστος Θεου υιος; often they repreſented the good ſhepherd, and other ſubjects of the Old and New Teſtaments.

The moſt celebrated engraved ſtones among the intaglios, with the names of the artiſts enumerated in the preceding part of this article are, the Io, the Demoſthenes, the Perſeus and Mercury of Dioſcorides, the bull of Hyllus, the Hercules of Onejus, the Meduſa of Solon, the Julia of Evodus, &c. One of the moſt famous of thoſe that are without the names of the artiſts, is the ſeal of Michael Angelo, a carnelian preſerved in the Imperial library at Paris, and thus called from having belonged to that celebrated painter. It ſimply repreſents a vintage, but has been the ſubject of much conjecture, and many diſſertations have been written on it. Mautour diſcovers in it ſacrifical rites in honour of the birth of Bacchus; according to Tournemine, it is Alexander repreſented as Bacchus, and the whole relates to the conqueſt of India; but, according to Roſman, it is the birth and education of Alexander. Baudelot and Thierheim conſider it as a repreſentation of an Athenian religious proceſſion. Mariette ſees nothing in it but a vintage, and the little fiſherman in the exergue, according to him, is intended to expreſs the name Allion, the engraver. Von Murr however, has proved that it is the work of Maria di Peſcia, a celebrated modern artiſt and friend of Michael Angelo, and that the figure of the little fiſherman in the exergue alludes to his own name. This ſtone has been often copied, and there are a great number of impreſſions from it. Other diſtinguiſhed intaglios are, a young Hercules, and a Hercules veiled like a Lydian woman, both in one of the public collections of Paris, five chiefs before Thebes, &c. &c. Among the gems in relievo called cameos the moſt remarkable are, the ſardonyx of Tiberius, and the ſardonyx that formerly belonged to the emperor of Auſtria; with ſome others mentioned above. Beſides theſe large cameos, there are in ſome cabinets moſt valuable ſpecimens of thoſe cups called *gemmæ potoriæ* by the Romans. They are generally of ſardonyx. The moſt celebrated are the ſuperb cup repreſenting the myſteries of Ceres and Bacchus given by Charles III. to St. Denis, and now in the collection of antiquities of Paris; the Brunſwick vaſe of ſardonyx, ſo often deſcribed, which repreſents the hiſtory of Ceres in ſearch of Proſerpine, and that of Triptolemus, and which originally belonged to the family Gonzaga, but was ſtolen at the ſacking of Mantua in 1630 by a ſoldier, who ſold it for 100 ducats to the duke of Brunſwick; this wonderful work of art is now likewiſe at Paris. But the moſt ſuperb of all the engraved vaſes is the Portland, or Barberini vaſe, which was firſt in the collection of the Barberinis, from whence it came into the poſſeſſion of the duke of Portland, and is now depoſited in the Britiſh Muſeum. One of the firſt Italian engravers of the fifteenth century was Giovanni delle Cargniole, whoſe reputation as an engraver of intaglios procured him this name; we poſſeſs of him, among others, the portrait of Savanarole.—Dominichino, ſurnamed de' Camree, becauſe he excelled in the execution of raiſed work, has engraved the portrait of Luigi Sforza.—Michelino, Marco de Benedetti, Marco, Attio, Moretti, Franceſco Francia, Leonarde di Milano, and Severo di Ravenna, likewiſe ac-

quired great celebrity as artiſts. Tagliacarne probably took this name on account of his ſkill in engraving carnelians.—Foppa ſurnamed Caradoſſe.

The liſt of the Italian engravers of the fifteenth century is much more numerous; this is the moſt flouriſhing period of modern glyptic art, and indeed that century produced ſeveral worthy of the ancient maſters to whom they looked as their models. The principal among them are, Pietro-Maria di Peſcia, in Tuſcany, a zealous admirer of the ancients, and their faithful imitator. This is the artiſt whom Von Murr believes to have executed the celebrated ſeal of Michael Angelo.—Giovanni Bernardi and Caſtel Bologneſe; the latter has engraved many cryſtal cups and ſtones for cardinal Farneſe; he died in 1557. Of him we poſſeſs a beautiful engraving repreſenting Tityus, whoſe liver is devoured by a vulture, executed after a deſign of Michael Angelo for cardinal Hippolito de' Medici. M. Collet owns a magnificent cameo, the work of this great artiſt, which repreſents the head of St. John decapitated.—Matteo del Naſſaro born at Verone, follows Francis I. into France where he diffuſed the taſte for his art. The Muſeum Napoleon, and the Cabinet of Antiquities of the library at Paris, poſſeſs ſeveral of his works. One among them repreſents a battle, and on one of the colours we ſee the letters O. P. N. S. (Opus Naſſarii Sculptoris). He died in 1547.—Giovanni Giacopo Caraglio of Verona, engraver of ſtones, medals, and of copper plates.—Valerio Vicenlino, called by ſome Valerio Belli. Mariette, (Traité, p. 46.) has publiſhed his portrait. This is one of the moſt capital and laborious artiſts in his department. He has engraved various ſubjects taken from Roman hiſtory; he died in 1546.—Aleſſandro Ceſari, ſurnamed Il Greco, on account of his imitating the ſtyle of the great maſters of Greece. We have of him a beautiful portrait of Henry II. king of France.—Giacopo da Trezzo, to whom the firſt engraving on diaomnd is attributed. The cabinet of Antiquities at Paris poſſeſſes of this maſter the portraits of Philip II. and Don Carlos on a Brazil topaze. He died in 1587.—Clemente di Birague, who is likewiſe ſaid to have executed engravings on diamond.—Annibale Fontana, known by ſeveral works on rock cryſtal.—Santa Croce, called Pippo, originally a ſimple ſhepherd, who engraved on cherry ſtones the moſt delicate bas-reliefs. Filippo Doria, who met with him in the duchy of Urbino, placed him under proper tuition, and aſſiſted him in ſettling at Genoa.—Antonio Dordoni; died at Rome in 1584;—and Flaminio Natalis, in 1596.

The art of engraving, ſo flouriſhing in Italy in the ſixteenth, loſt much of its ſplendour in the ſeventeenth century; nay, it was ſo little cultivated, that ſeveral proceedings and mechanical advantages were entirely loſt, ſo that the celebrated artiſts of the eighteenth century were obliged to invent others. The moſt diſtinguiſhed Italian engraver of ſtones in the ſeventeenth century is Andrea, ſurnamed Il Borgognone; he engraved about the year 1670. The others are Adoni Taddeo, Caſtrucci, Antonio Mochi, Juliano Pericioli, and a few more. For the conſervation of the art in that century, we are principally indebted to Ferdinand II., who continued and added to the penſions given to the artiſts then engaged to work in the gallery of Florence.

The eighteenth century has given artiſts to Italy, whoſe names are worthy to be mentioned together with the Pyrgoteles, Solon, Aulus and Dioſcorides. Moſt of them were ſettled at Florence.—Flaviano Sirletti, who died in 1737, has copied ſeveral greek works. He excelled in the imitation of ancient letters: his works are marked Φ. Τ. Σ. ΦΛΑΒΙΟΥ ΤΟΥ ΣΙΡΛΕΤΟΥ. Others worthy to be mentioned are the Coſtangis, Giovanni, Tomaſo, and Carlo his ſon; Domenico Landi; Franceſco Ghinghi; Jeronimo Roſſi; Stefano Paſſalia; Franceſco Borghighiani; Felice Barnabes, the Torricellis; Lorenzo Maſini. Thoſe gem engravers who at preſent cultivate their art with greateſt ſucceſs, are Sign. Santarelli, Maſſini, and Capperoni; at Naples, Sign. Rega, an artiſt, ſome of whoſe productions may be compared with thoſe of antiquity. There is alſo a female artiſt of note in that city, Signora Talani of Rome.

The German engravers of gems have always maintained the firſt rank after thoſe of Italy. The oldeſt German engraver on ſtones is Daniel Engelhard of Nuremberg, who died in 1552; he is, however, not known to have executed more than arms and creſts.—Chriſtopher Schwaiger has been called the German Pyrgoteles, but none of his engravings are aſcertained. There is a portrait of him with the year 1620 on it.—George Hoefler; he died in 1630.—Eberhard Dorſch, who died 1732: Raſpe thinks the greateſt part of the pretended antique gems that were in the cabinet of Mr. Ebermeier at Nuremberg are by Dorſch.—Philip Chriſtoph. de Beiker, died in 1743: an artiſt of great merit, as is proved by his buſt of Charles VI., and other engravings.—Marc Tuſcher, a good painter, but of whoſe engravings on ſtones Mariette is far from ſpeaking favorably. The fact is, Tuſcher exerciſed that art merely as an amateur.—Anton Pichler, the father of the celebrated John Pichler; he was a native of Brixen in Tyrol, and has produced ſome engravings of merit.—John Pichler, who is claſſed by Millin with the Italian ſchool of engravers, becauſe he ſpent a great part of his life, and is ſaid to have formed his taſte in Italy, is unqueſtionably one of the greateſt glyptic artiſts of modern times. He has produced a great number of excellent engravings, ſeveral of which may be compared with the more celebrated productions of ancient arts.—Lorenz Natter, a native of Suabia; his numerous works beſpeak a refined taſte, and are executed with the greateſt delicacy and correctneſs in the deſign. He was, at the ſame time, a great proficient in the theory of his art, and his "Traité de la Méthode Antique de Graver en Pierres Fine," is the only work we poſſeſs on this intereſting ſubject. He died in 1763.—Krafft from Dantzick, a good engraver, ſettled in Rome at the time of Mariette, who calls him Graaft, and ſays that the difficulty of pronouncing his name occaſioned his being called "il Tedeſco" by the Italians; but Raſpe obſerves that it is, or was, a general cuſtom among Italian artiſts, to call each other by their chriſtian names, or by the name of their country. He was a pupil of Natter. Other modern German engravers are Hubner of Dreſden; Lerter, and Aaron Wolf; the laſt-mentioned artiſt, a native of Brandenburg, is of the Jewiſh perſuaſion, and ſettled at Leghorn; we have of him a Leda which has rendered his name celebrated.

Among the Engliſh engravers of gems, eſpecially thoſe of more modern times, there are ſeveral who have acquired great reputation by their works, ſuch as Dean, Wray, &c. and a Burch and a Marchant have attained to a degree of excellence which would have been acknowledged and reſpected in the beſt periods of ancient art. In general, however, the number of good engravers on ſtones has not been very great in this country.

The firſt, and perhaps the only engraver of ſome note in France, after Matteo de Naſſaro had in the time of Francis I. introduced into that country the taſte for the glyptic art, was Coldoré, who lived at the end of the ſixteenth century, till the reign of Louis XIII. Whole figures are not known to be engraved by this artiſt; but his heads are remarkable for their elegance, the firmneſs with which they are executed, and their perfect reſemblance to the originals. It is ſaid, that

queen

queen Elizabeth invited him to ſettle in England; there was a beautiful cameo repreſenting this queen, in the cabinet of the duke of Orleans, which Mariette thinks can be the work of no other artiſt but Coldoré. The ſame author is of opinion, that Julien de Fontenay and Coldoré were no rivals, as it has been ſuppoſed, but one and the ſame perſon under different names.—Maurice, a native of the Netherlands, and a good engraver, ſettled at Rouen, where he died in 1732, aged 80.—François Julien Barrier, died 1746.—Louis Siries, who was employed in the gallery at Florence. His merit conſiſted in crowding a great number of figures into a ſmall ſpace. Giulianelli is very high in his praiſe; but Natter conſiders his engravings as devoid of all merit.—Jacques Guay of Marſeilles, has ſucceſsfully practiſed the art: there are, in the cabinet of antiquities in Paris, a ſeries of engravings executed by him for Louis XV.—France, which at no time excelled in the number of good gem engravers has, ever ſince Guay's time, been particularly deficient in this claſs of artiſts, ſo that Millin (in 1797) conſidered the glyptic art as abſolutely extinct in his country. There is, however, at the preſent day, a ſkilful engraver in Paris of the name of Jeuffroy, whom the national inſtitute has thought worthy to receive among its members.

Thoſe antique engraved ſtones, that bear the name of the artiſt, having at all times been looked upon as particularly intereſting and valuable, ſeveral perſons have fraudulently availed themſelves of this circumſtance to add the name of ſome celebrated engraver of antiquity to works both of ancient and modern art; and ſome of them have ſucceeded ſo well, that often much critical acumen is required to detect the deception. Natter himſelf is accuſed of having lent himſelf to this ſpecies of fraud in compliance with the commands of his employers. The artifice of thus putting the name of ſome celebrated artiſt to an engraving, is, however, not peculiar to modern times; it was already practiſed at the time of Phædrus, who complains of it in one of his fables. We ſhould not, therefore, conſider ancient names on gems as genuine, before the ſevereſt criticiſm has proved them to be ſo. The following rules may aſſiſt in diſcovering their authenticity. The beauty of the work ſhould be proportionate to the talent of the artiſt to whom it is attributed: a middling engraving, though it bears the names of Pyrgoteles, Cnejus, Solon, Aulus, or Dioſcorides, cannot reaſonably be attributed to any one of thoſe great maſters. The great ancient artiſts have in general engraved on the finer kind of ſtones; hence the name of Dioſcorides on a common jaſper muſt excite ſome doubt as to the authenticity of the name; there is, however, by way of exception, a very beautiful work of Aſpaſius in red jaſper. The form of the letters is likewiſe of great utility in diſtinguiſhing truth from impoſition. Thoſe of the early ages are leſs perfect than thoſe of the engravers of the Auguſtan age, which are elegant and highly finiſhed; whence the name of *Dioſcorides*, written in an unequal manner, can ſcarcely be the work of this great maſter; for the celebrated artiſts, jealous of their reputation, even with regard to the minutiæ of their art, did not truſt others with the execution of the letters. The inſcriptions on engraved ſtones, particularly thoſe of the Auguſtan age, are generally terminated by ſmall round dots, very equal in their proportions, intervals, and depth. Peireſcius was of opinion that they might have been intended for the reception of minute pins, for the ſake of faſtening the gold, with which he ſuppoſed the hollow characters were filled up; but nothing proves that theſe inſcriptions were intended to be filled up with a metal: they are cut in the ſtone in order to expreſs in reliévo the name, together with the image. At the preſent day moſt antiquaries agree in ſuppoſing theſe dots to have been deſtined to mark the diſtances of the letters, and to give greater regularity to them, juſt as we obſerve ruled lines in old manuſcripts. In the ſame manner medals have the letters of the inſcription terminated by round dots; and, from the frequency with which they occur on them, it is probable that what was firſt calculated to produce uniformity, was afterwards adopted as ornament. The form of the letters may likewiſe ſerve to diſcover fraud. The mixture of Greek with Latin letters is an evident ſign of forgery. The ſame may be ſaid of a letter expreſſed in two different ways in the ſame word; for inſtance, the ſigma written as C, and as Σ in the word COΣTPATOC. Such errors are commonly committed by modern artiſts, who undertake to add the names of ancient maſters to their works; they are generally indifferent grammarians, and, therefore, liable to commit errors, which no artiſt of antiquity could have fallen into. Thus deceived by the prnounciation of the name, they have written ΔIOCKOPIΔOY inſtead of ΔIOCKOYPIΔOY; they add a letter in one name, and omit one in another. If an artiſt is known to have been accuſtomed to add his name in the genitive caſe, as it was done by Dioſcorides, an engraved ſtone, on which the ſame occurs in the nominative caſe, muſt always excite ſuſpicion. In general the names expreſſed in the nominative caſe are rare. If we read AYΛOY, ΔIOCKOYPIΔOY, ΠAMΦIAOY, the word ἔργον is to be ſupplied, *i. e.* the work of Aulus, Dioſcorides, &c. If the name be in the nominative caſe, it is the verb which is omitted, whence ΔIOCKOYPIΔHC implies the word ἐποιει, Dioſcorides faciebat. Where two names occur in the ſame caſe, the one is the name, and the other the ſurname; but where the firſt name is put in the genitive and the ſecond in the nominative caſe, this indicates that the artiſt was the ſon, the pupil, or the freed ſervant of him whoſe name is put in the genitive caſe. Thus, EYTYXHC ΔIOCKOYPIΔOY ſignifies either that Eutyches was the ſon or pupil of Dioſcorides, or perhaps both the one and the other. But in the inſcription on a ſtone repreſenting Diomedes carrying off the palladium, KAΛΠOYPNIOY CEOYHPOY ΦHAIΞ EΠOIEI, (Calpurnii Severi Felix faciebat,) it is very probable that this Felix was the manumitted ſervant of Calpurnius Severus, and though theſe names are Roman, yet as he makes uſe of Greek letters, he likewiſe adopts the form of the Greek ſtyle. An engraving on a ſtone is ſometimes the joint work of two artiſts. Alphæus and Arethon have produced a gem with the inſcription AΛΦHΩC CYN APEΘΩNI (Alphæus with Arethon). We have but one ſingle inſtance of an engraver who with his name has indicated his profeſſion on the gem, and this is Apollodotus; by the ſide of the head of Minerva we read AΠOΛΛOΔΩT. ΛIΘO, (Απολλοδοτε λιθογλυφε sc. ἐργον,) or the work of Apollodotus the engraver). The greateſt part of the names of engravers are Greek. In one inſtance, perhaps, the artiſt has added the name of his native country; for on a ſtone repreſenting the cap of Caſtor between two ſtars, we read AΠOΛ ΣMYP, which is explained Apollonides of Smirna; but it is probable that this engraving is votive, and that, inſtead of the name of the artiſt, it bears that of the navigator, who hoped by this taliſman to obtain a fortunate voyage from the ſons of Leda.

The names of Roman engravers are, for the greateſt part, written in Greek letters, while there are very few inſtances of Greek names being written in Latin characters; and even theſe few inſtances cannot be conſidered as of great authority. In general it may be ſaid that the Etruſcan gems bear the name of the perſonages repreſented on them; for inſtance, thoſe on which are cut the names of Peleus, Tideus, the five Theban chiefs, &c. The engraved ſtones of the Greeks, on the other hand, bear the name of the artiſt, and

thoſe of the Romans ſometimes the name of the engraver, ſometimes that of the owner. This cuſtom, of adding the name of the poſſeſſor, has been preſerved in more modern times, particularly in the cinque cento, the ſixteenth century; witneſs the many antique gems with the inſcription LAUR. MED. (Lorenzo de' Medici) which Maffei has in vain endeavoured to explain. Not ſeldom the names of modern engravers are written in Greek characters, ſuch as Φ. Τ. Σ. ſignifying Φλαβιυς τυ Σιρλετυ, or Flavio Sirleti; ΠΙΧΛΗΡ, Pichler, &c. Thoſe amateurs only, that are unacquainted with the Greek alphabet, are liable to be deceived by this practice. Other artiſts have concealed their name, a kind of literal tranſlation of its import; Winkelmann and Büſchiny have taken the word ΥΔΡΟC (Hydros,) for the name of a Greek engraver, while it is nothing but a tranſlation of *Natter*, which German word ſignifies a viper, called hydros by the Greeks. We may alſo, in ſome meaſure, determine the period in which the engraver of a particular gem lived, by finding out the time when his name was moſt common: thus, for inſtance, the name of Zoſimus, more common in the Lower Empire than in any other period, will, with ſome probability, indicate that period to be the date of the work in queſtion. Some engravers, undoubtedly very well known at the time when they flouriſhed, have put nothing but the initials of their names, which neceſſarily muſt be filled up in an arbitrary manner; and this difficulty increaſes, if the name ſignifies at the ſame time the object repreſented, and therefore leaves us doubtful whether we are to apply it to the object, or to the artiſt. Thus the letters HERM, on a carnelian repreſenting Mercury, may be intended for Hermes, or for the name of an artiſt ſuch as Hermotime, Hermolaus, &c. The modern engravers that have been moſt ſucceſsful in copying the names of ancient artiſts, are Flavian Sirleti, Natter, and Pichler.

The *mechanical part* of the *art of engraving gems*, ſuch as it was practiſed by the ancients, differed in no reſpect from the method which is followed by the engravers of the preſent day; for, according to the opinion of a competent judge in theſe matters, the celebrated Natter, (the reſults of whoſe reſearches are publiſhed in a treatiſe entitled "De la Méthode Antique de Graver en Pierres fines, comparée avec la Méthode Moderne)," their tools were not only analogous to thoſe of modern artiſts, but they uſed them exactly under the ſame circumſtances. It is not our intention to follow the juſt-mentioned ingenious artiſt in the analyſis he has given of a number of antique engravings, but we ſhall copy one of the heads repreſented in the above work, together with an outline drawing of the ſame head, which exemplifies the mode of proceeding employed by the engraver of ſtones. Theſe figures, together with thoſe repreſenting the lathe and tools uſed by the gem engraver, will ſuperſede a more detailed deſcription than the one which we are enabled to give in this place.

The firſt operation of the engraver is to give to the ſtone that is to be employed a form ſuitable to the ſubject he intends to repreſent on it. This is generally performed by the lapidary. (See LAPIDARY.) He next draws the outline of the ſubject with a braſs needle, or a diamond, on the poliſhed ſtone, which is cemented by means of maſtich to a handle of wood for the purpoſe of moving it more commodiouſly in all directions.

Fig. 1. (*Plate* XVIII. *Miſcellany*) repreſents the whole of the lathe; it conſiſts, as the figure ſhews, of a table, on which is fixed the mill, or a ſmall horizontal cylinder of ſteel, at one of whoſe extremities the tool is inſerted, and which is turned by means of a vertical wheel below, communicating with the horizontal cylinder by means of a cord, and ſet in motion by the foot of the artiſt. Sometimes the whole of the mill on that ſide, except that part of the cylinder to which the tools are fixed, is covered by a cap; but this is not always made uſe of.

The tools that are alternately fixed to the extremity of the mill, are,

Fig. 2. a hollow cylinder made uſe of to deſcribe circles with facility, and alſo for perforating.

Fig. 3. is the knobbed tool, called *bouterolle* by the French; it is employed in various kinds of work; for extremities, &c.

Fig. 4. a tool, the upper part of which is in the form of a ſmall diſk rounded at the edge: it is uſed for various purpoſes.

Fig. 5. a ſimilar tool, but with diſks not rounded at the the edge.

Fig. 6. the ſame, but with the edge of the ſmall diſk, ſharpened for the purpoſe of cutting into the ſtone: it is called in French *ſcie* (ſaw).

The ſize of theſe tools varies from the bigneſs of a large pea, to that of a point ſcarcely viſible to the naked eye.

It is obvious that theſe tools may be varied in their form, according to the fancy of the engraver; but thoſe juſt deſcribed are moſt generally made uſe of.

When the tool is fixed in the manner above deſcribed, and repreſented in the figure, the artiſt applies to its point diamond-powder, mixed up with olive oil; he then turns the lathe, and begins his work, by bringing the ſtone faſtened to a piece of wood, into contact with the tool which turns round its axis with conſiderable velocity.

Fig. 7. repreſents a ſtone of convex ſurface, with a tool applied to it; it ſhews the advantage of working on ſtones of that form; for the ſpace between the ſtone and the tool being more conſiderable in a convex than in a plane ſtone, the tool penetrates farther on the former than it would on the latter. This may be ſeen by fig. 8, where the ſame tool touches much nearer the borders of the flat ſtone.

Fig. 9. The ſtone applied diagonally to the tool produces what the Italians call *ſotto quadro*; engravings made in this manner cannot give a good impreſſion.

There are ſome figures which are with difficulty executed on ſtone, although they appear eaſy; and others that appear difficult, although they are far from being ſo. Thus, for inſtance, figs. 10, 11, 12, repreſent different angles, which it is no eaſy matter to execute with nicety; we generally obſerve imperfect execution in ſuch angles, where the round tool cannot be made to touch.

Fig. 13. is a hexagon, which may be engraved without difficulty, ſince all its points correſponding by two and two, nothing is required but to trace three lines, croſſing each other in a common centre. Another difficulty there is with regard to the letters, which cannot be executed in the manner of thoſe that are ſeen on medals (ſee fig. 17.); the tool will always leave ſome imperfection in the angles of the extremities, as appears in fig. 14 and 15. The beſt engravers of antiquity have preferred to make uſe of the bouterolle to mark the termination of the letters and ſeveral other objects.

The head of Jupiter Serapis, repreſented figs. 16, 17, and 18, is given by Natter, as an example of the mode of proceeding, in order to produce a work of that deſcription.

A ſtone is to be procured, cut into an oval form, convex above, ſuch as fig. 18. It matters little, whether its baſe is flat or convex, provided it be of ſufficient thickneſs to bear the engraving. Being fixed to a handle, as above deſcribed, the engraver begins his operation by excavating, with a ſemicircular tool, an oval of the ſize of the head in queſtion; but leſt this operation ſhould produce a round figure inſtead of an oval, the ſtone is to be gradually moved in the direction

of

of its greater diameter. This is continued till the oval is of ſufficient depth, to begin the eyes. See fig. 18. *a*.

You may proceed in a longitudinal direction upwards, as far as to the middle of the *modium* on the head, expreſſed by the upper end of the dotted line *a*; and downwards as far as to the middle of the neck. The breadth of the oval is to be made in proportion.

This being done, you may work out the place for the hair, which, in order to imitate the original, fig. 16, ſhould be more projecting on the one than on the other ſide. The beard may be marked with the ſame tool as far downwards as *b*, fig. 18, and ſideways as far as *b*, fig. 17. After this the tool is changed for a ſmaller one to mark the forehead *c*, as alſo the modium; and, in order to avoid the unneceſſary ſhifting of tools, the ſhoulders may be begun upon with the ſame tool.

The foundation being laid in this manner, a narrower tool is taken, which is a little rounded, and whoſe ſize is adapted to the length of the noſe of the portrait; with this the form of the noſe, cheeks, and neck are engraved in ſtraight lines. See letter *d*, figs. 17 and 18.

After this a ſmall tool is required to croſs the top of the noſe, by which means the noſtrils are formed; with it alſo the eyes are ſketched, and the principal locks of hair. (See *f*. figs. 17 and 18.) Laſtly, the knobbed tool is uſed to produce the rounded tip of the noſe, which is to be brought into uniſon with the other parts already ſketched. (See *g*, figs. 17 and 18.)

When the figure is ſo far executed, ſmaller and more cutting tools are employed to finiſh it; for which latter operation depending entirely on the ſkill of the artiſt, no rules can be laid down.

In order to give the higheſt degree of poliſh to the engraving, boxwood, pewter, or copper tools with moiſtened tripoli or rotten-ſtone, and laſtly a bruſh, are faſtened to the mill, and ſet in motion in the ſame manner as the tools; the ſtone being brought into contact with them. The modern engravings have not nearly the ſame high poliſh as moſt of thoſe of antiquity.

It is obvious, that before ſuch a work can be entered upon, the engraver muſt be able to deſign and model the head in its juſt proportions, either in wax or clay; for without ſuch preparation no engraving can be expected to ſucceed. *Unexperienced* beginners, in copying the model, will often engrave leſs prominent parts before the more projecting are wrought ſufficiently deep, the conſequence of which is, that they are obliged to deſtroy a work ſo injudiciouſly commenced. An inconvenience of another nature ariſes from working too deep in the beginning; for in this caſe, in order to preſerve the work, it will afterwards be required to have the ſtone ground down by the lapidary. It is, therefore, better to proceed ſlowly and with caution, which enſures ſucceſs, than, by hurrying, run the riſk of loſing your labour and of deſtroying the ſtone.

On examining this head of Jupiter Serapis, which is not a work of great merit, it will be ſeen that the engraver has been obliged to trace at the left ſide of the head a lock of hair of greater breadth than appears neceſſary for juſt proportion: the reaſon for doing ſo was, that without it he could not well have finiſhed the ſmall parts, ſuch as the eyes, the noſe, mouth, &c.; whereas, having procured more room by this excavation, he found himſelf enabled to enter with the ſmaller tools, and to finiſh his engraving according to the ſhare of ſkill he poſſeſſed.

GEMS, *Impreſſions of*. See IMPRESSIONS.

GEMAAGIDID, or DELGUMUTU, in *Geography*, a town of Morocco; 40 miles S. W. of Morocco.

GEMAPPE. See JEMMAPE.

GEMARA, or GHEMARA, the ſecond part of the Talmud. The word גמרה, *gemara*, is commonly ſuppoſed to denote a ſupplement; but, in ſtrictneſs, it rather ſignifies complement, perfection: being formed of the Chaldee גמר, *gemar*, or *ghemar*, *to finiſh*, *perfect*, or *complete* any thing.

The rabbins call the Pentateuch, ſimply, the law. The firſt part of the Talmud, which is only an explication of the law, or an application thereof to particular caſes, with the deciſions of the ancient rabbins thereon, they call the Miſchna *i. e.* ſecond law; and the ſecond part, which is a more extenſive and ample explication of the ſame law, and a collection of deciſions of the rabbins poſterior to the Miſchna, they call Gemara, *q. d.* perfection, completion, finiſhing; becauſe they eſteem it the finiſhing of the law, or an explication, beyond which there is nothing farther to be deſired.

The Gemara is uſually called, ſimply, Talmud, the common name of the whole work. In this ſenſe we ſay, there are two Gemaras, or Talmuds; that of Jeruſalem, and that of Babylon: though, in ſtrictneſs, the Gemara is only an explication of the Miſchna, given by the Jewiſh doctors in their ſchools; much as the commentaries of our ſchool divines on St. Thomas, or the maſter of the ſentences, are an explication of the writings of thoſe authors.

A commentary, M. Tillemont obſerves, was wrote on the Miſchna by one Jochanan, whom the Jews place about the end of the ſecond century; but as it is generally believed that the Miſchna was not written till towards the cloſe of the ſecond century, the Gemara muſt have been compiled at a later period. Accordingly this Gemara is ſuppoſed to have been the production of ſome period between the years 300 and 400. Indeed, the Jews themſelves confeſs that the Gemara of Babylon was ſubſequent to the Miſchna about 316 years. But a great difference of opinion prevails among the learned, concerning the time when the Miſchna was written, ſome referring it to the end of the ſecond century, others to the end of the fourth, or end of the fifth, or beginning of the ſixth century. Wolfius obſerves, in his preface to his "Bibliotheca Hebræa," (p. 28.) that the Jews affirm the Miſchna to have been written 316 years before the Gemara of Babylon, and that the Jeruſalem Gemara was 83 years before the other Gemara. See MISCHNA. But F. Morin argues from the work itſelf, wherein mention is made of the Turks, that it was not written till the time of Heraclius, or about the year 620; and this is what is called the Gemara, or Talmud of Jeruſalem, which the Jews do not uſe or eſteem much, becauſe of its obſcurity.

They ſet a much greater value on the Gemara, or Talmud of Babylon, begun by one Aſa; diſcontinued for ſeventy-three years, on occaſion of the wars with the Saracens and Perſians; and finiſhed by one Joſa, about the cloſe of the ſeventh century. See TALMUD.

Though the name Talmud, in its latitude, includes both the Miſchna and the two Gemaras; yet it is properly that of Aſa and Joſa, alone, which is meant under that name. This the Jews prize above all their other writings, and even ſet it on a level with ſcripture itſelf; in effect, they conceive it as the word of God, derived by tradition from Moſes, and preſerved, without interruption, to their time. R. Jehuda, and afterwards R. Jochanan, R. Aſa, and R. Joſa, fearing the traditions ſhould be loſt in the diſperſion of the Jews, collected them into the Miſchna, and the Gemara. See CARAITES and RABBINISTS.

GEMATRIA, or GAMETRIA, the firſt kind of artificial cabbala uſed by the Jews.

The

The word is formed from the rabbinical Hebrew גימטריא, formed by corruption of the Greek.

Gematria is a geometrical or arithmetical method of explaining words, whereof there are two kinds; the firſt bearing a more immediate relation to arithmetic, and the latter to geometry.

The firſt conſiſts in taking the numerical value of each letter in a word or phraſe, and giving it the ſenſe of ſome other word, whoſe numerical letters, taken after the ſame manner, make the ſame ſum. For it is to be obſerved, that neither the Hebrews, nor the Greeks, have any numerical figures, beſides the letters of the alphabet.

Thus, a cabbaliſt, taking the two firſt words in Geneſis, בראשית ברא, and by addition getting the ſum total of all the numbers, ſignified by thoſe letters, finds that theſe two words ſignify the ſame as thoſe other three, בראש-השנה-נברא. For as to the firſt, ב is 2; ר, 200; א, 1; ש, 300; י, 10; ת, 400; ב, 2; ר, 200; and א, 1; which, together, make 1116. And, as to the latter, ב ſignifies 2; ר, 200; א, 1; ש, 300; ה, 5; נ, 50; ש, 300; ה, 5; נ, 50; ב, 2; ר, 200; and א, 1 which, ſummed up, yield the ſame number 1116

Whence the cabbaliſt concludes, בראשית־ברא, *in the beginning he created*, ſignifies the ſame thing as בראש השנה נברא, *it was created at the beginning of the year:* and, accordingly, the received opinion of the cabbaliſts is, that the world was created at the beginning of the month Tiſri, which was anciently the firſt month in the year, and anſwers to our firſt month in autumn, *viz.* September.

So, again, in the prophecy of Jacob, Gen. xlix. 10. the words יבא שילה, are underſtood of the Meſſiah, becauſe they make the ſame number with משיח, which ſignifies the Meſſiah.

The ſecond kind of Gematria is much more obſcure and difficult; and, accordingly, is leſs uſed. It is employed in ſeeking for abſtruſe and hidden interpretations, in the dimenſions and parts of the buildings mentioned in ſcripture, by dividing, multiplying, &c. thoſe meaſures by each other. Of this we ſhall give an example from ſome Chriſtian cabbaliſts.

The ſcripture ſays, that Noah's ark was 300 cubits long, 50 wide, and 30 high: now the cabbaliſt takes the length for the baſis of his operations; 300, in the Hebrew, is expreſſed by the letter ש, which length, divided by the height 30, gives the quotient 10, the Hebrew character whereof is י; this is to be placed on the right ſide of ש: he then divides the ſame length by the width, 50, the quotient whereof, 6, is expreſſed by a ו, which, being placed on the left ſide of ש, makes, together with the other two letters, the name Jeſus, ישו. Thus, by the rules of the cabbala, it appears, that there is no ſalvation but in Jeſus Chriſt; as, at the deluge, no perſon was ſaved but thoſe in the ark.

After the like manner is the ſame name ישו found in the dimenſions of Solomon's temple. But it is rather an injury than an advantage to the Chriſtian religion, to ſupport it by ſuch frivolous evidences.

GEMBICZ, or GEMBOCK, in *Geography*, a town of the duchy of Warſaw; 16 miles E. N. E. of Gneſna.

GEMBLOUX, GEMBLOURS, or GIBLOU, a town of France, in the department of the Sambre and Meuſe, and chief place of a canton, in the diſtrict of Namur, ſituated on the ſmall river Orneau, which runs into the Sambre; 10 miles N. W. of Namur. The place contains 1531, and the canton 10,500 inhabitants, on a territory of 157½ kiliometres, in 30 communes. This town was famous for its ancient abbey, which had once the privilege of coining money, and poſſeſſed a celebrated library, which contained a number of ancient and valuable MSS., among which was the "Chronicum Gemblacenſe," well known among the learned, begun by Sigebert, a monk, who died in the year 1112, and continued by Anſelm, the abbot, to his death in 1137. Gembloux has twice, *viz.* in 1678, and in 1712, ſuffered much by fire.

GEMELLÆ, in *Ancient Geography*, *Jimméelah*, an epiſcopal town of Africa, ſituated about four leagues N. E. of Satafi, in the eaſtern part of Mauritania Cæſarienſis. This place is diſtinguiſhed by ſome ancient ruins of the gate of the town, and of an amphitheatre.

GEMELLES, in *Heraldry*, a bearing of bars by pairs, or in couples, in a coat of arms. He beareth gules, on a chevron, argent, three bars gemelles, ſable, by the name of Throgmorton.

GEMELLI, CARERI FRANCIS, in *Biography*, an advocate at Naples, who made the tour of Europe in the year 1683, of which he publiſhed an account in one volume. In 1693, he undertook a voyage round the world, which he completed in 1698, and of this he publiſhed a narrative in the year 1700, which was ſeveral times re-edited, and was tranſlated into French and Engliſh, and admitted into various collections of voyages and travels. This work is frequently referred to and quoted, though the facts contained in it are certainly of queſtionable authority. It is, however, conſidered as valuable for the objects of curioſity it points out, and for the directions it gives for ſafe and uſeful travelling.

GEMELLUS, in *Anatomy*, a name ſometimes given to the *gaſtrocnemius*, which ſee.

GEMERURCH, in *Geography*, a town of Perſia, in the province of Irak; 60 miles S. W. of Kermanſha.

GEMIANA, a town of Egypt, 18 miles S. of Damietta.

GEMIGNANO, ST. VINCENTIO DI, in *Biography*, a painter, born at San Gemignano, in Tuſcany, in 1490, who became a diſciple of Raphael, and wrought for him with much ſucceſs in the chambers of the Vatican. He alſo performed many works under the eye of Raphael, in which he imitated the ſtyle and manner of that great man; but when he loſt him, his talents were not found equal to ſupport the reputation he had previouſly acquired. He died in 1530, at the age of 40.

GEMINATED COLUMN. See COLUMN.

GEMINGEN, in *Geography*, a town of Germany, in the palatinate of the Rhine; ſix miles N. W. of Heilbronn.

GEMINI, in *Anatomy*, iſchii-trochanteriens; are two ſmall and ſhort muſcles, ſituated at the poſterior part of the pelvis, the one above, and the other below the tendon of the obturator internus, which they nearly cover. They are diſtinguiſhed from each other by the epithets ſuperior and inferior. The geminus ſuperior extends from the ſpinous proceſs of the iſchium, in a horizontal direction, to the hollow behind the trochanter major of the thigh bone. It lies in front upon the os innominatum, and the capſule of the hip-joint; and is covered behind by the gluteus maximus, and great ſciatic nerve. The upper margin of the muſcle is parallel with, and contiguous to, the under edge of the pyramidalis; while the inferior, by its outer half, is confounded with the tendon of the obturator internus, by its inner half, is connected to the ſame tendon, by means of a thin aponeurotic expanſion. The inner extremity is fixed to the ſpine of the iſchium, from which point the fibres are continued horizontally, to the upper and back part of the trochanter, where the outer extremity is attached. It is compoſed entirely of muſcular fibres, except towards the outer

outer end, where it has a tendon united to that of the obturator externus.

The geminus inferior reſembles the former in figure and direction, covered behind by the gluteus maximus, and great ſciatic nerve, it covers in front the os innominatum and capſule of the hip. The lower margin is parallel with, and cloſe to, the upper margin of the quadratus femoris; the upper, like the lower of the preceding muſcle, is connected to the tendon of the obturator externus. Indeed the oppoſed edges of the two gemini are connected together, ſo as to form a groove, in which the obturator tendon is lodged. The inner extremity is fixed to the upper and back part of the tuberoſity of the iſchium; the fibres run horizontally outwards, and are attached to the trochanter, cloſe to the preceding muſcle. It conſiſts of fleſhy fibres, with the exception of the outer extremity.

By drawing the trochanter major backwards, the two gemini will rotate the femur outwards on its axis. When the limb is bent, they will aſſiſt in ſeparating it from the oppoſite, or carrying it into the ſtate of abduction. If the thigh be fixed, they may rotate the pelvis outwards or backwards upon the head of the femur.

GEMINI, in *Aſtronomy*, the *Twins*; a conſtellation, or ſign of the zodiac, the third in order, repreſenting Caſtor and Pollux; and it is marked thus, II. See CONSTELLATION.

This conſtellation was anciently depicted by a couple of young kids, by the Egyptians and eaſtern nations, as denoting that part of ſpring, when theſe animals appear; but the Greeks altered them to two children, which ſome of them repreſented by Caſtor and Pollux, ſome by Hercules and Apollo, and others by Triptolemus and Jaſion; but the Arabians afterwards changed them into two peacocks, their religion not allowing them to paint or draw any human figure. Sir Iſaac Newton thinks, that the figures had ſome reference to the Argonautic expedition. The ancients attributed to every ſign of the zodiac one of the principal deities for its tutelary power. Phœbus had the care of Gemini, and hence aroſe all the jargon of aſtrologers about the agreement of the ſun and this conſtellation.

GEMINI, *St.* in *Geography*, a town of Italy, in the duchy of Spoleto; ſix miles N. of Narni.

GEMINIANI, FRANCESCO, in *Biography*, a muſician of great abilities and renown. He was a native of Lucca, born about the year 1666; and received his firſt inſtruction on the violin of Carlo Ambrogio Lonati, of Milan, commonly called Il Gobbo, a celebrated performer on that inſtrument, who ſet the opera of "Ariberto & Flavio" for Venice, in 1684. After this, he ſtudied counterpoint under Aleſ. Scarlatti at Rome, where he became a diſciple of Corelli on the violin; and having finiſhed his ſtudies there, he went to Naples, where, from the reputation of his performance at Rome, he was placed at the head of the orcheſtra; but, according to the elder Barbella, he was ſoon diſcovered to be ſo wild and unſteady a timiſt, that inſtead of regulating and conducting the band, he threw it into confuſion; as none of the performers were able to follow him in his *tempo rubato*, and other unexpected accelerations and relaxations of meaſure.

The younger Barbella aſſured the writer of this article, that his father, who well remembered the arrival of Geminiani at Naples, ſaid he was never truſted with a better part than the tenor during his reſidence in that city.

He arrived in England in 1714, and in 1716 publiſhed in London his firſt work, conſiſting of 12 ſolos for the violin, dedicated to baron Kilmanſegge, on the plan of Corelli; ſix with double ſtops, and ſix ſingle, which, though few could execute, yet all the profeſſors allowed them to be maſterly; more learned and difficult than thoſe of his model, but not ſo pleaſing. Theſe ſolos ſeem to have been previouſly publiſhed at Amſterdam by le Cene; we are in poſſeſſion of a copy beautifully engraved on copper. In 1726 he formed Corelli's firſt ſix ſolos into concertos, and ſoon after the laſt ſix. He likewiſe ſelected ſix of his ſonatas for the ſame purpoſe, and imitating his ſtyle in compoſing additional parts to them, manifeſted how much he reſpected the originals. It was not till the year 1732 that Geminiani publiſhed his firſt ſix concertos, which he called his "Opera ſeconda," and dedicated to the ducheſs of Marlborough. Soon after this, his "Opera terza," or ſecond ſet of concertos, appeared, which eſtabliſhed his character, and placed him at the head of all the maſters then living, in this ſpecies of compoſition.

His ſecond ſet of ſolos, commonly called his French ſolos, either from their ſtyle or their having been compoſed and engraved in France, was publiſhed in 1739. Theſe were admired more than played; as about this time it became more than ever the faſhion for public ſolo-players to perform only their own compoſitions, and others were unable to execute them. His third ſet of concertos, which appeared about the year 1741, was ſo laboured, difficult, and fantaſtical, as never to be performed, to our knowledge, in either public place, or private concert.

His long-promiſed work, with the title of "Guida Armonica," publiſhed in 1742, appeared too late; for though there are many combinations, modulations, and cadences, that would open the mind and enrich the memory of a young ſtudent in harmony, he promiſed too much. The original title runs thus; "Guida Armonica o Dizionario Armonico," being a ſure guide to harmony and modulation, in which are exhibited the various combinations of ſounds, progreſſions of harmony, ligatures, and cadences, real and deceptive." It was a kind of mill, in which good muſic was to be ground with little trouble and no genius; as good ſenſe and ſcience by the Laputan machine, in Gulliver's travels; and his authority in the kingdom was diminiſhed by new muſic and new performers, as well as by his own frequent change of ſentiment: ſetting up at one time as a model of perfection, what he would deſpiſe and condemn at another.

His "Treatiſe on Good Taſte, and Rules for Playing in Good Taſte," did not appear till about 1747, but that was too ſoon for the preſent times. Indeed a treatiſe on good taſte in dreſs, during the reign of queen Elizabeth, would now be as uſeful to a tailor or milliner, as the rules of taſte in muſic, forty years ago, to a modern muſician.

In 1748, he publiſhed his "Art of Playing the Violin," which was a very uſeful work in its day; the ſhifts and examples of different difficulties, and uſes of the bow, being infinitely ſuperior to thoſe in any other book of the kind, or indeed oral inſtruction, which the nation could boaſt, till the arrival of Giardini.

His compoſition, called the "Enchanted Foreſt," in which he endeavoured by mere ſound to repreſent to the imagination of an audience all the events in the epiſode of the thirteenth book of Taſſo's Jeruſalem, was publiſhed about 1756; but muſic has never had the power, without vocal articulation, to narrate or inſtruct; it can excite, paint, and ſoothe our paſſions; but is utterly incapable of reaſoning, or converſing, to any reaſonable purpoſe.

Beſides theſe practical and theoretical works, he publiſhed two books of "harpſichord pieces," that are rendered impracticable by crouded harmony and multiplied notes; and two books upon the "art of accompaniment," which are only intelligible

telligible to thoſe who no longer want ſuch aſſiſtance; and if practiſed, would be intolerable to fingers and ſolo-players, who wiſh to be heard through the tinkling of a harpſichord.

Geminiani was ſeldom heard in public during his long reſidence in England. His compoſitions, ſcholars, and the preſents he received from the great, whenever he could be prevailed upon to play at their houſes, were his chief ſupport. In 1731, he advertiſed a "weekly conſort" of muſic, to be carried on at Hickford's room, by ſubſcription, and at which he played the firſt violin himſelf. This concert was advertiſed to be carried on the next year by Arrigoni and San Martini, "in the ſame manner as by ſignor Geminiani, who had declined the undertaking; the firſt violin by ſignor Carbonelli." In 1741, he had a benefit concert at the little theatre in the Hay-market, by command of their royal highneſſes the late prince and princeſs of Wales. And in 1749, a "concerto ſpirituale," during Lent, at Drury-lane theatre; in which he led the band, and played a concerto, from the fifth ſolo of his fourth opera, and the tenth ſolo of the ſame ſet. The unſteady manner in which he led, ſeemed to confirm the Neapolitan account of his being a bad mental arithmetician, or calculator of time. After this, he went to Paris, where he continued till 1755, when he returned to England, and publiſhed a new edition of his two firſt ſets of concertos. In 1761, he went to Ireland, to viſit his ſcholar Dubourg, maſter of the king's band in that kingdom, who always treated him with great reſpect and affection. It is ſuppoſed that his death was accelerated there the next year, by the loſs of an elaborate treatiſe on muſic, which he had been many years compiling, and which, by the treachery of a female ſervant, was conveyed out of his room, and could never be recovered. Surviving this loſs but a ſhort time, he died at Dublin, September 17th, 1762, at the great age of ninety-ſix.

Geminiani, with all his harmonical abilities, was ſo circumſcribed in his invention, that he was obliged to have recourſe to all the arts of muſical cookery, not to call it quackery, for materials to publiſh. In his younger days, when imagination is moſt fertile, ſixteen years elapſed between the publication of his firſt book of ſolos and his firſt ſix concertos. Indeed, during that period, he atchieved what a plodding contrapuntiſt of inferior abilities might have done as well: he transformed Corelli's ſolos and ſix of his ſonatas into concertos, by multiplying notes, and loading, and deforming, we think, thoſe melodies, that were more graceful and pleaſing in their light original dreſs. After the publication of his ſecond ſet of ſolos, his productions ſeem to have been the offſpring of whim, caprice, expedients, and an unprincipled change of ſtyle and taſte, which neither pleaſed the public, nor contributed to his own honour or profit. One day he would ſet up French muſic againſt all other; the next Engliſh, Scots, Iriſh—anything but the beſt compoſitions of Italy or Handel. It is well known how much he preferred the character of a picture-dealer, without the neceſſary knowledge or taſte in painting, as very good judges aſſerted, to that of a compoſer of muſic, by which he had ſubſiſted and acquired all his fame and importance. It is to be feared that a propenſity towards chicane and cunning, which gratifies ſome diſpoſitions more by outwitting mankind, than excelling them in virtue and talents, operated a little upon Geminiani; whoſe muſical deciſions, ceaſing to be irrevocable in England, determined him to try his hand at buying cheap and ſelling dear; impoſing upon groſſer ignorance with falſe names, and paſſing off copies for originals. As a muſician, he was certainly a great maſter of harmony, and very uſeful to our country in his day; but though he had more variety of modulation, and more ſkill in diverſifying his parts than Corelli, his melody was even inferior, and there is frequently an irregularity in his meaſures and phraſeology, and a confuſion in the effect of the whole, from the too great buſineſs and diſſimilitude of the ſeveral parts, which gives to each of his compoſitions the effect of a rhapſody or extemporaneous flight, rather than a poliſhed and regular production. His ſixth concerto of the ſecond ſet is always to be excepted, which is the moſt pleaſing and perfect compoſition of the kind, within our knowledge.

GEMINIANO, St., in *Geography*, a town of Etruria, ſeated on a mountain, with a beautiful palace; near which is a mine of vitriol; 24 miles S. of Florence.

GEMIST, George, in *Biography*, an eminent Greek philoſopher, was born at Conſtantinople in the year 1390. He reſided chiefly in the Peloponneſus, where he acquired a high character for his learning and prudence. He was a zealous advocate for Platoniſm, and maintained a violent controverſy with the Ariſtotelians. He was a ſtrenuous defender of the Greek church againſt the Latins, and was conſulted as an oracle on the points in debate. When a deputation was ſent from Greece to attend the council of Florence, in the year 1438, in order to diſcuſs the ſubject of an union between the Greek and Latin churches, he was appointed a member of it, and ſuſtained the cauſe of the Greeks with an acuteneſs of reaſoning, and a flow of eloquence which entitled him to the gratitude of his countrymen, and extorted the eſteem and admiration of his Latin opponents. But the viſit of Gemiſt to Italy was more memorable, as it afforded him an opportunity of reviving Platoniſm in that country, and he loſt no means of expatiating on the ſuperior excellence of his favourite ſyſtem, but defended it in public and private with great ſpirit and ſucceſs. He made many illuſtrious converts among the literary characters then aſſembled in Florence, and in the number was Coſmo de Medici. By the influence which he had over this patron of ſcience and literature, the foundation of a Platonic academy was laid at Florence, and under the inſtructions of Gemiſt, the firſt preſident, Marſilius Ficinus, of that inſtitution, was formed. After the termination of the council of Florence, Gemiſt returned to Greece where he died at the advanced age of nearly one hundred years. He left behind him numerous works, which afford ample evidence of his profound erudition, and of his intimate acquaintance with the Alexandrian Philoſophy. The principal are "De Geſtis Græcorum poſt pugnam ad Mantineam, duobus Libris digeſta." "De virtutibus Libellus," which has been reprinted in many forms, and illuſtrated by various commentators: "De rebus Peloponneſiaſis conſtituendis Orationes duæ," with an appendix containing a deſcription of all the places in the Peloponneſus, their longitudes and latitudes taken from Ptolemy, and corrected by the author: "De Platonicæ et Ariſtotelicæ Philoſophiæ Differentia." Gemiſt was author likewiſe of a number of theological, hiſtorical, rhetorical, and philoſophical pieces: alſo of a work entitled "In Oracula magica Zoroaſtris Commentarii," in which he gives an elegant compendium of the Platonic philoſophy. Moreri. Enfield's Hiſt. Phil.

GEMMA, Cornelius, the ſon of Reinier Gemma, (who was a phyſician, but diſtinguiſhed chiefly by his mathematical and aſtronomical knowledge,) was born at Louvain in February, 1535. He became royal profeſſor of medicine in his native place in 1569, through the appointment of the duke of Alba, at which time he took the degree of doctor. But he did not enjoy his honours many years; for he was cut off by the plague, which raged at Louvain, on the

the 12th of October 1577. His writings are not numerous, and relate to mathematical and philoſophical ſubjects as well as to medicine.

GEMMA, JOHN BAPTIST, a native of Venice, and a phyſician of conſiderable repute about the end of the fifteenth century. He was phyſician to Sigiſmund III. king of Poland. He wrote a treatiſe, containing a hiſtory of peſtilential epidemics, with a detail of the effects of contagion, &c., and entitled, "De vera ratione curandi bubonis atque carbunculi peſtilentis deque eorundem, Commentarius." 1584. Eloy.

GEMMA, in *Botany* and *Vegetable Phyſiology*, a bud, moſt probably from γιμω, *to be full*. See BUD.

In addition to what is ſaid in that place, it is neceſſary to caution the ſtudent againſt an error of ſome philoſophers, eſpecially Dr. Darwin in the ninth ſection of his *Phytologia*, who draws a too cloſe, and indeed erroneous, analogy, between buds and the embryo of a ſeed, or the chick in the egg. By buds, it is true, plants are propagated and increaſed, and in that ſenſe each bud becomes a ſeparate being, or new plant; but ſuch propagation is only the extenſion of an individual, and not a reproduction of the ſpecies, in conſequence of ſexual impregnation, as by ſeed. This was long ago obſerved, in oppoſition to the opinions and experiments of Spallanzani, by the author of the preſent article. See Diſſertation on the Sexes of Plants, tranſlated from the Latin of Linnæus, p. 45, note. Accordingly, all plants increaſed by buds, cuttings, layers or roots, retain preciſely the peculiar qualities of the individual from which they are taken. Thus varietiesare propagated, which commonly vaniſh in the legitimate ſeminal progeny, and thus, as Mr. Knight has obſerved of the different kinds, or varieties, of apples and pears, each individual ſo propagated has only a determinate period of exiſtence. The date of ſuch varieties in Cape Geraniums is uſually very ſhort; in apples and pears it is generally, not always, very much longer; in willows, ſo readily increaſed by cuttings, apparently without end, it ſeems to be almoſt unlimited, for no cultivator has yet remarked any advantage in renewing oſiers of any kind from ſeed; but we apprehend the ſubject has not been properly attended to. As ſuch willows do, to our knowledge, ſow themſelves frequently, their ſeedlings may unconſciouſly be preferred, for ſome characters of vigour in their appearance, by thoſe who are about to chooſe cuttings. Gardeners well know that many of the moſt hardy perennial herbs require frequent renewal from ſeed, in order to exiſt with vigour. Propagation by ſeed is therefore the only true reproduction of plants. How that is accompliſhed we have already explained. Seee FECUNDATION *of Plants*.

Some very eminent Cryptogamic botaniſts, as Gærtner and even Acharius, contend for eſexual propagation in the lower tribes of vegetables. This is particularly inſiſted upon by the former with reſpect to *Fuci*, in the introduction to his great work on ſeeds, p. 32; and yet what he details in the following page, of the impregnation of the ſeeds of thoſe plants by a mucus formed in their germen or ovarium, is really equivalent to ſexual impregnation. Acharius extends the eſexual theory, not indeed without ſome doubts, to *Byſſi*, *Lichenes*, and *Fungi*. If however the propagation of theſe or any other plants be truly eſexual, what theſe writers term *ſporæ*, and ſeem to think equivalent to ſeeds, are eſſentially nothing but *gemmæ*, and the analogy of all other vegetables is againſt any continued propagation or reproduction by ſuch means. It was a moſt extraordinary and unaccountable overſight in the great Hedwig, to adopt this term of *ſpora* for the ſeed of moſſes, though his own brilliant theory of their ſexual impregnation, which has brought him ſo much deſerved reputation, proves that part to be a real ſeed; whereas the term *ſpora*, indicating the contrary, ſerves only to invalidate his own hypotheſis! S.

GEMMA *Veneris*, in *Natural Hiſtory*, a name given by ſome of the Latin poets, and other authors in that language, to a gem, which was much eſteemed by the Romans, and ſet in rings. It was called by the Greeks *aphrodites*. Many have ſuppoſed this to be the opal; but it is certain, from the oldeſt accounts, that the moſt beautiful kind of the amethyſt was the gem they called by this name. They diſtinguiſhed the amethyſt as all the other gems, into ſeveral kinds, according to the degrees of the colour; and to the moſt eminent of theſe they gave peculiar names, as is evident in the ſeveral kinds of the emerald and beryl. The worſt amethyſts were thoſe which had very little colour beyond that of cryſtal, and the very beſt were thoſe which had the fine red of the carbuncle, mixed with the purple of the violet, and the whole ſo pale, that a roſe-colour ſeemed blended with them, and predominated over the reſt. Theſe, Pliny tells us, were called *pæderotes* and *anterotes*, and were the gems called, from their beauty, *aphrodites lapis*, and *gemma Veneris*; but all theſe names have been ſince given by others to the opal.

GEMMÆ, *Sal*, is peculiarly uſed for rock ſalt, or ſalt dug out of mines. See SALT.

The name gemma is applied to this on occaſion of its luſtre and brilliancy, which is not unlike that of cryſtal.

The principal mines of this ſalt are thoſe of Wiliſca, in Poland; thoſe of Eperia, in Upper Hungary; and thoſe of Cardonna, in Catalonia.

The chief uſe of this ſalt is for the powdering or pickling of meats, in places deſtitute of ſalt ſprings, &c.

GEMMEUM, an epithet uſed by the Latins to expreſs ſuch veſſels as were called *dialitha* and *lithocolla* by the Greeks. The more correct Roman authors, however, call this *gemmatum poculum*, and not *gemmeum*; the word gemmeum ſignifying properly a vaſe or cup, cut out of a ſingle ſtone, as an agate, or the like; but gemmatum expreſſing thoſe fine vaſes of gold, which were ornamented with emeralds and other precious ſtones.

GEMMI, in *Geography*, part of a chain of mountains of Switzerland, which ſeparates the canton of Bern from the Vallais; the point of which, that overlooks and almoſt overhangs the Vallais, affording a moſt extenſive proſpect over that fertile country and the rugged alps of Savoy. Although this mountain is, in many places, almoſt perpendicular, a horſe-road has been hewn in the hard rock down this formidable deſcent. This aſtoniſhing work was begun in 1736, and finiſhed in 1741, at the joint expence of the Vallais and the canton of Bern. More than a league of it has been blown up with gunpowder. This road is about nine feet broad, and quite hangs over the precipice; in ſome parts it is hollow, open only at one ſide, the rock above projecting over it, of the ſame breadth. The effect is very ſtriking; for, as the road winds continually, the ſcene alſo changes; ſo that at one moment the paſſage commands an extenſive view, and in the next is incloſed with barren rock. The deſcent from the top to the plain is about two leagues.

GEMONA, a town of Italy, in Friuli, old but opulent. In this place the merchandiſe brought from Germany is detained and ſearched by officers of the cuſtoms. The diſtrict contains 32 villages. In 1797, it was taken by the French; 21 miles N.W. of Friuli. N. lat. 46° 20'. E. long. 12° 59'.

GEMONIÆ SCALÆ, or *Gradus Gemonii*, among the

Romans, was much the ſame as a gallows, or gibbet, in England.

Some ſay, they were thus denominated from the perſon who raiſed them; others, from the firſt criminals that ſuffered on them; and others, from the verb *gemo*, *I ſigh* or *groan*.

The *gradus gemonii*, according to Publius Victor, or Sextus Rufus, was a place raiſed on ſeveral ſteps, from whence they precipitated their criminals; others repreſent it as a place whereon offenders were executed, and afterwards expoſed to public view. The gemoniæ ſcalæ were in the tenth region of the city, near the temple of Juno. Camillus firſt appropriated the place to this uſe, in the year of Rome 358.

GEMONIDES, a name by which ſome of the ancients have called the peantides; probably the ſame with our ſtalactites, a ſtone famous with them for its ſuppoſed virtue in promoting delivery.

GEMOTE, or GEMOT, *Conventus*, a Saxon word, denoting a meeting or aſſembly.

"Omnis homo pacem habeat eundo ad gemotum & rediens de gemoto, niſi probatus fur fuerit." Ll. Ed. Conf. See WITTENA.

GEMOZAC, in *Geography*, a town of France, in the department of the Lower Charente, and chief place of a canton, in the diſtrict of Saintes; 10 miles S. of Saintes. The place contains 2396, and the canton 15,759 inhabitants, on a territory of 247½ kiliometres, in 17 communes.

GEMSHORN, a ſtop in German organs, which anſwers to our principal and flute. It is 16, 8, 4, or 2 feet, in proportion to the ſize of the inſtrument. Walther.

GEMUND, in *Geography*, a town of France, in the department of the Roer, and chief place of a canton, in the diſtrict of Aix-la-Chapelle, ſeated on the Ruhr; 41 miles W.N.W. of Coblentz. N. lat. 50° 37'. E. long. 6° 28'.

GEMUND, or *Gmund*, a town of Wurtemberg, on the Rembs. In 1802, this town, which was imperial, was granted among the indemnities to the duke (now king) of Wurtemberg; 24 miles E. of Stuttgart. N. lat. 48° 44'. E. long. 9° 50°.

GEMUND, or *Gemunden*, a town of Germany, in the biſhopric of Wurtzburg, on the right bank of the Maine, where it is joined by the united ſtreams of the Saal and the Sinn; 37 miles E. of Frankfort. N. lat. 50° 9'. E. long. 9° 52'.—Alſo, a town of Auſtria, ſituated on the Traunſee, celebrated for its ſalt-works; 24 miles S.S.W. of Lintz. N. lat 47° 65'. E. long. 13° 42'.

GEMUND, a town of the duchy of Carinthia; 32 miles N.W. of Clagenfurt. N. lat. 46° 50'. E. long. 13° 21'.—Alſo, a town of Auſtria; 60 miles N.W. of Vienna. N. lat. 48° 44'. E. long. 15° 3'.

GEMUNDEN, a town of France, in the department of Mont Tonnerre, famous for its fairs; 3 miles E. of Weſterburg.—Alſo, a town of Germany, in the principality of Heſſe-Caſſel; 28 miles S.W. of Caſſel. N. lat. 50° 59'. E. long. 9'.—Alſo, a town of Germany, in the principality of Calenberg; 13 miles S.W. of Gottengin.

GEMURSA, in *Surgery*, an excreſcence between the toes.

GENA. See CHEEK.

GENABUM, in *Ancient Geography*, called alſo "Civitas Aurelianorum," a town of Gaul, in the country of the Carnuti, ſuppoſed by ſome to be *Gien*, but by others, with greater probability, *Orleans*. Cæſar mentions it; and Strabo calls it the "emporium of the Carnuti," and ſays that it was ſituated upon the Loire, towards the middle of its courſe. The communication was ſo eſtabliſhed, and ſo neceſſary between this town and Chartres, that they had a public way, ſtill in ſome degree of preſervation, which was called the "way or road of Cæſar."

GENABUS, an epiſcopal town of Aſia, in Phrygia.

GENADEL, in *Geography*, a mountain of Nubia, over which the Nile paſſes, and forms a cataract; 120 miles S.S.W. of Syene.

GENADGE, a town of Egypt; 12 miles S. of Faoué.

GENÆ QUADRATUS. See QUADRATUS.

GENAPILLA, in *Geography*, a town of Hindooſtan, in the Carnatic; 36 miles W. of Nellore.

GENAPPE, a town of France, in the department of the Dyle, and chief place of a canton, in the diſtrict of Nivelles, ſituated on the Dyle; 5 miles E. of Nivelles. The place contains 1186, and the canton 8842 inhabitants, on a territory of 132½ kiliometres, in 71 communes.

GENARO MANNI, in *Biography*, a celebrated Neapolitan compoſer, in a ſolid yet ingenious ſtyle, between that of the church and the theatre. He was compoſer of the archiepiſcopal church at Naples in 1770, and much reſpected by profeſſors and real judges of muſic in that capital. His name will be embalmed with that of Jomelli, for his pious and active zeal at the public funeral of that admirable maſter in 1774, which he projected and conducted in a manner equally honourable to himſelf and his deceaſed friend. Sig. Saverio Mattie, the learned commentator and tranſlator of the Pſalms into Italian verſe, arranged in ſtanzas, and fitted for muſic of every ſpecies in the eccleſiaſtical ſtyle, has recorded this event in an intereſting pamphlet, which will live, and add longevity to the fame of theſe eminent profeſſors.

GENBARABA, in *Geography*, a town of Perſia, in the province of Irak; 100 miles E. of Hamadan.

GENBITA, a town of Africa, in Nubia; 65 miles N.E. of Dekin.

GENÇAY, a town of France, in the department of the Vienne, and chief place of a canton, in the diſtrict of Civray; 12 miles N.N.E. of Civray. The place contains 628, and the canton 8169 inhabitants, on a territory of 270 kiliometres, in 11 communes.

GENDARMES, or GENS D'ARMES, *q. d.* men of arms, a term uſed among the French for a ſelect body of horſe-guards; becauſe they ſucceeded the ancient men of arms, who were armed at all points, and thence were called gendarmes. Under the old government of France, the troops of the king's guard de corps, the muſqueteers, and light-horſe, were reputed to belong to the gendarmerie.

The grand-gendarmes, ſometimes called ſimply the gendarmes, were a troop of gentlemen, to the number of about 200, and in time of war 240, who guarded the king's perſon. The king himſelf was their captain, and one of the prime peers the captain-lieutenant, under whom were two ſub-lieutenants, three enſigns, and three guidons. When the king marched with all his houſhold troops, the gens d'armes cloſed the march. They were eſtabliſhed about the year 1665.

Their device was a thunder-bolt falling from heaven, with the motto, "Quo jubet iratus Jupiter." There were alſo, beſides theſe, gens d'armes of the queen, the dauphin, &c.

The gendarmery was a body of horſe, conſiſting of ſixteen companies, forming eight ſquadron, *viz.* the Scotch gendarmes, the Engliſh gendarmes, the Burgundy gendarmes, and the Flemiſh gendarmes, which four companies compoſed the king's gendarmes, or life-guard. The other companies took their names from the princes who commanded them, as captains, *viz.* the queen's gendarmes, the queen's light-

light-horſe; the dauphin's gendarmes, the dauphin's light-horſe; the duke of Burgundy's gendarmes, the duke of Burgundy's light-horſe; the duke of Orlean's gendarmes, &c. each troop, at a medium, conſiſted of ſeventy-ſix gendarmes, or light-horſe. Each company was divided into two brigades, one commanded by the captain-lieutenant, and the other by the ſub-lieutenant; and the ſubordinate officers were an enſign and guidon.

The gendarmerie took precedence of every regiment of horſe in the French ſervice, and ranked immediately after the king's houſhold. The uniform of this ſelect body of cavalry, under the old government, was ſcarlet, with facings of the ſame colour. The coat was formerly more or leſs laced with ſilver, according to the king's pleaſure. A little while before the revolution, it was only laced on the cuff. The waiſtcoat was of buff-leather, and the bandouleer of the ſame, ſilver-laced; the hat was edged with broad ſilver lace. The horſe-cloths and holſter-caps were red, and the arms of the captain were embroidered on the corners of the ſaddle-cloths, and on the front of the holſters. In 1762, a conſiderable body of men was raiſed by order of Louis XIV., and the ſoldiers that compoſed it were called gens d'armes; and in 1792, their number, conſiſting of horſe and foot, was augmented, and both were denominated indiſcriminately gens d'armes; but their cloathing was altered to deep blue. Their pay was greater than that of the reſt of the army; and their privileges were founded on the claims to military honour, which they were obliged to produce, before they were enliſted. Every individual was to exhibit a certificate of ſix or eight years' ſervice.

GENDER, Genus, in *Metaphyſics*. See Genus.

Gender, in *Grammar*, denotes a diviſion or diſtinction of nouns or names, according to the different ſexes of the things they denote.

It has been thought proper, in order to render diſcourſe more expreſs and diſtinct, as alſo to embelliſh it by a variety of terminations, to contrive certain diverſities in adjectives, accommodated to the ſubſtantives they are applied to; whence, from a regard to that notable difference there is between the two ſexes, all nouns ſubſtantive have been diſtinguiſhed into maſculine and feminine; and the nouns adjectives alſo varied to correſpond therewith.

Mr. Harris, obſerves, that in the diſtribution of genders, ſuch ſubſtantives might have been conſidered as maſculine, which were conſpicuous for the attributes of imparting or communicating; or which were, by nature, active, ſtrong, and efficacious, and that indiſcriminately whether to good or ill; or which had claim to eminence, either laudable or otherwiſe; the feminine, on the contrary, were ſuch as were conſpicuous for the attributes either of receiving, of containing, or of producing and bringing forth; or which had more of the paſſive in their nature than of the active; or, which were peculiarly beautiful and amiable; or which had reſpect to ſuch exceſſes as were rather feminine than maſculine. Thus the ſun, the ſky, time, death, God, &c. are maſculine; but the moon, the earth, a ſhip, a city, country, virtue, fortune, &c. are feminine. Hermes, p. 44, &c.

But as there was an infinity of words, which had no proper relation, either to the one ſex or the other, they had genders aſſigned them, rather out of caprice than reaſon; and hence it is, that the gender of a noun is frequently dubious and fluctuating. Though, as there are ſubſtantives that have evidently no ſex, the neuter gender expreſſing ſuch ſubſtances is as natural and rational a diſtinction as either of the others.

It ſhould here, however, be obſerved, that this inſtitution of genders was not made with deſign and deliberation by the maſters of language, but was introduced by cuſtom and uſage. At firſt, there was only a difference between the names of animals, when ſpoken of males and females; and, by degrees, the ſame regulation was extended to other things: the grammarians have only noted and allowed what uſage had eſtabliſhed. The oriental languages frequently neglect the uſe of genders; and the Perſian language has abſolutely none at all, which is no diſadvantage; the diſtinction of genders being in great meaſure uſeleſs.

The Latins, Greeks, &c. generally content themſelves to expreſs the different genders by different terminations, as *bonus equus*, a *good horſe*; *bona equa*, a *good mare*, &c. But in Engliſh we frequently go farther, and expreſs the difference of ſex by different words; as *boar*, *ſow*; *boy*, *girl*; *buck*, *doe*; *bull*, *cow*; *cock*, *hen*; *dog*, *bitch*, &c.

We have only about twenty-four feminines, diſtinguiſhed from the males, by the variation of the termination of the male into *eſs*; of which number are *abbot*, *abbeſs*; *count*, *counteſs*; *actor*, *actreſs*; *heir*, *heireſs*; *prince*, *princeſs*, &c. which is all that our language knows of any thing like genders.

The eaſtern languages, as well as the vulgar languages of the weſt, have three genders; the maſculine, feminine, and neuter. The Greek and Latin have likewiſe the neuter, common, and the doubtful gender; and beſides theſe, they have the epicene, or promiſcuous, which, under one ſingle gender, and termination, includes both the kinds.

The Engliſh language, with ſingular propriety, following nature alone, applies the diſtinction of maſculine and feminine only to the names of animals; all the reſt are neuter; except when by a poetical or rhetorical fiction things inanimate and qualities are exhibited as perſons, and conſequently become either male or female. And this gives the Engliſh an advantage above moſt other languages in the poetical and rhetorical ſtyle; for when nouns naturally neuter are converted into maſculine or feminine, the perſonification is more diſtinctly and forcibly marked. Lowth's Grammar, p. 44. ed. 1772.

Gender, in *Geometry*. Geometrical lines are diſtinguiſhed into genders, or genera, claſſes, or orders, according to the number of the dimenſions of the equation that expreſſes the relation between their ordinates, and the abſciſſas.

Gender, in *Botany*. See Genus.

Gender, in *Muſic*, &c. See Genera.

GENDIE, in *Geography*, a town of Egypt, on the left bank of the Nile; 4 miles N. of Abu-Girgé.

GENDRE, Gilbert-Charles le, in *Biography*, marquis de St. Aubin, was a counſellor in the parliament of Paris, and afterwards maſter of requeſts. He is known by two works of conſiderable reputation, theſe are; "Traité de l'Opinion, ou Mémoires pour ſervir á l'Hiſtoire de l'Eſprit Humain," ſix vols, 12mo., and "Antiquités de la Maiſon de France," 4to. The former conſiſts of a great variety of hiſtorical examples to elucidate the power of opinion in the ſciences, accompanied with reflections; the latter is a work of deep and curious reſearch concerning the origin of the regal dynaſties of France. Moreri.

Gendre, Louis le, was born of an obſcure family at Rouen in 1659. Through the favour and great kindneſs of M. de Harlai, then archbiſhop of Rouen, afterwards of Paris, he received an excellent education, and was in 1690 preſented with a canonry in the cathedral of Paris. His firſt eſſays as an author were two eulogies and a life of his patron, the ſtyle of which has been much approved by able critics.

In

In 1697 he publiſhed "Eſſays on the Reign of Louis le Grand," which he preſented, in perſon, to the monarch, and which were ſo well received by the public as to paſs through four editions in eighteen months. After this, he gave the world his "Hiſtory of France to the Death of Lous XIII.," in three vols. folio. This is eſteemed one of the moſt exact abridgments of French hiſtory, and is written with great ſimplicity. He died at Paris in 1733, at the age of 74. Beſides the works already mentioned, he publiſhed "A Treatiſe upon the Manners and Cuſtoms of the French at different Periods of their Monarchy:" and "A Life of the Cardinal Amboiſe, with a Parallel of the celebrated Cardinals who have governed States." At his death he left five hiſtories of his own life, each compoſed in a different ſtyle and manner, which he directed to be made public. He left alſo bequeſts for various ſingular foundations, ſome of which, after exciting diſputes relative to their fulfilment, were applied by authority to the inſtitution of prizes in the univerſity of Paris. Moreri.

GENDREY, in *Geography*, a town of France, in the department of the Jura, and chief place of a canton in the diſtrict of Dôle; 10 miles E. of Auxonne. The place contains 652, and the canton 4399 inhabitants, on a territory of 94 kiliometres, in 95 communes.

GENDRON, Claude-Deshais, in *Biography*, doctor of the faculty of Montpellier, phyſician in ordinary to Monſieur, the brother of Louis XIV., and afterwards to the duke of Orleans, when regent, was a native of Beauce. He exhibited in his early youth a conſiderable zeal and talent for natural hiſtory and medicine, and anxiouſly ſought the ſociety of men of ſcience and literature, with a view to profit by their inſtructions, and to learn the beſt mode of proſecuting his ſtudies. He ſoon became diſtinguiſhed by the ſucceſs of his practice in many caſes of chronic maladies of difficult cure. To the reputation, thus acquired, he added thoſe qualities of the mind and heart which endear a man to ſociety, at the ſame time that he deteſted all flattery and diſguiſe. At an advanced age he quitted his profeſſion, and retired with an ample income to Auteuil, near Paris, where he was viſited by all deſcriptions of the great, by miniſters, ambaſſadors, and men of ſcience, and various other perſons of both ſexes. He lived in this retirement with true Chriſtian philoſophy, and died on the 3d of September, 1750, at the age of 87, univerſally lamented. He wrote two treatiſes, the one entitled, "Recherches ſur la Nature et la Guériſon du Cancer," Paris 1601:—the other "Recherches ſur l'Origine le Développement, et la Reproduction des êtres Vivans."

A nephew of the preceding, Louis Florent Deſhais-Gendron, alſo a phyſician, was the author of two treatiſes on the diſeaſes of the eyes. Eloy. Dict. Hiſt.

GENDUR, in *Geography*, a town of Hindooſtan, in Dowlatabad; 24 miles N. of Naldowrouk.

GENEALOGICA Arbor. See Arbor.

GENEALOGY, a ſeries or ſucceſſion of anceſtors, or progenitors; or, a ſummary account of the relations and kindred of a perſon, or family, both in the direct and collateral lines.

The word is Greek, γενεαλογια, which is formed of γενος, *genus*, *proſapia*, *race*, and *lineage*; and λογος, *ſermo*, *diſcourſe*.

In divers chapters, and military orders, it is required, that the candidates produce their genealogy, to ſhew that they are noble by ſo many deſcents.

The genealogical degrees are uſually repreſented in circles, ranged over, under, and aſide of each other. The ancients had the like, which they called *ſtemmata*, from a Greek word, ſignifying *crown*, *garland*, or the like. See Consanguinity and Descent.

The Jews were very anxious for preſerving their genealogies entire and uninterrupted; and this care on their part affords an argument of conſiderable importance with reſpect to the accompliſhment of thoſe ancient prophecies that pertain to the Meſſiah. Accordingly, in their ſacred writings we find genealogies carried on for above 3500 years. It is obſerved (Ezra, ii. 62.) that ſuch prieſts as could not produce an exact genealogy of their families were not permitted to exerciſe their functions. Joſephus ſays that they had, in his nation, an uninterrupted ſucceſſion of prieſts for 2000 years; that the prieſts were particularly careful to preſerve their genealogies, not only in Judæa, but alſo in Babylonia and Egypt; and that, wherever they were, they never married below themſelves, and had exact genealogical tables prepared from thoſe authentic documents which were kept at Jeruſalem, and to which they had recourſe; and that, in all their wars, perſecutions, and calamities, they always were diligent in ſecuring thoſe documents, and in renewing them from time to time. Jerome ſays (ad Tit. iii.) that the Jews know ſo perfectly the genealogies, that they can repeat all the names from Abraham to Zerubbabel, as eaſily as their own. Nevertheleſs, ſince the war of the Romans againſt the Jews, about 30 years after the death of our Saviour, and ſince their entire diſperſion in the reign of Adrian, the Jews have loſt their ancient genealogies; and perhaps there is not even one of the ſacerdotal race who can produce authentic proofs of his genealogy. This circumſtance has been alleged by Chriſtian writers as a preſumptive proof of the actual advent of the Meſſiah, whoſe genealogy, correſponding to ancient predictions, the Jews are no longer able to trace, and conſequently of the truth of Chriſtianity. It is obſervable, that the genealogies ſet down by Ezra and Nehemiah vary in ſome particulars. Of this difference Dr. Prideaux (Conn. Pt. i. b. 4.) gives the following account: "For the true ſettling of theſe genealogies ſearch was made by Nehemiah for the old regiſters, and having found among them a regiſter of the genealogies of thoſe who came up at firſt from Babylon, with Zerubbabel and Joſhua, he ſettled this matter according to it, adding ſuch as afterwards came up, and expunging others whoſe families were extinguiſhed; and this has cauſed the difference between the accounts which we have of theſe genealogies in Ezra and Nehemiah. For in the ſecond chapter of Ezra we have the old regiſter, made by Zerubbabel; and in the ſeventh of Nehemiah, from the ſixth verſe to the end of the chapter, a copy of it, as ſettled by Nehemiah, with the alterations I have mentioned."

The genealogies of Chriſt, recorded by St. Matthew (ch. i.) and St. Luke (ch. iii.) in their reſpective goſpels, have occaſioned no little perplexity to biblical commentators and critics. The genealogy of Chriſt by Matthew is generally ſuppoſed to be that of Joſeph his reputed father; and that given by Luke to be that of his mother Mary, whom one of the Jewiſh rabbis calls the daughter of Heli. But according to Euſebius, who admits both the genealogies, as indeed they were generally received by the ancient fathers, and who cites a long paſſage from a letter of Julius Africanus, in which he endeavours to obviate the diſagreement between them, it was a tradition in the family of Joſeph, that he was properly the *legal ſon* of Heli, and that, as he died without children, his brother Jacob married his wife, and having a child by her, it was transferred to Heli. If the genealogy of Matthew be compared with the correſponding genealogies in the Old Teſtament, it will be found to differ from them in ſeveral reſpects; but it was probably ſuch a

genealogy

genealogy as was generally allowed to be of authority; and it ſufficiently proved the deſcent of Jeſus from David. The difference between the two genealogies, and the omiſſion of three perſons by Matthew (v. 8.), who were all deſcendants of David, do not, of themſelves, warrant our diſputing the authenticity of the two firſt chapters of Matthew's goſpel, as ſome have done. The omiſſion of Matthew might either be in the record copied by him, or it might have been occaſioned by ſome early tranſcriber. Allowing the former to be the caſe, the 17th verſe, which makes the generations between David and the Babyloniſh captivity to be no more than fourteen generations, muſt, as biſhop Pearce obſerves, be an interpolation. We refer, without farther enlarging, to the numerous commentators and critics, who, in their harmonies and comments, have written on the ſubject.

Genealogical tables are of great uſe for exhibiting at one view, and in a compendious manner, the deſcent of families.

The moſt natural order of theſe tables ſeems to be to place the common ſtock at the head of the table, and the ſeveral deſcents, or ſucceeding generations, each in a lower line appropriated to it; and not to make the order of generations to proceed from the left hand to the right, as is done by ſome. But every diſtinct generation ſhould by all means be placed in a line or ſpace appropriated to itſelf; otherwiſe our ideas will be greatly confuſed. The order of birth in the ſame generation may eaſily be obſerved (as is done in ſome of our beſt tables) by placing the firſt-born to the left hand in the table, and the reſt, according to the order of birth, to the right.

There is a variety of other relations, beſides mere natural deſcent, of which it is very uſeful to have a clear idea, as the connection by marriage, by adoption among the Romans, &c. by which different families are intermixed. And it is poſſible, by different kinds of lines, joining the names ſo connected, how remote ſoever, in the table of generation, to expreſs all thoſe relations without the uſe of words. But as the attempt to expreſs them all by characters disfigures the table with a great variety of lines, many of them of conſiderable length, and extending themſelves in every direction, it ſeems moſt convenient to expreſs *natural deſcent* only by characters, and to ſubjoin to each name an account, in words, of all its other connections, referring at moſt from one to another, by *marks* contrived for that purpoſe. This method Rapin has taken in the excellent genealogical tables in his "Hiſtory of England."

Some valuable tables of genealogy may be ſeen at the end of "Petavius's Chronology;" but the largeſt and moſt complete body of genealogies is that publiſhed by Anderſon; which, in one large volume folio, contains all the genealogies he could collect from the whole body of hiſtory, ancient and modern. Prieſtley's Lectures on Hiſtory, ſect. xvii.

GENEBRARD, Gilbert, in *Biography*, was born at Riom, in Auvergne, about the year 1537. At a very early age he entered into the Benedictine order in the dioceſe of Clermont, and went to purſue his ſtudies at Paris, where he learned Greek under Turnebius, philoſophy under Carpentier, and theology under Claude de Saintes. He ſoon became diſtinguiſhed for his great learning, and in 1563 was admitted to the degree of doctor of divinity by the college of Navarre, and was afterwards appointed regius-profeſſor of the Hebrew language. He was nominated to ſeveral important offices in the church, but being diſappointed in his expectations of a biſhopric through the intrigues at court, he joined the party of the League, of which he became a zealous advocate. The numerous writings which he publiſhed againſt thoſe who ſupported the meaſures of the court and the reformed religion were uncommonly bitter and furious. They had however ſufficient influence to obtain for him the archbiſhopric of Aix, to which ſee he was conſecrated in the year 1593. Here he continued to ſhew his hoſtility to the court, and went ſo far as to declaim againſt the king, in his ſermons, even when his own cauſe was hopeleſs. The League being broken up, and Henry IV. generally acknowleged throughout the kingdom, Genebrard thought it adviſable to retire to Avignon, where he publiſhed a treatiſe "De Sacrarum Electionum Jure, ad Eccleſiæ Romanæ Reintegrationem," in which he diſplayed ſo much violence againſt kings and princes, that he was proſecuted and ſentenced to perpetual baniſhment. He was, however, permitted to retire to his priory at Semur, but his book was ordered to be burnt by the hands of the common executioner. He died in 1597, when little more than ſixty years of age. His works are very numerous, and many ſhew that he poſſeſſed very conſiderable erudition, and that he was as induſtrious in the inveſtigation of the ſubjects on which he wrote as he was learned. His principal pieces were "A ſacred Chronology," more exact than any that had before appeared. Notes and Commentaries on various books of the Old Teſtament. "An Introduction to the reading of Hebrew and other Eaſtern Languages without Points." "A Treatiſe againſt the Eternity of the World." "An Edition of Origen's Works," and a tranſlation of the works of Joſephus into the French language. Moreri.

GENENNE, El, in *Geography*, a town of Egypt; 60 miles S. of Girgé.

GENERA, in *Ancient Greek Muſic*, implied, according to Euclid, the different diviſions and diſpoſitions of the tetrachord or fourth, as to the intervals of the four ſounds of which it is compoſed.

Plutarch (de Muſica) ſays, that it is not ſufficient for a muſician to know what kind of muſic ſhould be ſet to any particular poem; he ſhould likewiſe know how to write it down in all the genera, that is to ſay, in the diatonic or natural ſcale, conſiſting of tones and ſemitones, as at preſent; in the chromatic, in which the ſcale was divided into ſemitones and minor thirds; and in the enharmonic genus, moving by quarter tones, and major thirds.

In modern muſic the genera are but two; diatonic and chromatic. Theſe conſiſt in the manner of arranging the tones and ſemitones of which melody is compoſed.

When no more than two ſemitones occur in the courſe of an octave, the melody may properly be ſtyled genuine diatonic.

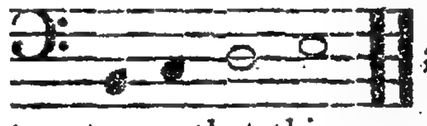
Indeed the chromatic in uſe at preſent can hardly be compared with that of the ancients; for with them every accidental flat or ſharp which led to a new mode or key, would have been called a change of genus. With us, however, a mere change of modulation, though it occaſions a change of key, is not a change of genus; for while the ſounds made uſe of in harmony and melody can be referred to any one key, the diatonic genus is ſuppoſed to be preſerved: it is only a regular ſucceſſion of two or more ſemitones, aſcending or deſcending, that conſtitutes modern chromatic.

In ancient muſic, not only the tone was divided into two, as with us, but the ſemitone by a dieſis or quarter-tone. Theſe three kinds of interval, the tone, ſemitone, and dieſis, conſtituted the difference of the three genera.

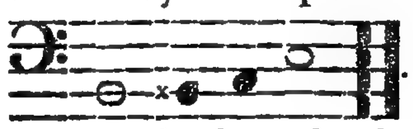
The fourth being the conſtant boundary of ſounds in the muſic of the ancients, as the octave is in that of the moderns, its extremes, or loweſt and higheſt ſounds, were *ſtantes*, *immobiles*, or fixed. As the octave in modern muſic admits of no change, but is tuned as perfect as poſſible, ſo the

the fourths in ancient muſic were never allowed to deviate from perfection.

The different genera were therefore characterized by the changes made in the two middle ſounds of the tetrachords, that were ſtiled *mobiles*, mutable.

In the diatonic genus, the melody proceeded by a ſemitone, and two tones, as B C D E  ; and it was from the ſucceſſion of two tones, that this genus acquired the name of *Diatonic*. As the term is derived from δια, *by*, and τονος, *tone*; that is, paſſing from one tone to another; which, in the Greek muſic, was never done but in the diatonic genus.

The *Chromatic* proceeded by two ſucceſſive ſemitones, and a hemiditone, or minor third, as B C C ✕ E . This modulation holding the middle place between the diatonic and enharmonic, has been ſuppoſed by Martianus Capella and Bryennius, to derive its name from χρωμα, *colour*; for as the gradations between black and white are called colours; ſo this genus, being placed between the diatonic and enharmonic, is called *chromatic*. M. Rouſſeau tells us, in his Dictionary, that this genus uſed to be written in coloured notes, but without giving any authority in ſupport of this opinion.

The *Enharmonic* tetrachord proceeded by two quarter tones, and a major third, B B × C E  . This genus is often called by Ariſtoxenus, and others, ſimply ἁρμονια, *harmonia*, that is, well arranged and ordered.

Ariſtoxenus tells us, that the diviſions and bounds of the genera were not accurately fixed till his time; and Ariſtides Quintilianus ſpeaks of ſeveral genera, or ſpecies of intervals, which were of the higheſt antiquity; yet ſo wild and irregular, that after the art of muſic was brought to a greater degree of perfection, and the laws of the three principal genera were ſettled, they had been totally diſuſed by the beſt muſicians. The ſame author aſſerts, that it is of theſe barbarous diviſions of the ſcale, or old harmonies, as they were called, and not the common modes of the ſame names, that Plato ſpeaks in his Republic, where he admits ſome of them, and rejects others.

The ancients attributed peculiar effects to each genus, and ſpeak of many characteriſtic diſtinctions of genera, which now appear to be wholly fanciful and imaginary. Theſe, if they ever had exiſtence, were, perhaps, deſtroyed by modern harmony. Ariſtides Quintilianus, p. 111, tells us, that

The diatonic is manly and auſtere;

The chromatic ſweet and pathetic; and

The enharmonic animating and mild.

Vitruvius, ſpeaking of the enharmonic, ſays, that it is in a particular manner grave and majeſtic. "Cantus ejus maximè gravem, et egregiam habet auctoritatem."

Perhaps the idea of a major-key, which the enharmonic ditone muſt impreſs upon the ear, may have contributed to the notion of muſic in that genus being animating; but how it could be at the ſame time grave and ſoothing, animating and mild, is not eaſy to conceive. This genus was never known to the Romans, having been loſt before they attempted the polite arts.

And Plutarch, in his firſt Eſſay againſt Colotes, the Epicurean, aſks, "Why does the chromatic genus melt and diſſolve, and the enharmonic brace the nerves, and compoſe the mind, after being diſturbed?"

Ariſtides Quintilianus, in another place, (p. 19. Edit. Meibom.) ſays of the genera, that the diatonic is the moſt natural, becauſe all who have ears, though uninſtructed in muſic, are capable of ſinging it.

The chromatic is more artificial, for it can be ſung only by ſuch as are adepts in muſic.

The enharmonic is the moſt refined and difficult of all, and has been received and practiſed only by the greateſt artiſts. See ENHARMONIC and MUSIC *of the Ancients*.

GENERAL, ſomething that comprehends all, or extends to a whole genus, or kind.

All the ſciences have ſome general principles, or axioms.

General councils are particularly called œcumenical.

GENERAL *Aſſembly*, *aſſizes*, *averment*, *council*, *demurrer*, *diet*, *fee-tail*, *jund*, *geography*, *gravity*, *imparlance*, *iſſue*, *legacy*, *nature*, *occupancy*. See the ſeveral ſubſtantives.

GENERAL *Officers*, in an *Army*, are thoſe who do not only command over a ſingle company, or regiment, but whoſe office and authority extend over a body of ſeveral regiments of horſe and foot.

Such are brigadier-generals, lieutenant-generals, major-generals, generals of the horſe, and of the foot. All officers above the rank of lieutenant-colonel are called general officers. See GENERAL, below. See alſo PAYMASTER-*general*, COMMISSARY-*general*, MUSTERMASTER-*general*, &c. and PAY.

We have alſo officers in law, in the revenues, &c. diſtinguiſhed by the appellation of general: as attorney-general, ſolicitor-general, &c. receiver-general, comptroller-general, &c.

GENERAL *pauſe*, *qualities*, *-ſeſſions*, *ſtatutes*, *tail*. See the ſubſtantives.

GENERAL *terms* or *words*, are ſuch as expreſs or denote general ideas.

Ideas become general, by ſeparating from them the circumſtances of time, place, or any other ideas that may determine them to this or that particular exiſtence.

By this way of abſtraction they become capable of repreſenting more individuals than one; each of which having a conformity to that abſtract idea, is of that ſort.

All things, Mr. Locke obſerves, that exiſt, being particulars, it might be expected that words ſhould be ſo too in their ſignification; but we find it quite contrary; for moſt of the words that make all languages, are general terms.

This is the effect of reaſon and neceſſity: for, 1. It is impoſſible that every particular thing ſhould have a diſtinct peculiar name; becauſe it is impoſſible to have diſtinct ideas of every particular thing, to retain its name with its peculiar appropriation to that idea. 2. It would be uſeleſs, unleſs all could be ſuppoſed to have the ſame ideas in their minds: for names applied to particular things, whereof one alone has the ideas in his mind, could not be ſignificant, or intelligible to another, who is not acquainted with all thoſe particular things which had fallen under his notice. 3. It would be of no great uſe for the improvement of knowledge; which, though founded in particular things, enlarges itſelf by general views, to which things reduced into ſorts under general names, are properly ſubſervient.

In things where we have occaſion to conſider and diſcourſe of individuals and particulars, we uſe proper names: as in perſons, countries, cities, rivers, mountains, &c.

The firſt ideas children get are only particular; as thoſe of the nurſe, or mother; and the names they give them are confined to theſe individuals; afterwards, obſerving that there are a great many other things in the world that reſemble

ſemble them in ſhape, and other qualities, they frame an idea which they find thoſe many particulars do partake in: to that they give, with others the name, *man*, for example. In this they make nothing new, but only leave out of the complex idea they had of Peter, James, Mary, &c. that which is peculiar to each, and retain only what is common to all. And thus they come to have a general name, and a general idea.

By the ſame method they advance to more general names and notions; for obſerving ſeveral things that differ from their idea of man, and which cannot, therefore, be comprehended under that name, to agree with man in ſome certain qualities; by retaining only thoſe qualities, and uniting them into one idea, they have another more general idea; to which, giving a name, they make a term of a more comprehenſive extenſion.

Thus, by leaving out the ſhape, and ſome other properties ſignified by the name, man; and retaining only body with life, ſenſe, and ſpontaneous motion, we form the idea ſignified by the name *animal*. After the ſame manner, the mind proceeds to body, ſubſtance, and at laſt to being, thing, and ſuch univerſal terms, which ſtand for any ideas whatſoever.

Hence, we ſee the whole myſtery of genus and ſpecies is nothing but abſtract ideas, more or leſs comprehenſive, with names annexed to them: this ſhews us the reaſon why, in defining words, we make uſe of the genus; namely, to ſave the labour of enumerating the ſeveral ſimple ideas, which the next general term ſtands for.

From what has been ſaid, it is plain, that general and univerſal belong not to the real exiſtence of things, but are the inventions of the underſtanding, made by it for its own uſe, and concern only ſigns, either words or ideas. General words do not barely ſignify one particular thing; for then they would not be general terms, but proper names: neither do they ſignify a plurality; for then man and men would ſignify the ſame thing; but what they ſignify is a ſort of things; and this they do, by being made ſigns of abſtract ideas in the mind; to which ideas, as things exiſting are found to agree, ſo they come to be ranked under that name, or to be of that ſort.

The eſſences then of the ſorts, or ſpecies of things, are nothing but theſe abſtract ideas.

It is not denied here, that nature makes things alike, and ſo lays the foundation of this ſorting and claſſing; but the ſorts or ſpecies themſelves are the workmanſhip of human underſtanding; ſo that every diſtinct abſtract idea is a diſtinct eſſence; and the names that ſtand for ſuch diſtinct ideas, are the names of things eſſentially different. Thus oval, circle, rain, and ſnow, are eſſentially different. See this further illuſtrated under ABSTRACTION, ESSENCE, IDEA, and SUBSTANCE.

GENERAL *Verdict, Warrant, Wind.* See the Subſtantives.

GENERAL *of an Army*, is the chief commanding officer; whoſe buſineſs is to regulate the march and encampment of the army; to chooſe the moſt advantageous ground in the day of battle; to diſpoſe the army; to poſt the artillery; and to ſend his orders, wherever there is occaſion, by his aids-de-camp. At a ſiege, he is to cauſe the place to be inveſted; to regulate the approaches and attacks; to viſit the works, and to ſend out detachments for ſecuring the convoy; and for foraging. See GENERALISSSIMO.

The natural qualities of a general ſhould be a martial genius, a ſolid judgment, a healthy robuſt conſtitution, intrepidity and ſelf-poſſeſſion on critical occaſions, goodneſs of heart, and liberality: he ſhould alſo be of a mean age, neither too young, becauſe he would want prudence and experience, nor too old, becauſe he would want vivacity and activity. He ſhould be ſteady and uniform in his conduct, affable in his diſpoſition, and yet inflexible in maintaining the diſcipline of his army. His acquired qualities ſhould be ſecrecy, juſtice, ſobriety, temperance, knowledge of the art of war, both from theory and practice, the art of commanding and of ſpeaking with preciſion, great attention in preſerving the lives and ſupplying the wants of the ſoldiers, and a conſtant ſtudy of the characters of the officers of his army, ſo that he may be capable of employing them according to their reſpective talents. His conduct appears in eſtabliſhing his magazines in the moſt convenient places; in examining the country, that he may not engage his troops too far, while he is ignorant of the means of bringing them off; in procuring ſubſiſtence for them; and in ſelecting the moſt advantageous poſts for fighting, retreating, or ſhunning a battle. His experience inſpires his army with confidence; his quality, by creating reſpect, augments his authority; his liberality enables him to procure intelligence of the ſtrength and deſigns of the enemy, and thus to take the moſt ſucceſsful meaſures. In a word, a general ought to be fond of glory, to have an averſion to flattery, to render himſelf beloved, and to keep a ſtrict diſcipline and ſubordination.

In the day of battle, the ſtation of a general is with the reſerve, where he remains ſo ſituated, that he can ſee every thing which is going forward; and by means of his own obſervations, or the communications of his aids-de-camp, he is enabled to ſend reinforcements, as the exigences of the conflict may require.

GENERAL, *Adjutant*, is an officer who attends the general, aſſiſts in council, and carries the general's orders to the army. He diſtributes the daily orders to the majors of brigade. He is likewiſe charged with the general detail of the duty of the army. The majors of brigade ſend every morning to the adjutant-general an exact return, by battalion and company, of the men of their brigade. In a day of battle, the adjutant-general ſees the infantry drawn up, after which he places himſelf by the general, to receive any orders which may regard the corps of which he has the detail. In a ſiege, he orders the number of workmen required, and ſigns the warrants of their payment. He receives the guards of the trenches at their rendezvous, and examines their condition; he gives and ſigns all orders for parties; he has an orderly ſerjeant from each brigade of infantry in the line, to carry ſuch orders as he may have occaſion to ſend from the general. See ADJUTANT.

GENERAL *of the Artillery*. See ARTILLERY.

GENERAL, *Brigadier*, is next in rank, in the Britiſh ſervice, to that of major-general, being ſuperior to all colonels, and having a ſeparate command. Brigadier-generals are not entitled to aids-de-camp; but they have each one brigade-major. See BRIGADIER.

GENERAL, *Brigade-Major*. As England and Scotland have been divided into different diſtricts, each diſtrict being under the command of a general officer, it has been found neceſſary, for the diſpatch of buſineſs, to eſtabliſh an office, which ſhall be ſolely confined to brigade duties.

The firſt brigade-major-general was appointed in 1797. Since this period all orders relative to corps of officers, which are tranſmitted from the commander-in-chief to the generals of diſtricts, paſs through this channel of intermediate communication.

By the laſt general regulations, it is particularly directed, that all general officers commanding brigades, ſhall very

minutely inſpect the internal economy and diſcipline of the ſeveral regiments under their order.

They are frequently to viſit the hoſpitals and guards. On arriving in camp they are never to leave their brigades till the tents are pitched, and the guards poſted; they muſt always encamp with their brigades, unleſs quarters can be procured for them immediately in the vicinity of their camp. General officers muſt not at any time change the quarters aſſigned them, without leave from head-quarters.

All general officers ſhould make themſelves acquainted, as ſoon as poſſible, with the ſituation of the country near the camp, with the roads, paſſes, bridges, &c. leading to it; and likewiſe with the out-poſts, that in caſe they ſhould be ordered ſuddenly to ſuſtain, or defend any poſt, they may be able to march without waiting for guides, and be competent, from a topographical knowledge of the country, to form the beſt diſpoſition for the ſervice. They ſhould inſtruct their aids-de-camp in theſe particulars, and always require their attendance when they viſit the out-poſts.

All general officers, and others in conſiderable command, muſt make themſelves thoroughly acquainted with the nature of the country, the quality of the roads, every circuitous acceſs through vallies or openings, the relative height of the neighbouring hills, and the courſe of rivers, which are to be found within the ſpace entruſted to their care. Theſe important objects may be attained by maps, by acquired local information, and by unremitting activity and obſervation. And if it ſhould ever be the fate of a country, interſected as Great Britain is, to act upon the defenſive, a full and accurate poſſeſſion of all its faſtneſſes, &c. muſt give each general officer a decided advantage over the commanding officer of an enemy, who cannot have examined the ground upon which he may be reduced to fight, and muſt be embarraſſed in every forward movement that he makes. Although guides may ſerve, and ought always to be uſed in the common operations of marches, there are occaſions where the eye and intelligence of the principal officers muſt determine the movements of troops, and enable them to ſeize and improve every advantage that occurs as the enemy approaches.

General officers on ſervice abroad, or commanding diſtricts at home, may appoint their own aids-de-camp and brigade-majors. The latter, however, are to be conſidered as officers attached to their ſeveral brigades, not perſonally to the officers commanding them. The former are their habitual attendants and domeſtic inmates. In the ſelection of aids-de-camp and brigade-majors, too much attention cannot be given to their requiſite qualifications; and that general would not only commit an act of injuſtice againſt the intereſts of his country, but deſerve the ſevereſt cenſure and diſpleaſure of his ſovereign, who, through motives of private convenience, family connection, or convivial recommendation, could ſo far forget his duty, as to prefer an unexperienced ſtripling, to a character marked by a knowledge of the profeſſion, a zeal for the ſervice, and an irreproachable conduct.

GENERAL, *Colonel*, an honorary title, or military rank, which is conferred in foreign ſervices. Thus, the prince of peace in Spain is colonel-general of the Swiſs-guards.

GENERAL *of a Diſtrict*, a general officer, who has the charge and ſuperintendance of a certain extent of country, in which troops are encamped, quartered, or cantoned. He is entitled to have three aids-de-camp, and one brigade-major. He receives reports, &c. from the major-general, reſpecting the troops in his diſtrict; reviews and inſpects them, and likewiſe orders field-days of the whole, brigaded, or by ſeparate corps, when and in what part he pleaſes, making the neceſſary reports to the war-office, commander-in-chief, &c.

GENERAL *of Foot*, is an officer under the chief general, who has an abſolute command of the foot of the army.

GENERAL *of Horſe*, is an officer next under the chief general, who has an abſolute command of the horſe of an army, above the lieutenant-generals.

GENERAL, *Lieutenant*, is the firſt military dignity after that of a general. One part of their function is to aſſiſt the general with counſel; and, therefore, this officer ought, if poſſible, to poſſeſs the ſame qualities with the general himſelf; and this is the more neceſſary, as he often commands armies in chief, or ſucceeds to the command on the death of the general.

Lieuteant-generals have been of late multiplied in Europe, in proportion as the armies have become more numerous. They ſerve either in the field, or in ſieges, according to the dates of their commiſſions. In battle the eldeſt commands the right wing of the army, the ſecond the left wing, the third the centre, the fourth the right wing of the ſecond line, the fifth the left wing, the ſixth the centre, and ſo on. In ſieges the lieutenant-generals always command the right of the principal attack, and order what they judge proper for the advancement of the ſiege, during the 24 hours they are in the trenches, except the attacks, which they are not to make, without an order from the general-in-chief. Lieutenant-generals are entitled to two aids-de-camp.

GENERAL *of Artillery, Lieutenant*, is ſuppoſed to be an able mathematician and engineer, to know all the powers of artillery, to underſtand the attack and defence of fortified places, in all their different branches, and how to diſpoſe of the artillery in the day of battle to the greateſt advantage; to conduct its march and retreat; and alſo to be well acquainted with the numerous apparatus belonging to the train, laboratory, &c.

GENERAL, *Major*, the next officer to the lieutenant-general; whoſe office it is to receive orders from the general, or, in caſe of his abſence, from the lieutenant-general of the day; which orders he is to diſtribute to the brigade-majors, with whom he is to regulate the guards, convoys, detachments, &c. On him the whole fatigue and detail of duty of the army reſt. It is the major-general of the day who is charged with the encampment of the army, who places himſelf at the head of it, when it marches, who marks out the ground of the camp to the quarter-maſter-general, and who places the new guards for the ſafety of the camp. On the day when the army is to march, he dictates to the field-officers the order of the march, which he has received from the general, and on other days he gives them the parole. In a fixed camp he is charged with the foraging, with reconnoitring the ground for it, poſting the eſcorts, &c. In ſieges, when two ſeparate attacks are made, the ſecond belongs to him; but if there be only one, he takes either from the right or left of the attack, that which has not been choſen by the lieutenant-general. When the army is under arms, he aſſiſts the lieutenant-general, and executes his orders. If the army marches to an engagement, his poſt is at the head of the guards of the army, until they are near enough to the enemy, to enjoin their different corps; after which he returns to his own proper poſt; for the major-generals are diſpoſed in the order of battle as the lieutenant-generals are, to whom, however, they are ſubordinate, for the command of their diviſions. The major-general has one aid-de-camp and one brigade-major.

GENERAL is alſo uſed, in a monaſtic ſenſe, for the chief of an order; or of all the houſes or congregations eſtabliſhed under the ſame rule.

Thus we ſay the general of the Ciſtercians, the Franciſcans, &c.

F. Thomaſſin derives the origin of generals of orders from the privileges granted by the ancient patriarchs to the monaſteries ſituate in their capital cities. By ſuch means they were exempted from the juriſdiction of the biſhop, and immediately ſubjected to that of the patriarch alone.

GENERAL *of the Jeſuits*. See JESUITS, and ADJUTANT.

GENERAL is alſo uſed, in the *Military Art*, for a particular march, or beat of drum; being the firſt which gives notice, commonly in the morning early, for the infantry to be in readineſs to march. See DRUM.

GENERALISATION, in the *Philoſophy of the Human Mind*, denotes, according to profeſſor Stewart, nothing more than the capacity of employing general terms; though ſome philoſophers have ſuppoſed that it is a faculty of the mind diſtinct from abſtraction, and neceſſary to account for the formation of genera and ſpecies; and they have endeavoured to ſhew, that although generalization without abſtraction is impoſſible; yet, that you might have been ſo formed, as to be able to abſtract, without being capable of generalizing. Stewart's Elements, &c. p. 159, &c. See ABSTRACTION.

GENERALISSIMO, called alſo *Captain-General*, and ſimply *General*, is an officer who commands all the military powers of a nation; who gives orders to all the other general officers; and receives no orders himſelf but from the king. He holds this important truſt under various titles, as captain-general in England and Spain, feldt-mareſchal in Germany, or mareſchal in France. In the Britiſh ſervice the king is conſtitutionally, and in his own proper right, captain-general. He has ten aids-de-camps; every one of whom enjoys the brevet rank of full colonel in the army. Next to his majeſty is the commander-in-chief, whom he ſometimes honours with the title of captain-general.

Monſ. Balſac obſerves that the cardinal de Richelieu firſt coined the word, generaliſſimo, of his own abſolute authority, upon his going to command the French army in Italy.

GENERATE, in *Muſic*, is uſed to ſignify the operation of that mechanical power in nature, which every ſound has in producing one or more different ſounds. Thus, any given ſound, however ſimple, produces, together with itſelf, its octave, and two other ſounds, extremely ſharp, *viz.* its twelfth above, *i. e.* the octave of its fifth, and the other the ſeventeenth above, or the double octave of its third major. Whether we ſuppoſe this procreation of ſounds to reſult from an aptitude in the texture and magnitude of certain particles in the air, for conveying to one's ears vibrations that bear thoſe proportions to one another, as being determined at once by the partial and total oſcillations of any muſical ſtring; or from whatever economy of nature we chuſe to trace it; the power of one ſound thus to produce another, when in action, is ſaid to "generate." The ſame word is applied by Tartini and his followers to any two ſounds, which, ſimultaneouſly heard, produce a third. See GENERATOR.

GENERATED, or GENITED, is uſed by ſome mathematical writers, for whatever is produced, either in arithmetic by the multiplication, diviſion, or extraction of roots; or in geometry, by the invention of the contents, areas, and ſides; or of extreme and mean proportionals, without arithmetical addition and ſubtraction. Thus, 20 is the product generated of 4 and 5; *a b* that of *a* and *b*; 4, 8, 16, &c. the powers generated from the root 2, and a^2, a^3, a^4, &c. thoſe from the root *a*. Thus alſo, a circle is generated by the revolution of a line about one of its extremities, a right cone by the rotation of a right-angled triangle about its perpendicular, a cylinder by the rotation of a rectangle about one of its ſides, or by the motion of a circle in the direction of a right line, whilſt it always keeps parallel to itſelf.

GENERATING LINE, or *Figure*, in *Geometry*, is that which, by its motion of revolution, produces any other figure, plane, or ſolid. Thus, a line, according to Euclid, generates a circle, a right-angled triangle, a right cone, &c. (ſee the preceding article); and thus alſo Archimedes ſuppoſes his ſpirals to be generated by the motions of generating points and lines; and the figure thus generated is called the "generant." In geometry it is a general theorem, that the meaſure of any generant, or figure produced by any kind of motion of any other figure, or generating quantity, is equal to the product of this generating quantity drawn into the length of the path deſcribed by its centre of gravity, whatever the kind of motion may be, whether rotatory, or direct, &c. (See CENTRO-BARYC *Method.*) In the modern analyſis, or fluxions, all ſorts of quantities are conſidered as generated by ſome ſuch motion, and the quantity hereby generated is called a fluent. See FLUENT and FLUXION. See GENESIS.

GENERATION, in *Mathematics*, denotes the formation or production of any geometrical figure, or other quantities, as any of thoſe mentioned in the preceding articles; and the term is alſo applied to equations, &c.

GENERATION, in *Phyſics*, denotes the act of procreating, or producing a thing which before was not: or, the total change or converſion of a body into a new one, which retains no ſenſible part, or mark of its former ſtate.

Thus, fire is ſaid to be generated, when we perceive it to be where before was only wood, or other fuel: or when the wood is ſo changed as to retain no ſenſible character of wood: thus, alſo, a chick is ſaid to be generated, when we perceive the chick, where before was only an egg; or when the egg is changed into the form of a chick.

In generation, there is not properly any production of new parts, but only a new modification or manner of exiſtence of the old ones; by this, generation is diſtinguiſhed from *creation*.

It is diſtinguiſhed from *alteration*, in that the ſubject, in this latter, remains apparently the ſame; and only the accidents or affections are changed; as when the ſame body is to-day well, and to-morrow ſick; or that braſs, which before was round, is now ſquare.

Laſtly, generation ſtands oppoſed to *corruption*, which is the utter extinction of a former thing: as when that which before was wood, or an egg, is no longer the one or the other, whence it appears, that the generation of one thing is the corruption of another.

The Peripatetics explain generation by a change or paſſage from a privation, or want of a ſubſtantial form, to the having of ſuch a form. The moderns allow of no other change in generation, than what is local: according to them it is only a tranſpoſition, or new arrangement of parts; and thus the ſame matter ſhall ſucceſſively undergo an infinity of generations.

A grain of wheat, *e. gr.* is committed to the ground: this, imbibing the humidity of the ſoil, becomes turgid, and dilates to ſuch a degree, that it becomes a plant; and, by a continual acceſſion of matter, ripens by degrees into an ear; and at length into new ſeed. This ſeed, ground in the mill, appears in form of flour; which, mixed up with water, makes a paſte; whereof, with the addition of yeaſt, fire, &c. bread is generated; and this bread, broken with the teeth, digeſted in the ſtomach, and conveyed through the canals of the body, becomes fleſh.

Now, in all this ſeries of generation, the only thing effected is a local motion of the parts of the matter, and their ſettling again in a different order; ſo that, in reality, wherever there is new arrangement or compoſition of elements, there is a new generation; and, therefore, generation is finally reducible to motion.

END OF VOLUME XV.

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